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## SHORELAND ZONING PERMIT APPLICATION



April 2026

### **Harrison Avenue Slope Repair and Stormwater Improvements Gardiner, Maine**

PREPARED FOR:  
City of Gardiner

SUBMITTED TO:  
Gardiner Code Enforcement Office



April 14, 2026

Code Enforcement  
Gardiner City Hall  
6 Church Street  
Gardiner, ME  
04345

**Re:     *Shoreland Zoning Permit Application  
          Harrison Avenue Slope Repair and Stormwater Improvements  
          Gardiner, Maine***

To Whom it May Concern,

On behalf of the City of Gardiner, Weston & Sampson Engineers, Inc., hereby encloses the following Shoreland Zoning Permit Application for the proposed Harrison Avenue Slope Repair and Stormwater Improvements Project in Gardiner to fulfill the requirements of the Mandatory Shoreland Zoning Act (MSZA).

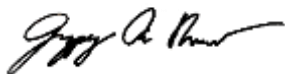
As part of the filing, we have attached the following:

Local Application Form  
Appendix A: Project Description  
Appendix B: Alternatives Analysis  
Appendix C: Maps  
Appendix D: Photos  
Appendix E: Deeds  
Appendix F: Abutters/Public Notice  
Appendix G: Plans  
Appendix H: Wetland Delineation Report  
Appendix I: IPaC Information

If you have any questions regarding this submittal, please contact me at 774-298-3095.

Very truly yours,

WESTON & SAMPSON



Gregory Russo, CWS



## Shoreland Zoning Permit Application

### LAND USE AND MULTI-PURPOSE PERMIT APPLICATION

	Applicant	Owner ( <input type="checkbox"/> Same as Applicant)	Contractor ( <input type="checkbox"/> Same as Applicant)
<b>Name</b>	Denise Brown, City Manager	same as applicant	Tom Strike, PE Weston & Sampson Engineers
<b>Address</b>	Gardiner City Hall, 6 Church St.	same as applicant	150 Dow St.
<b>City, State, Zip</b>	Gardiner, ME 04345	same as applicant	Manchester, NH 13101
<b>Phone</b>	207-582-4200	same as applicant	603-263-9296
<b>Email</b>	dbrown@gardinermaine.com	same as applicant	striket@wseinc.com

**Application Instructions:** Complete all sections of application, including any additional forms noted. The Applicant must prove that the proposed activity conforms with the City's land use ordinance (LUO 4.9.3). A permit will be issued only if the application is deemed complete and has been reviewed and fully complies with all the provisions of the LUO (4.9.4).

**Property Address or Location:** Harrison Ave, Gardiner, ME Map 28, Lot 4, 6, 6C

**Project Description:** Repair and stabilization of the failed slope between Harrison Ave. and Cobbosseecontee Stream and the portion of Harrison Avenue adjacent to the slope. Slope stabilization will involve installing slope nails and toe bank protection. Repairs to Harrison Ave. will include storm water drainage improvements.

PROPERTY USE TABLE (LUO 7.6)			PROJECT INFORMATION	
	Existing	Proposed	<b>BUILDING:</b> <input type="checkbox"/> <b>COMMERCIAL</b> (add Form 03) OR <input type="checkbox"/> <b>RESIDENTIAL</b> (add Form 04)	
Commercial	<input type="checkbox"/>	<input type="checkbox"/>	<b>Additional-General:</b> <input type="checkbox"/> Address/E-911(add Form 05) <input type="checkbox"/> Manufactured Home (add Form 11) <input type="checkbox"/> Change of Use (add Form 06) <input type="checkbox"/> Sewer (add Form 15) <input type="checkbox"/> Demolition/Removal (add Form 07) <input checked="" type="checkbox"/> Shoreland (add Form 12) <input type="checkbox"/> Driveway Entrance (add Form 05) <input type="checkbox"/> Sign (add Form 13) <input type="checkbox"/> Excavation (add Form 08) <input type="checkbox"/> Sludge Management (add Form 14) <input type="checkbox"/> Floodplain (add Form 09) <input type="checkbox"/> Street Opening (add Form 05) <input type="checkbox"/> Home Occupation (add Form 10) <input type="checkbox"/> Water (add Form 15)	
Educational	<input type="checkbox"/>	<input type="checkbox"/>		
Governmental	<input type="checkbox"/>	<input type="checkbox"/>		
Industrial	<input type="checkbox"/>	<input type="checkbox"/>		
Institutional	<input type="checkbox"/>	<input type="checkbox"/>		
Other	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Rural	<input type="checkbox"/>	<input type="checkbox"/>		
Residential	<input type="checkbox"/>	<input type="checkbox"/>	<b>Plumbing:</b> <input type="checkbox"/> Internal (use HHE 211) <input type="checkbox"/> Subsurface (use HHE 200)	
Transportation	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Wholesale	<input type="checkbox"/>	<input type="checkbox"/>		

☐ **Is Applicant not owner?** Add authorizing letter from Property Owner (LUO 4.9.2)

☐ **Is work exterior?** Add Site Plan for Permit Application (Form 02)

By signing below, I agree that the information provided is complete and correct and that my project will adhere to applicable State and City land use laws and regulations. I agree to future inspections by the Code Enforcement Officer at reasonable hours.

Denise M. Brown  
**Applicant Signature**

4/9/26  
**Date**

Form01\_LandUseMultiPurposeApp

Date Received: \_\_\_\_\_

Original copy for property file

Address: Harrison Ave, Gardiner, ME  
Tax Map & Lot #: Map 28, Lot 4, 6, 6C  
Zoning District: \_\_\_\_\_



## CITY OF GARDINER, MAINE – SHORELAND ZONING PERMIT APPLICATION

Address:

Harrison Ave, Gardiner, ME

Tax Map & Lot #: Map 28, Lot 4, 6, 6C

Zoning District:

**FEES: 1**

### Description of property including a description of all proposed construction, e.g. Land Clearing, road, building, septic systems and wells (Please note that a site plan sketch is required on Form 02 – Site Plan for Permit Application)

The proposed work site is located along Harrison Avenue and an adjacent soil slope, between approximately its intersection with Cobbossee Avenue and 291 Harrison Avenue. Cobbosseecontee Stream runs generally parallel to Harrison Avenue along the east side of the roadway in the proposed work area. The stream is situated at a lower elevation (approximately 40 feet lower) than the roadway, and a relatively steep, vegetated soil slope separates the edge of the roadway pavement from the stream. Slope failures occurred in May and December 2023 due to a combination of over-steepened slopes, excessive stormwater flow over the slope, and erosional forces along the slope toe. Both failures caused portions of the vegetated slope and surficial soils to slide into the Stream. The slope surface primarily consists of exposed embankment soils in the areas of the failures and is covered with vegetation outside failure areas.

Harrison Avenue is a paved roadway with infrastructure mainly present along the east side of the road including metal guardrails and timber utility poles. Subsurface utilities, including water and sewer pipes, are present below Harrison Avenue. The right edge of the pavement surface, the metal guardrails, and timber utility poles were damaged as result of the previous slope failures. Conditions have progressively worsened since the failure due to on-going erosion of the adjacent slope. Harrison Avenue in the areas of the failures have been closed since May 2023.

The proposed work includes repair and stabilization of the failed slope sections to meet current engineering design standards and stormwater collection improvements along Harrison Avenue. Slope repair and stabilization includes installation of soil nails into the embankment to increase slope stability and riprap along the slope toe to provide resistance to erosion from the Cobbosseecontee Stream. The slope in the areas of the soil nails will be surfaced with loam and seed. Stormwater improvements include installation of catch basin, stormwater collection pipes, and asphalt curbing. The purpose of the stormwater improvements is to direct flow away from the Harrison Avenue slope.

Proposed Use Project:	Estimated Cost of Construction:
Slope Repair and Stormwater Improvements	\$2.0M

### SHORELAND PROPERTY INFORMATION

Sq. Ft. of lot to be covered by non-vegetated surfaces 1,750 SF - Riprap at slope toe	Elevation above 100 year flood FEMA 100 year Flood = El. 129.0 Work Area = El. 124.0 to El. 168.0
Height of proposed structure Not Applicable	
Existing use of property Vegetated slope and paved road surface	Proposed use of property Same but with riprap at slope toe

#### Fees:

CEO Review:	\$25.00
Planning Board Review:	\$125.00

NOTE: This set of questions (A – D) apply only to expansions of portions of existing structures which are less than the required setback from the high water mark:	
A) Total floor area of portion of structure which is less than required setback as of 1/1/89 (sq. ft.)	A) Total volume of portion of structure which is less than required setback as of 1/1/89 (cu. ft.)
B) Floor area of expansions of portion of structure which is less than required setback from 1/1/89 to present (sq. ft.)	B) Volume of expansions of portion of structure which is less required setback from 1/1/89 to present (cu. ft.)
C) Floor area of proposed expansion of portion of structure which is less than required setback (sq. ft.)	C) Volume of proposed expansion of portion of structure which is less than required setback (cu. ft.)
D. % increase of floor area of actual and proposed expansions of portion of structure which is less than required setback since 1/1/89:  (% increase= $\frac{B+C}{A} \times 100$ ) _____ %	D. % increase of volume of actual and proposed expansions of portion of structure which is less than required setback since 1/1/89:  (% increase= $\frac{B+C}{A} \times 100$ ) _____ %

**Definition of Structure:** For shoreland zoning purposes, anything built for the support, shelter or enclosure of persons, animals, goods or property of any kind, together with anything constructed or erected with a fixed location on or in the ground, exclusive of fences, and poles, wiring and other aerial equipment normally associated with service drops as well as guying and guy anchors. The term includes structures temporarily or permanently located, such as decks and satellite dishes.



Draw a simple sketch showing both the existing and proposed structures with dimensions:

**Front or Rear Elevation**

See Appendix H - Plans

**Side Elevation**

See Appendix H - Plans

Scale: \_\_\_\_\_ inches = \_\_\_\_\_ feet





# CITY OF GARDINER, MAINE – SITE PLAN FOR PERMIT APPLICATION

Attach or draw below, a site plan showing size, location and ground floor elevations of all existing and/or proposed structures, sewage disposal facilities, water supply facilities, stormwater facilities, direction of surface water drainage and areas to be cut and filled. Include lot dimensions, property boundaries, distances of structures from boundaries, distances from high water marks on marsh, water brooks, ponds, streams, brooks, rivers, wetlands. Show the location of any signs, exterior lighting, landscaping and buffering. Indicate location, dimensions and materials of driveway, parking areas, sidewalks and/or street openings. Show flow of vehicular and pedestrian traffic into and through the property. Identify established street(s) and intersecting road name(s). Give distance to/from property line pins to opening and distance to/from opening to nearest intersecting road.

See Appendix H - Plans

Address:

Harrison Ave, Gardiner, ME

Tax Map & Lot #: Map 28, Lot 4, 6, 6C

Zoning District:

Scale: \_\_\_\_\_ = \_\_\_\_\_ feet

STREET FRONTAGE: \_\_\_\_\_ FT SHORE FRONTAGE: \_\_\_\_\_ LOT SIZE: \_\_\_\_\_ S.F. ACRES \_\_\_\_\_

SETBACKS - NUMBER OF FEET TO PROPOSED STRUCTURE FROM: \_\_\_\_\_ CENTER LINE OF ROAD

FROM PROPERTY LINES: \_\_\_\_\_ FRONT \_\_\_\_\_ REAR \_\_\_\_\_ LEFT SIDE \_\_\_\_\_ RIGHT SIDE

% LOT COVERAGE: MAXIMUM ALLOWED \_\_\_\_\_ PROPOSED: \_\_\_\_\_ EXISTING: \_\_\_\_\_

## Site Plan Review Application





6 Church Street,  
Gardiner, Maine 04345  
Phone (207) 582-4200

## Site Plan Review Application

Project Name: Harrison Ave Slope Failure Project Cost: \$2M  
Date of Submission: 4/14/2026 Received by: \_\_\_\_\_ Fees: \$250

A complete written description of the proposed project including all other local, state and federal permits required for the project. Repair and stabilization of the failed slope between Harrison Ave. and Cobbosseecontee Stream and the portion of Harrison Avenue adjacent to the slope.

Slope stabilization will involve installing slope nails and riprap toe protection. Repairs to Harrison Ave. will include stormwater improvements.

Other permits required include Shoreland Zoning, DEP NRPA, and Army Corps Nationwide Permit.

Anticipated beginning/completion dates of construction: \_\_\_\_\_ / \_\_\_\_\_

### 1. General Information:

Name of Property Owner: Denise Brown, City Manager

Address: Gardiner City Hall, 6 Church St, Gardiner, ME 04345

Phone/Fax No: 207-582-4200

Applicant/Agent Name: Same as above

Address: \_\_\_\_\_

Phone/Fax No \_\_\_\_\_

Design Professional(s)/Contractor(s): ☐ Surveyor ☒ Engineer ☐ Architect ☐ Contractor

Name: Tom Strike, PE, Weston & Sampson Engineers

Address: 150 Dow St., Manchester, NH 13101

Phone/Fax No 603-263-9296

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Phone/Fax No \_\_\_\_\_

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Phone/Fax No \_\_\_\_\_

Signature: Denise M. Brown Date: 4/14/26

## **2. Property Information:**

Property Location: \_\_\_\_\_

Deed Ref: Book \_\_\_\_\_ Page \_\_\_\_\_ . City Tax Map(s) \_\_\_\_\_ Lot(s) \_\_\_\_\_

Property Size/Frontage: Acres \_\_\_\_\_ Sq. Ft. \_\_\_\_\_ Road \_\_\_\_\_ Shore \_\_\_\_\_

Zoning District(s): \_\_\_\_\_

## **3. Development Information:**

One or more site maps drawn to scale, prepared and sealed by a professional engineer or architect showing the following:

### **a.) The existing conditions on the property including:**

1. The property boundaries;
2. The zoning district and zoning district boundaries if the property is located in more than one zone;
3. The location of required setbacks, buffers and other restrictions;
4. The location of any easements or rights-of-way;
5. The locations of existing structures and other existing improvements on the property including a description of the current use of the property;
6. The locations of existing utilities on and adjacent to the property including sewers, water mains, stormwater facilities, gas mains, and electric and other telecommunication facilities;
7. The location of the nearest source of a fire protection water supply (hydrant, fire pond, etc.)
8. The general topography of the property indicating the general slope of the land and drainage patterns. The CEO and/or Planning Board may require a topographic survey of all or a portion of the property for projects involving the construction of new or expanded structures or site modifications.
9. The location, type and extent of any natural resources on the property including wetlands, vernal pools, floodplains, waterbodies, significant wildlife habitats, rare or endangered plants or animals, or similar resources; and
10. The location and type of any identified historic or archeological resource on the property.

### **b.) The proposed development activity for which approval is requested including:**

1. The estimated demand for water supply and sewage disposal together with the proposed location and provisions for water supply and wastewater disposal including evidence of soil suitability if on-site sewage disposal is proposed;
2. The direction of proposed surface water drainage across the site and from the site together with the proposed location of all stormwater facilities and evidence of their adequacy;
3. The location, dimensions, and ground floor elevations of all proposed buildings and structures including expansions or modifications to existing buildings that change the footprint of the building;
4. The location, dimensions and materials to be used in the construction of drives, parking areas, sidewalks and similar facilities;
5. The proposed flow of vehicular and pedestrian traffic into and through the property;

6. The location and details for any signs proposed to be install or altered;
7. The location and details for any exterior lighting proposed to be installed or altered;
8. Provisions for landscaping and buffering; and
9. Any other information necessary to demonstrate compliance with the review criteria or other standards of the Land Use Ordinance.

c.) Evidence that the applicant has or can obtain all required permits necessary for the proposal.

**Additional Information Required:**

Building and structure drawings showing the footprint, height, front, side and rear profiles and all design features necessary to show compliance with this Ordinance;

An estimate of the peak hour and average daily traffic to be generated by the project and evidence that the additional traffic can be safely accommodated on the adjacent streets;

An erosion and sedimentation control plan; and

A stormwater management plan demonstrating how any increased runoff from the site will be handled if the project requires a stormwater permit from the Maine Department of Environmental Protection or if the Planning Board determines that such information is necessary based on the scale of the project and the existing conditions in the vicinity of the project.

Elevation drawings prepared by a professional engineer or architect showing the façade and roof of the side of all proposed structures facing the road, and the side facing the customer entrance. The drawings shall clearly illustrate the profile of the roof. All façade and roof materials shall be identified including color and texture.

Photographs or similar photo representations or drawings showing the architectural design and context of the proposed structures and adjacent properties on the both sides of the road.

**Survey Requirements**

The Planning Board may require the applicant to submit a survey of the perimeter of the tract, giving complete descriptive data by bearing and distances, made and certified by a Registered Land Surveyor. The survey may be required for the construction of new structures or any construction proposed on a undeveloped parcel or tract of land, whenever the Planning Board finds that a survey is necessary to show compliance with the requirements of this Ordinance due to the size of the lot, location of the lot or the placement of existing or proposed structures on the lot or neighboring properties.

**Additional Studies**

The Planning Board may require the applicant to perform additional studies or may hire a consultant to review the application or portions thereof. The cost to perform additional studies or hire a consultant shall be borne by the applicant.

#### **4. Review Criteria**

An applicant shall demonstrate that the proposed use or uses meet the review criteria listed below for the type of application. The Planning Board shall approve an application unless one or the other of them makes a written finding that one or more of the following criteria have not been met.

**6.5.1.1** The application is complete and the review fee has been paid.

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**6.5.1.2** The proposal conforms to all the applicable provisions of this Ordinance.

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**6.5.1.3** The proposed activity will not result in water pollution, erosion or sedimentation to water bodies.

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**6.5.1.4** The proposal will provide for the adequate disposal of all wastewater and solid waste.

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**6.5.1.5** The proposal will not have an adverse impact upon wildlife habitat, unique natural areas, shoreline access or visual quality, scenic areas and archeological and historic resources.

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**6.5.1.6** The proposal will not have an adverse impact upon waterbodies and wetlands.

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**6.5.1.7** The proposal will provide for adequate storm water management.

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**6.5.1.8** The proposal will conform to all applicable Shoreland Zoning requirements.

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**6.5.1.9** The proposal will conform to all applicable Floodplain Management requirements.

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**6.5.1.10** The proposal will have sufficient water available to meet the needs of the development.

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**6.5.1.11** The proposal will not adversely affect groundwater quality or quantity.

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**6.5.1.12** The proposal will provide for safe and adequate vehicle and pedestrian circulation in the development.

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**6.5.1.13** The proposal will not result in a reduction of the quality of any municipal service due to an inability to serve the needs of the development.

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**6.5.1.14** The applicant has the adequate financial and technical capacity to meet the provisions of this Ordinance.

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**6.5.2 Site Plan Review Criteria**

All applications for Site Plan Review shall meet the Review Criteria contained in 6.5.1 and the additional criteria contained in this section.

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**6.5.2.1.** The proposal will be sensitive to the character of the site, neighborhood and the district in which it is located including conformance to any zoning district specific design standards;

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**6.5.2.2** The proposal will not have an adverse impact upon neighboring properties;

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**6.5.2.3** The proposal contains landscaping, buffering, and screening elements which provide privacy to adjacent land uses in accordance with the appropriate performance standards;

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**6.5.2.4** The building site and roadway design will harmonize with the existing topography and conserve natural surroundings and vegetation to the greatest practical extent such that filling, excavation and earth moving is kept to a minimum;

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**6.5.2.5** The proposal will reflect the natural capabilities of the site to support the development. Buildings, structures, and other features should be located in the areas of the site most suitable for development. Environmentally sensitive areas including waterbodies, steep slopes, floodplains, wetlands, significant plant and wildlife habitats, scenic areas, aquifers and archeological and historic resources shall be preserved to the maximum extent;

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**6.5.2.6** The proposal will provide for a system of pedestrian ways within the site appropriate to the development and the surrounding area. The system will connect building entrances/exits with the parking areas and with existing sidewalks, if they exist or are planned in the vicinity of the project;

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**6.5.2.7** In urban and built-up areas, buildings will be placed closer to the road in conformance with setback requirements and parking areas shall be located at the side or rear of the building;

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**6.5.2.8** Proposals with multiple buildings will be designed and placed to utilize common parking areas to the greatest practical extent;

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**6.5.2.9** Building entrances will be oriented to the public road unless the layout or grouping of the buildings justifies another approach.

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**6.5.2.10** Exterior building walls greater than 50 feet in length which can be viewed from the public road will be designed with a combination of architectural features with a variety of building materials and shall include landscaping abutting the wall for at least 50% of the length of the wall.

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**6.5.2.11** Building materials will match the character of those commonly found in the City and surrounding area including brick, wood, native stone, tinted/textured concrete block or glass products. Materials such as smooth-faced concrete block or concrete panels and steel panels will only be used as accent features. Materials shall be of low reflectance, subtle, neutral or earth tone colors. High-intensity and bright colors shall be prohibited except when used as trim or accent. Building materials for industrial or commercial buildings located within an approved industrial park or subdivision are not be required to comply with this provision.

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**6.5.2.12** Building entrances and points where the development intersects with the public road and sidewalk will be provided with amenities appropriate for the area such as benches, bike racks, bus stop locations and other similar landscape features.

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**6.5.2.13** A proposal which includes drive-through service will be designed to minimize impact on the neighborhood. Drive-through lanes will be fully screened from adjacent residential properties and communication systems will not be audible on adjacent properties.

Applicant shall provide information that demonstrates that the proposal will be sensitive to the character of the site, neighborhood and the district in which it is located by considering the following:

## 6. Waivers

## Waiver of Submission Requirements

The Planning Board may, for good cause shown and only upon the written request of an applicant specifically stating the reasons therefor, waive any of the application requirements provided such waiver will not unduly restrict the review process. The Planning Board may condition such a waiver on the applicant's compliance with alternative requirements. Good cause may include the Planning Board's finding that particular submissions are inapplicable, unnecessary, or inappropriate for a complete review. Notwithstanding the waiver of a submission requirement, the Planning Board may, at any later point in the review process, rescind such waiver if it appears that the submission previously waived is necessary for an adequate review. A request for a submission previously waived shall not affect the pending status of an application.

[illegible]

## APPENDIX A

### Project Description

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## 1.0 BACKGROUND AND SITE CONDITIONS

The project proponent, the City of Gardiner, is proposing to repair slope failures that occurred along the soil embankment located immediately east of Harrison Avenue. The failed slope areas are situated between the roadway and Cobbosseecontee Stream. The slopes have experienced loss of vegetative cover and surficial soils as a result of recent instability. Infrastructure along the top of the slope have also been negatively impacted by the slope failures including damage to Harrison Avenue, guardrails, and utility poles. The proposed work is intended to repair and stabilize the affected sections of slope, restore vegetation, repair affected infrastructure, and reduce the potential for additional slope movement that could further impact the infrastructure and surrounding environment.

In addition to the slope repair work, the City is proposing additional mitigation improvements that will address stormwater collection improvements within the Harrison Avenue corridor. Mitigation is expected to include installation of stormwater pipes and catch basins, adjustment to roadway surface grades, and installation of curbing along the south side of Harrison Avenue. The intent of this mitigation is to reduce the volume of stormwater flow along the newly repaired soil embankment slope.

Continued slope instability could lead to continued damage to the roadway and other infrastructure and soil/vegetation sloughing into Cobbosseecontee Stream. As a result, the City is pursuing stabilization, repair, and mitigation measures to reduce the likelihood of future failures that could threaten both the roadway, slope, and the nearby stream environment.

### 1.1 Slope Failures

Two separate slope failures occurred in 2023 along the eastern embankment of Harrison Avenue. Both failures caused portions of the vegetated slope and surficial soils to slide downslope into Cobbosseecontee Stream. Harrison Avenue in the immediate vicinity of the failures has been closed to public vehicular traffic since the initial failure due to concerns that additional soil loss could cause localized collapse of the roadway and risk public safety. The road will remain closed until the slope is repaired.

The first slope failure occurred on May 1, 2023 and the second failure occurred on December 18, 2023. The May failed section of slope is located approximately 120 feet downstream (north) of New Mills Dam and immediately adjacent to the northern limit of a slope area that failed and was repaired in 2015. The December failed slope section is located approximately 20 feet downstream of the May failed slope section. The outlet control structure for the dam is located on the right (west) side of the dam, which is the same side of the stream as the Harrison Avenue slope. This location places the slope directly downstream of the dam's outlet discharge area, where stream velocities and hydraulic forces can be elevated during high-flow events.

Both failures occurred during a period of significant rainfall that produced increased stormwater runoff and elevated stream flows. During these events, flow velocities within Cobbosseecontee Stream and through the outlet control structure of New Mills Dam were relatively high. These hydraulic conditions, combined with saturated soil conditions along the slope, likely contributed to the instability of the embankment. As a result, the surficial soils and most of the vegetative cover in both areas slid



downslope and into the stream channel. Following the failures, only a limited number of trees remained rooted along portions of the slope. The slope failures resulted in a large sloughed areas that exposed the underlying granular embankment soils. The May failed section of slope measures approximately 70 feet wide, 75 feet long, and 12 feet deep into the slope. The December failed section of slope measures approximately 40 feet wide, 75 feet long, and 4 feet deep into the slope. Portions of the failed faces are very steep, with some areas approaching near-vertical inclinations near the edge of Harrison Avenue. The loss of soil mass significantly altered the slope geometry and reduced the stability of the remaining embankment.



*Image 1-1: View of May and December 2023 slope failures taken on May 5, 2024*

The failures also caused undermining and loss of supporting soil along the eastern edge of the paved surface of Harrison Avenue. Soil loss was observed around the posts supporting the existing metal guardrail, further reducing the stability of the roadside safety barrier. In addition, the failures reduced the lateral support for a nearby timber utility pole located along the east side of the roadway. As a result of the soil loss, the pole has rotated toward the slope and is considered structurally compromised.

Based on historical imagery available through Google Street View and on observations during site visits after the May 2023 failure, the slopes were generally covered with brush, weeds, and scattered mature trees that provided vegetative cover and some degree of soil stabilization. Topographic surveys were completed after the May 2023 failure and before and after the December 2023 failure. Based on these surveys, the December 2023 failed portion was inclined at approximately 1.2 horizontal to 1 vertical (1.2H:1V) along the upper portion of the slope and approximately 2 horizontal to 1 vertical (2H:1V) along the lower portion closer to the stream prior to failure. Based on the similar terrain and geomorphic characteristics observed in adjacent areas, it is presumed that the May 2023 failed portion of the slope had a comparable inclination prior to the 2023 failure.



*Image 1-2: View of site prior to slope failure (Google Maps©)*





*Image 1-3: View of site after May 2023 but before December 2023 failure taken on November 14, 2023*

## 2.0 SITE DESCRIPTION

### 2.1 Existing Site Conditions

The proposed work site is located along Harrison Avenue in Gardiner. Harrison Avenue is a municipal roadway that extends from its southern intersection with Andrews Street to its northern intersection with Highland Avenue. The roadway serves as a local connector through a developed area of the city and provides access to several municipal utilities and nearby infrastructure.



*Image 2-1: Google Earth, Existing Conditions as of September 2025*

A wastewater pump station is located at the southeast corner of the intersection of Harrison Avenue and Andrews Street. This facility is part of the municipal wastewater collection system and conveys sanitary flows from the surrounding area to downstream treatment facilities.

Cobbosseecontee Stream runs generally parallel to Harrison Avenue along the east side of the roadway for much of its length. The stream is situated at a lower elevation (approximately 40 feet lower) than the roadway, and a relatively steep, vegetated soil slope separates the edge of pavement from the stream channel. This slope, outside the failed portions, is primarily covered with grasses, shrubs, and other vegetation that help stabilize the soil and provide a buffer between the roadway and the stream corridor.



Near the southern end of Harrison Avenue, New Mills Dam is located along Cobbosseecontee Stream. The dam is a notable hydraulic structure within the stream system and influences water levels and flow conditions in the immediate vicinity.

Existing roadside infrastructure is present along the east side of the southern portion of Harrison Avenue, including metal guardrails and timber utility poles. In addition, subsurface municipal utilities are located within the roadway corridor, including water and sewer pipelines that run along Harrison Avenue. These utilities provide essential services to nearby properties and must be considered during any proposed work within the roadway corridor.

## 2.2 Wetland Resource Areas Delineated on Site

On November 19<sup>th</sup>, 2024, a wetland delineation occurred at the project site. The delineated wetland resources within the project site included a single perennial stream (Cobbosseecontee Stream), which was identified and flagged in the field using pink flagging by a Weston & Sampson employee who is trained in the wetland delineation process using US Army Corps of Engineers methodology. This wetland area is outlined in the Wetland Delineation Report (Appendix H) and below in Figure 2 (Wetlands Field Map also can be found in Appendix C).

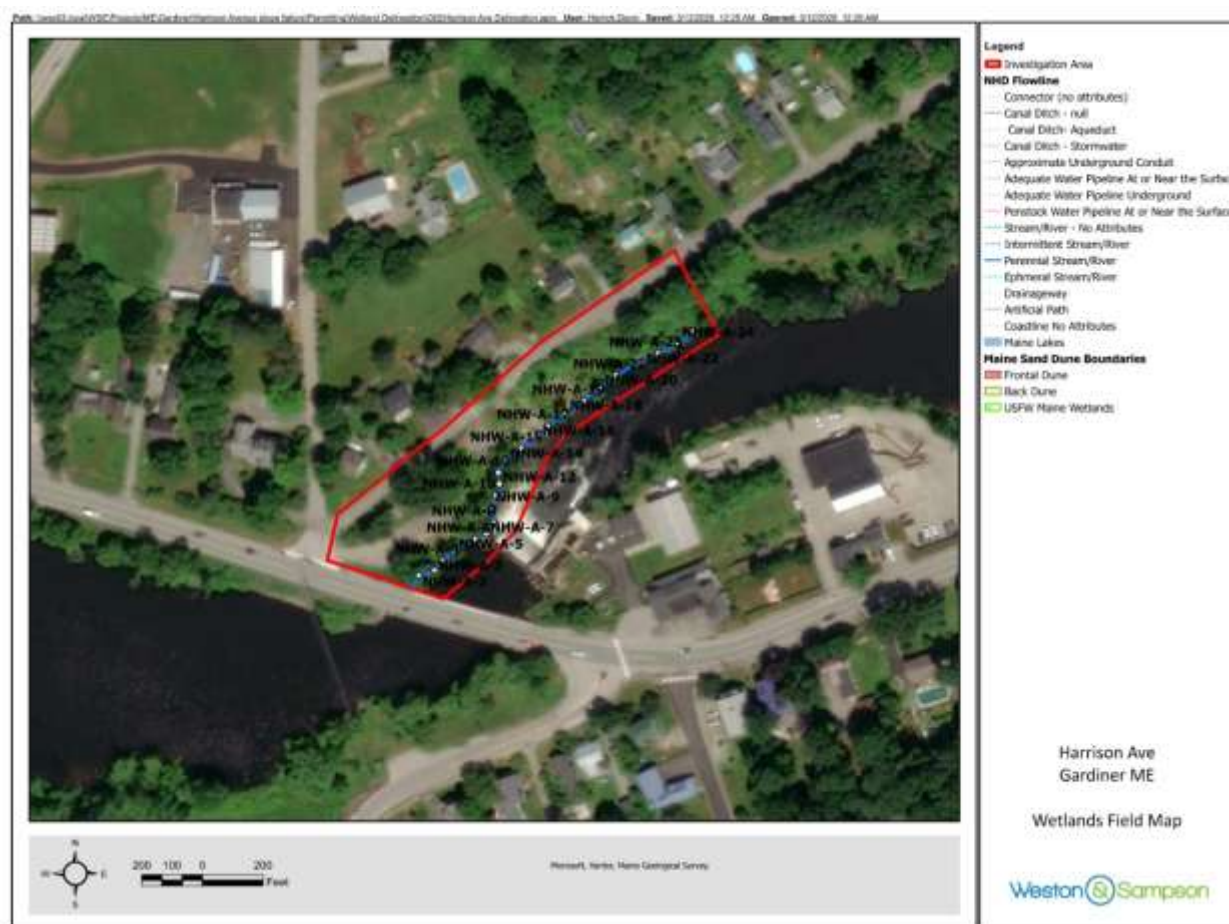


Figure 2-1: Wetlands Field Map (See Appendix C)

### 3.0 PROPOSED SCOPE OF WORK

Based on the engineering assessment and evaluation completed for the site, restoration of the Harrison Avenue slope to its pre-failure condition as an unsupported, vegetated soil slope is not recommended. Although the slope previously functioned in this configuration, the existing geometry and subsurface conditions indicate that reconstructing the slope in the same manner would not meet current engineering design standards for stability. Reestablishing the slope as an unsupported vegetated embankment would result in an unacceptably low factor of safety against failure and would leave the area vulnerable to future instability events similar to, or potentially more severe than, those that have occurred in the past.

To address these concerns, the proposed slope repair will incorporate stabilization measures designed to increase the factor of safety against slope failure to acceptable engineering levels. The stabilization design will also include protective measures to reduce the risk of erosion, scour, and undercutting caused by flows within Cobbosseecontee Stream. Because the stream runs directly along the toe of the slope, hydraulic forces during high-flow events have the potential to erode the base of the embankment and contribute to future slope instability. As such, the repair approach will include structural and erosion-resistant features intended to protect the toe of the slope and maintain long-term stability.

Due to the constrained site conditions, the repaired slope must generally match the existing pre-failure alignment and geometry. The locations of both the slope crest, adjacent to Harrison Avenue, and the slope toe, adjacent to the stream channel, cannot be significantly shifted because of the proximity of the roadway, utilities, and the stream corridor. As a result, the repair will restore the slope to its pre-failure lines and grades while maintaining the existing slope inclinations on either side of the failed area. The stabilization approach will therefore rely on reinforcement and armoring measures rather than large-scale regrading or relocation of the slope.

Stormwater catch basins and pipes and curbs are not currently present along Harrison Avenue in the area of the slope failures. The absence of these features has allowed continued uncontrolled stormwater flow over the Harrison Avenue slope for an extended time. Assessment of the slope failure suggests that continued stormwater flow progressively weakened the slopes and that the excessive stormwater flow at the time of the failure was a contributing factor to both failures. Engineering evaluation recommends that the project includes installation of stormwater control features to collect and divert stormwater flows away from the repaired slopes.

The City of Gardiner is proposing to repair the failed portions of slope to meet current engineering standards and to implement stormwater control measures to collect and divert flow away from the slope. The repair is intended to provide long-term support and protection for the failed portions of slope.

Slope repair will include installation of a soil nail stabilization system over most of the failed slopes and riprap protection along the slope toes. Stormwater control improvements will include installation of catch basins, stormwater collection pipes, and curbing. Discussions on these repairs and improvements are presented in the following sections.

The City intends to proceed with both slope repair and stormwater control improvement aspects of the project consecutively, provided that sufficient funding is available. If project funding is limited, priority will be given to slope repair so that Harrison Avenue can be re-opened. Under a constrained funding



scenario, the stormwater control improvements portion of the project may be reduced in scope, postponed, or potentially eliminated, depending on available resources.

### 3.1 Soil Nail Slope Repair

The failed slopes will be repaired using a soil nail reinforcement system. This system consists of hollow steel tension bars, commonly referred to as soil nails, that are installed through the slope face and anchored into the embankment soils. The soil nails reinforce the existing soil mass by providing internal structural support, thereby increasing the overall stability of the slope and improving its resistance to future movement or failure.

The soil nails will be installed in a regular grid pattern across the repaired portion of the slope, with approximate horizontal and vertical spacing of 5 feet by 5 feet. Each soil nail will extend beyond the estimated theoretical failure surface of the slope so that the nails are anchored in more stable soil materials behind the potential sliding mass. This configuration allows the reinforced soil mass to act as a stabilized composite structure, increasing the factor of safety against slope instability to acceptable engineering levels.

Following installation of the soil nails, a high-tensile steel wire mesh will be installed across the slope face and secured to the soil nail heads. The wire mesh will span between the nails and serve to confine and reinforce the soil surface, helping to distribute loads across the slope face and prevent localized sloughing of soil between the reinforcement points. Together, the soil nails and wire mesh will create a reinforced soil system that stabilizes the slope while allowing the surface to support vegetation.

Once the reinforcement system is installed, the slope surface will be covered with loam and seeded to promote the reestablishment of vegetative cover. Establishing vegetation on the slope will provide additional long-term benefits by reducing surface erosion, improving soil cohesion near the surface, and helping the repaired area blend with the surrounding landscape.

While the soil nail reinforcement system will stabilize the slope mass, it will not on its own provide protection against erosion, scour, or undercutting caused by stream flows at the base of the slope. Because Cobbosseecontee Stream flows directly along the toe of the embankment, hydraulic forces during high-flow conditions have the potential to erode the base of the slope and undermine the stabilization system if not addressed.

To protect against these conditions, the proposed slope repair includes installation of large stone riprap along the toe of the slope. The riprap will extend from the base of the slope upward to approximately elevation 130.0 feet, which is 12-inches above the FEMA defined 100-year storm stream level. This armored layer will protect the lower portion of the slope from stream-related erosion by dissipating flow energy and preventing scour of the underlying soils. By stabilizing the toe of the slope and protecting it from undercutting, the riprap will work in conjunction with the soil nail reinforcement system to provide a comprehensive and durable slope stabilization solution. The face of the riprap will match the face of the former soil slope to avoid extending into Cobbosseecontee Stream.

Construction access for work at the bottom section of the soil slope will include a temporary access roadway constructed in Cobbosseecontee Stream. Due to the height of the slope, construction equipment cannot reach the bottom section of slope from Harrison Avenue. The relatively steep inclination of the slope precludes construction equipment working on the slope. The temporary access

road will therefore allow construction equipment to safely reach the slope toe to facilitate installation of the riprap bank protection and other stabilization measures.

Construction of the temporary access road will require the installation of a temporary cofferdam within the stream channel and localized dewatering of the work area. The cofferdam will isolate a limited portion of the stream along the bank so that work can be performed in relatively dry conditions while minimizing disturbance to flowing water. Water within the isolated work area will be pumped around the cofferdam and discharged back into the stream downstream of the work zone in a controlled manner.

The temporary access structure will extend only a limited distance into the stream channel and will not significantly impede overall stream flow. The access area is anticipated to extend approximately 25 feet into the stream, leaving roughly 100 feet of channel width unobstructed. This remaining channel width will allow for continued stream flow and maintain a passage corridor for aquatic organisms during construction activities.

Once the slope stabilization work has been completed, the temporary cofferdam and access roadway will be fully removed from the stream channel. Any temporarily disturbed areas of the streambed and streambank will be restored to pre-existing conditions to the extent practicable. Restoration efforts will include removal of temporary fill materials, regrading of the streambed to pre-construction conditions as necessary, and stabilization of the disturbed areas to promote natural recovery of the channel and surrounding habitat.

### 3.2 Stormwater Collection Improvements

Stormwater collection improvements will be implemented along Harrison Avenue in the area of the slope repair. Specifically, the improvements will extend from the south end of Harrison Avenue at its intersection with Andrews Street to the north along Harrison Avenue for approximately 1,060 feet. The intent of the improvements is to collect and carry stormwater flow directed at the slope that could otherwise weaken the slope and contribute to future failures.

Stormwater collection improvements include installation of a new closed drainage system consisting of catch basins, drain manholes, and high-density polyethylene (HDPE) stormwater pipes. A new catch basin with curb inlet will be installed along the south side of Harrison Avenue to intercept roadway runoff. Stormwater collected at this location will be conveyed through a series of new HDPE pipes ranging in size from approximately 15 inches to 34 inches in diameter. The pipes will be installed beneath the roadway in order to direct stormwater flows to a controlled discharge point.

Several drain manholes will be installed along the alignment to facilitate pipe connections, provide access for maintenance, and allow for changes in pipe direction and grade. The stormwater system will be designed to follow the roadway profile and slope geometry, gradually conveying runoff away from the roadway and the embankment.

The drainage system will ultimately discharge stormwater downslope toward the stream corridor through a controlled outlet. The outlet structure will include erosion protection measures to reduce the potential for scour and sediment transport at the discharge location.

As part of the work, localized roadway grading adjustments and installation of curbing along the east side of Harrison Avenue are also proposed. Re-grading is necessary so that stormwater runoff is

properly directed toward the new collection structures. The curbs will facilitate direction of stormwater flow to the new catch basins and will divert higher flow intensities away from the slope.

Overall, the proposed drainage improvements are intended to reduce uncontrolled surface runoff along Harrison Avenue, improve roadway drainage performance, and minimize the potential for stormwater-related erosion along the steep slope between the roadway and Cobbosseecontee Stream. These improvements will complement the proposed slope stabilization measures by helping to limit infiltration and surface flow that could otherwise contribute to slope instability in the future.

### 3.3 Intended Timeline and Construction Sequence

Project construction is intended to begin in late Summer 2026, after all approved regulatory permits are received. We anticipate project completion before the end of Summer 2027.

The anticipated construction sequence of the project, as described above, is presented as follows:

- Install construction fencing and environmental controls around the project area
- Establish temporary staging area
- Remove and dispose/salvage existing features along Harrison Avenue
- Remove and dispose vegetation in improvement and temporary access areas
- Install temporary cofferdam
- Install temporary access road
- Install slope repair soil nail system and riprap toe protection
- Establish loam and seed and install new vegetation along slope
- Remove cofferdam and access road
- Reclaim existing pavement along Harrison Avenue
- Install new stormwater pipes, catch basins, and manholes
- Install new guardrails
- Set new utility and re-install salvaged features
- Pave Harrison Avenue and parking area. Stripe pavement as required
- Complete general site cleanup
- Remove construction fencing and environmental controls

## 4.0 MANDATORY SHORELAND ZONING ACT (MSZA)

The Mandatory Shoreland Zoning Act (MSZA) requires municipalities to adopt, administer, and enforce local ordinances that regulate land use activities in the shoreland zone. The shoreland zone is comprised of all land areas within 250 feet, horizontal distance, of the:

- normal high-water line of any great pond or river;
- upland edge of a coastal wetland, including all areas affected by tidal action, and
- upland edge of defined freshwater wetlands; and
- all land areas within 75 feet, horizontal distance, of the normal high-water line of certain streams

The shoreland zoning regulations are administered and enforced by each municipality through municipal specific ordinances.

### 4.1 Gardiner ME Local Ordinance

Due to the presence of the Cobbosseecontee Stream, the proposed project is subject to Land Use Ordinance of the City of Gardiner Maine Section 13 Shoreland Zoning. Applicable sections of the Ordinance are cited below.

#### 4.1.1 Section 13.15 Roads and Driveways

*Section 13.15.2 Existing public roads may be expanded within the legal road right-of-way regardless of their setback from a water body, tributary stream or wetland.*

This proposed project includes improvements to Harrison Ave which is an existing public roadway located within 250 feet from the Cobbosseecontee Stream.

*13.15.7. In order to prevent road and driveway surface drainage from directly entering water bodies, tributary streams or wetlands, roads and driveways shall be designed, constructed, and maintained to empty onto an unscarified buffer strip at least fifty (50) feet plus two times the average slope in width between the outflow point of the ditch or culvert and the normal high-water line of a water body, tributary stream, or upland edge of a wetland. Surface drainage which is directed to an unscarified buffer strip shall be diffused or spread out to promote infiltration of the runoff and to minimize channelized flow of the drainage through the buffer strip.*

The project includes installation of new stormwater catch basins and pipes along Harrison Avenue to collect and carry storm water flow directed at Cobbosseecontee Stream.

#### 4.1.2 Section 3.19 Clearing or Removal of Vegetation for Activities Other Than Timber Harvesting

*13.19.1. In a Resource Protection District abutting a great pond, there shall be no cutting of vegetation within the strip of land extending seventy-five (75) feet, horizontal distance, inland from the normal high-water line, except to remove hazard trees. Elsewhere, in any Resource Protection District the cutting or removal of vegetation shall be limited to that which is necessary for uses expressly authorized in that district.*

The proposed project is not located abutting a great pond however it is located within a Resource Protection District according to the most recent Zoning Map.

*13.19.2. Except in areas as described above, within a strip of land extending one hundred (100) feet, horizontal distance, inland from the normal high-water line of a great pond classified GPA or a river flowing to a great pond classified GPA, and/or within a strip of land extending seventy-five (75) feet, horizontal distance, from any other water body, tributary stream, or the upland edge of a wetland, a buffer strip of vegetation shall be preserved as follows:*

The proponent is seeking a waiver from Section 13.19 of the Local Ordinance. In order to properly restore the slope all woody vegetation needs to be removed to install the proposed soil nail system.

#### **4.1.3 Section 13.21 Revegetation Requirements**

*When revegetation is required in response to violations of the vegetation standards set forth in Section 13.19, to address the removal of non-native invasive species of vegetation, or as a mechanism to allow for development that may otherwise not be permissible due to the vegetation standards, including removal of vegetation in conjunction with a shoreline stabilization project, the revegetation must comply with the following requirements.*

The proponent is seeking a waiver from the Section 13.21 of the Local Ordinance. While some revegetation is proposed utilizing loam and seed, woody vegetation cannot be replanted because root systems can compromise the integrity of the proposed soil nail system.

#### **4.1.4 Section 13.27 Installation of Public Utility Service**

*A public utility, water district, sanitary district or any utility company of any kind shall not install services to any new structure located in the Shoreland zone unless written authorization attesting to the validity and currency of all local permits required under this or any previous Ordinance has been issued by the appropriate municipal officials or other written arrangements have been made between the municipal officials and the utility.*

This proposed project seeks to install new stormwater utilities and control measures along Harrison Avenue.

#### **4.1.5 Section 13.28 Storm Water Runoff**

*13.28.1. All new construction and development shall be designed to minimize storm water runoff from the site in excess of the natural predevelopment conditions. Where possible, existing natural runoff control features, such as berms, swales, terraces and wooded areas, shall be retained in order to reduce runoff and encourage infiltration of stormwater.*

The project includes installation of new stormwater catch basins and pipes along Harrison Avenue to collect and carry storm water flow directed at Cobbosseecontee Stream. So, storm water runoff will be substantially less than pre-construction conditions.

## 4.2 Summary of Project Impacts in MSZA Jurisdiction

The following table outlines the impacts of jurisdictional areas under MSZA.

Table 4-1 – Summary of MSZA Jurisdictional Area Impacts

Jurisdictional Area	Temporary Impact	Permanent Impact	Total Impact
Cobbosseecontee Stream – Normal High Water	180 LF (Temp Access Road)	140 LF (Riprap)	320 LF
Cobbosseecontee Stream – Land Below Normal High Water Line	2,660 SF (Temp Access Road)	620 SF (Riprap)	3,280 SF
Adjacent Land – Within 25-feet of Normal High Water Line	1,245 SF	3,150 SF	4,395 SF
Adjacent Land – Within 75-feet of Normal High Water Line	11,500 SF	13,210 SF	24,710 SF
100-Year Floodplain	3,105 SF	1,820 SF	4,925 SF
Jurisdictional Area	Dredge	Fill	
Cobbosseecontee Stream – Land Below Normal High Water Line (for riprap)	3,040 CF	3,040 CF	
100-Year Floodplain (for riprap)	7,290 CF	7,290 CF	



## APPENDIX B

### Alternatives Analysis



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# ALTERNATIVES ANALYSIS REPORT

April 9, 2024

CITY OF  
**GARDINER**  
MAINE

Harrison Avenue Slope Repair  
Gardiner, Maine



April 9, 2024

Mr. Andrew Carlton  
City Manager – City of Gardiner, Maine  
6 Church Street  
Gardiner, Maine 04345  
[ACarlton@gardinermaine.com](mailto:ACarlton@gardinermaine.com)

**Re: Alternatives Analysis Report  
Harrison Avenue Slope Repair  
Gardiner, Maine**

Dear Mr. Carlton:

Weston & Sampson Engineers, Inc. (Weston & Sampson) is pleased to submit our Alternatives Analysis Report for the Harrison Avenue Slope Repair project. This report presents our findings and documents our visual observations, topographic survey, subsurface explorations, engineering assessments, and alternatives analysis. Slope repair concepts and estimated costs for feasible alternatives are provided along with our recommended replacement alternative to assist the City in deciding how to best proceed with addressing the failed section of soil slope along Harrison Avenue.

We appreciate the opportunity to be of continued service to you. If you have questions concerning this report or require additional information, please contact me at 603-263-9499 ([striket@wseinc.com](mailto:striket@wseinc.com)).

Very truly yours,

WESTON & SAMPSON ENGINEERS, INC.



Thomas J. Strike  
Team Leader

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## 1.0 INTRODUCTION AND SITE CONDITIONS

The City of Gardiner, Maine (the City) retained Weston & Sampson to provide consulting engineering services for repair to a section of slope that failed along Harrison Avenue and the Cobbosseecontee Stream in Gardiner on May 1, 2023. Our services to date have included site observations by professional geotechnical engineering staff, topographic survey, subsurface explorations, and preparation of a January 18, 2024 In-Kind Replacement Memorandum that included estimated costs to restore the failed slope to pre-failure conditions. This report summarizes our services and findings, and presents conceptual-level alternatives for slope repair with advantages, disadvantages, and approximate cost ranges for each.

### 1.1 Site Conditions Prior to Failure

Harrison Avenue is a city roadway that extends from Andrews Street at its south end to Highland Avenue at its north end. A wastewater pump station is located at the southeast corner of the intersection of Harrison Avenue and Andrews Street. Cobbosseecontee Stream is located along the east side of and below Harrison Avenue along much of its length. A relatively steep, vegetated soil slope is located between Harrison Avenue and Cobbosseecontee Stream. New Mills Dam is located along Cobbosseecontee Stream near the south end of Harrison Avenue. Metal guardrails and timber utility poles are located along the east side of the south section of Harrison Avenue. Subsurface water and sewer utility pipes are located along Harrison Avenue. The site area with respect to surrounding conditions is shown in *Figure 1*.

A section of slope north of the pump station failed in 2015 during construction for new subsurface utility pipes within the slope. The 2015 failed section of slope was repaired with riprap and construction of a soil berm. A stone access road was constructed along the slope from the pump station area to the end of the failed slope section for construction access. An alternative utility pipe alignment was selected after the 2015 slope failure (e.g. utility pipes are not located within the soil slope). A Slope Restoration Plan Sheet for the repair prepared by Summit Geoengineering Services is included in *Appendix A*. The intents of that slope stabilization, as noted in the Summit Plan Sheet, were to stabilize the existing slope and to prevent further undermining of Harrison Avenue. The stabilization was not intended as a global stabilization of Harrison Avenue.

Based on historical street view photos from Google Maps®, the section of slope that failed on May 1, 2023 was covered with brush, weeds, and scattered trees prior to failure (see photo to the right). Based on a topographic survey plan completed for this project, the slope adjacent to the north side of the failed slope section is inclined at approximately 1.2H:1V at its upper portion and approximately 2H:1V at its lower portion. We assume that the failed section of slope was similarly inclined prior to failure. The slope in the area of the May 1, 2023 failure is approximately 40 feet tall.



*View of site prior to slope failure (Google Maps®)*

### 1.2 May 1, 2023 Failure and Existing Conditions

The section of Harrison Avenue slope that failed on May 1, 2023 is located approximately 120 feet downstream (north) of the New Mills Dam and immediately adjacent to the north end of the 2015 slope failure. The dam's outlet



control is located on the right (west) side of the dam, on the same side of the Cobbosseecontee Stream as the slope failure. The failure occurred during a period of significant rainfall and stormwater runoff, and high flow velocities in the Cobbosseecontee Stream and through the outlet control of New Mills Dam. Surficial soils and most vegetative cover slid into the Cobbosseecontee Stream. A few trees remain after the failure. The failure left a sloughed slope exposing granular embankment soils (see photo to the right). Water seepage from the slope was observed at an isolated location approximately 8 feet below the slope crest at the time of one of our site observations. The failed section of slope measures approximately 70 feet wide by 40 feet tall by 12 feet deep. Sections of the failed slope are inclined up to near vertical near Harrison Avenue.



*View of May 2023 slope failure on November 14, 2023*

The failure caused undermining and loss of soil material along the east side of the paved surface of Harrison Avenue and around the metal guardrail support posts. The failure also caused reduced lateral support of a timber utility pole that, as a result, is structurally compromised and has rotated towards the soil slope. Harrison Avenue in the area of the slope failure has been closed to public vehicular traffic due to safety concerns. Photos of the failed slope and damaged infrastructure are included in **Appendix B**.

An additional slope failure occurred in December 2023, approximately 20 feet north of the May 2023 failure during a period of significant rainfall and stormwater runoff. Discussions on the December 2023 failure and slope repair alternatives are not included in this report.

### **1.3 Topographic Survey**

Weston & Sampson retained Doucet Survey, LLC to complete a topographic survey of the project area and adjacent slope sections. The survey was completed in August and November 2023 using a Leica Survey Grade Laser Scanner and conventional survey equipment. The horizontal datum is NAD83 (2011) Maine State Coordinate Zone (1802) and was established from redundant GPS observations utilizing the Keynet GPS VRS Network. The vertical datum is NAVD88 and was established using Caging Station RM (USGS). An existing conditions plan set is provided in **Appendix C**.

## 2.0 SUBSURFACE CONDITIONS

### 2.1 Geologic Setting

Information from the Maine Geological Survey – Gardiner Quadrangle, Maine developed by the Maine Department of Conservation (MEDC) indicates that the site is located in an area of glaciomarine deposits above glacial till deposits. Information from the Bedrock Geologic Map of Maine developed by the MDC indicates that bedrock in the site area is interbedded pelite and sandstone. Bedrock outcrops were observed on the east side of the Cobbosseecontee Stream.

### 2.2 Subsurface Explorations Program

#### 2.2.1 General

Weston & Sampson retained New England Boring Contractors, Inc. of Hermon, Maine to complete a subsurface exploration program at the site. The purpose of our exploration program was to collect information on soil and groundwater conditions within the slope embankment necessary to evaluate geotechnical considerations and appropriate conceptual slope repair alternatives.

The subsurface exploration program was completed on February 6 and 7, 2024 and included the advancement of three borings designated as B-1, B-1A, and B-2 and the installation of one groundwater observation well in B-2. Boring B-1 was offset to the location of B-1A due to misalignment of the augers at about 7 feet. Boring B-1A was advanced to refusal at 31.8 feet and B-2 was terminated at 66.3 feet. Approximate boring locations are shown in **Figure 2**. A Weston & Sampson geotechnical engineering representative observed exploration activities, measured boring locations from existing site features, and prepared logs for each boring.

#### 2.2.2 Borings

The borings were advanced with a truck-mounted drill rig using hollow-stem auger and drive-and-wash drilling methods. Standard penetration tests (SPTs) were conducted at 2 to 5-foot intervals in the borings by driving a 24-inch long by 1-3/8-inch inside diameter (2-inch outside diameter) split spoon sampler with blows from a 140-pound automatic safety hammer falling 30-inches per blow. Hammer blows per 6-inches of sampler penetration (for 24-inches) were recorded. The blow counts for the middle 12-inches are combined and designated as the SPT blow count, which is correlated to soil consistencies and engineering soil properties. Split-spoon refusal, where noted in the boring logs, is defined as 100 hammer blows for less than 6-inches of sampler penetration. Drilling refusal is defined as no discernable advancement of the auger/roller bit under the full weight of the drill rig over a period of approximately 5 minutes.

#### 2.2.3 Encountered Subsurface Conditions

Subsurface conditions encountered in the borings below surficial asphalt concrete pavement generally consisted of up to approximately 7.5 feet of fill above native glaciomarine and glacial till deposits. The native subsurface conditions encountered in the borings were generally consistent with mapped surficial geology.

Descriptions of the subsurface conditions encountered in the borings are included in the boring logs in **Appendix D**. The major strata encountered in the borings described below. Variations may occur and should be expected outside and between boring locations.

**Asphalt Concrete Pavement** – Approximately 6 to 11-inches of asphalt concrete pavement was encountered at the ground surface at each boring location.

**Fill** – Approximately 5 to 7.5 feet of medium dense to dense and medium stiff to very stiff fill was encountered in B-1 and B-2. The fill generally consisted of a mixture of fine to coarse sand, gravel, and non-plastic fines, and up to trace organics (roots).

**Glaciomarine Deposits** – Glaciomarine deposits were encountered in B-1A and B-2 below the fill to depths ranging from approximately 27.5 to 32.5 feet. Boring B-1 was terminated at 7 feet in the glaciomarine deposits as previously discussed. These deposits generally consisted of loose to dense, fine to medium sand with up to some non-plastic fines, and up to little gravel and stiff to very stiff non plastic fines with up to little fine to coarse sand and up to little gravel.

**Glacial Till** – Very dense glacial till was encountered below the glaciomarine deposits in B-1A and B-2. These deposits generally consisted of fine to medium sand with up to some gravel and up to some non-plastic fines. Boring B-2 was terminated in the glacial till at 66.3 feet.

**Refusal** – Sampler and auger refusals were encountered in B-1A at approximately 31.8 feet. Rock coring was not completed to evaluate the nature of refusal; therefore, the refusal could have been caused by very dense soils, a boulder, or bedrock.

**Groundwater** – Groundwater was encountered at approximately 21.2 feet in B-1A based on observation of saturated samples. A groundwater observation well was installed in B-2 to a depth of approximately 29.5 feet on February 7, 2024. Groundwater was measured at approximately 6.5 feet in the well on February 23, 2024.

We anticipate that groundwater levels will fluctuate with season, variations in precipitation, construction in the area, tides, and other factors. Perched groundwater conditions could exist close to the ground surface, especially during and after extended periods of wet weather.



### 3.0 ENGINEERING ASSESSMENT AND EVALUATION

#### 3.1 Summary of Pre-Failure Conditions

The Harrison Avenue soil slope in the area of the May 1, 2023 failure is approximately 40 feet tall. Based on our topographic survey, which included adjacent non-failure slope areas, we estimate that the failed section of slope was likely inclined as steep as approximately 1.2H:1V at its upper portion and as steep as approximately 2H:1V at its lower portion prior to failure. The condition of the slope prior to failure, including the presence of any undercutting, shallow slides, and/or erosion rills, is not known.

The slope supports Harrison Avenue, which is an approximately 20-foot wide, paved roadway with metal guardrails and timber utility poles along the slope crest. The ground surface along the west side of Harrison Avenue in the area of the failure slopes up and away from Harrison Avenue. Subsurface utilities along Harrison Avenue include sewer and water utility pipes. Stormwater catch basin and subsurface stormwater utility pipes are not located along Harrison Avenue in the area of the failure. Based on area topography and the absence of stormwater collection systems or curbs, stormwater runoff from areas west of Harrison Avenue likely flows directly over the roadway and the soil slope.

Cobbosseecontee Stream flows south to north along the slope toe. New Mills Dam is located approximately 120 feet south of the failed section of slope and the outlet control for the dam is located on the right (west) side of the dam. During periods of heavy precipitation and/or runoff, high flow velocities appear to exit the outlet control. Protective measures against scour along the slope toe, such as stone riprap, are present immediately downstream of the dam but are not evident beginning at approximately the 2015 failed slope area and continuing further downstream (north) including the May 1, 2023 failed slope area. Based on review of information provided in the Kennebec County, Maine Flood Insurance Study document prepared by FEMA and FEMA's National Flood Hazard Layer (NFHL) Viewer, the FEMA 100-year flood elevation for the Cobbosseecontee Stream near the slope failure location is El. 129.0 feet. For reference, the bottom of slope in the area of failure is approximately El. 124.0 feet.

#### 3.2 Assessment of May 1, 2023 Failure

Based on our observations, the May 1, 2023 slope failure included a near surface sliding of surficial organic and underling embankment soils (known as veneer failure), as opposed to a deep-seated failure that would have likely caused a failure surface to extend from behind the slope crest to beyond the slope toe. Veneer failures are more prevalent on steep slopes, such as the Harrison Avenue slope, and the degree of failure can be exacerbated by any or all of the following external conditions: (1) stormwater runoff over the slope surface, (2) an elevated groundwater table in the embankment, and (3) undercutting (scour) of soils near the slope toe. As previously discussed, the failure occurred during a period of significant rainfall and stormwater runoff, and high flow velocities in the Cobbosseecontee Stream and through the outlet control of New Mills Dam. Therefore, all three conditions likely existed at the time of failure. It is likely, however, that slope conditions had been deteriorating over an extended time period (failure creep) and the conditions experienced on May 1, 2023 accelerated the failure.

### 3.3 Slope Stability

The factor of safety against slope instability is defined as the ratio of forces resisting slope failure to those driving slope failure along a given failure surface. A factor of safety less than 1.0 indicates failure and a factor of safety approximately equal to 1.0 indicates marginal stability. The industry standard for minimum factor of safety values against instability for embankments supporting roadways are 1.3 under static conditions and 1.0 for seismic (earthquake) conditions.

We completed stability analysis for pre-failure slope conditions using the computer program SLIDE2 Modeler by Rocscience and using slope inclination configurations discussed in **Section 3.1**. Soil strength properties were estimated based on conditions encountered in the borings and a normal stream elevation of El. 124.0 feet was used for the water surface elevation of Cobbosseecontee Stream. Seismic factor of safety values were evaluated using a peak ground surface acceleration (PGA) available from the U.S. Geological Survey.

Our analysis indicates that the pre-failure slope configuration of the Harrison Avenue slope does not meet minimum factor of safety values against instability. The pre-failure slope configuration is marginally stable against deep-seated failure under static conditions and is unstable against near surface failure. The presence of vegetation on the slope at pre-failure conditions was not incorporated in our stability model and likely provides some measure of resistance to near surface failures, although localized minor surface raveling and/or sliding were likely present in steeper areas prior to failure.

Conceptual slope repair alternatives that increase factor of safety values against instability to acceptable values and that provide scour protection are discussed in the following section.

## 4.0 SLOPE REPAIR ALTERNATIVES ANALYSIS

### 4.1 General

Based on our engineering assessment and evaluation, restoration of the Harrison Avenue slope to pre-failure conditions is not recommended for this project since it will not provide adequate resistance to slope instability or scour protection at the slope toe. Slope repair will need to incorporate design elements that provide adequate factor of safety values against instability. Any slope repair will need to restore pre-failure lines and grades since the slope crest and toe locations cannot be adjusted and soils slopes will remain at their current inclinations on both sides of the repaired slope area. Therefore, slope repair alternatives that would have included flattening slopes or incorporated walls to increase stability factor of safety values were not considered.

Slope repair will also need to include design elements at the slope toe to provide protection against scour and undercutting from flows in the Cobbosseecontee Stream and through the New Mills Dam outlet control. We recommend that protection extend a minimum of 5 feet above the FEMA 100-year flood elevation of El. 129.0 feet.

It appears that stormwater runoff from higher ground areas west of the slope flow over the slope surface in the area of the May 1, 2023 failure. Best practice design of soil slopes typically includes measures to collect and/or divert stormwater flow away from the slope since flowing water will weaken surficial soils and cause erosion rills/gullies to develop along the slope. As discussed in **Section 3.2** above, our opinion is that progressive and excessive stormwater runoff was likely a contributing factor to the May 1, 2023 slope failure. We therefore recommend that slope repair include measures to collect and/or divert stormwater from flowing over the repaired slope surface. These measures could include installation of catch basins and subsurface stormwater pipes and construction of curbing along the east side of Harrison Avenue.

Conceptual slope repair alternatives considered and evaluated for this project are presented in the following section.

### 4.2 Conceptual Slope Repair Alternatives

We considered two conceptual slope repair alternatives for the project that would achieve minimum factor of safety values against instability, provide protection from scour, and return the slope to pre-failure lines and grades. These alternatives included: (1) armoring the entire slope with stone riprap and (2) installing soil nail reinforcements in the embankment along with stone riprap toe protection. Although both slope repair alternatives are technically feasible, each have their own advantages and disadvantages that should be considered. Slope repair alternatives that included slope flattening or construction of buttresses and/or walls to increase factor of safety values were not considered since such alternatives would not return the slope to pre-failure lines and grades.

Although each slope repair alternatives will include their own unique construction work, both will include similar site preparation work. This work will include at a minimum the following:

- Installation of environmental protection (straw wattles, stabilized construction entrances, etc.).
- Removal and reinstallation of guardrail, utility pole, and overhead utilities.
- Improvement to the existing stone access road constructed for the 2015 slope failure for equipment access.

- Tree/vegetation removal.
- Sloughed soil removal.
- Hauling and disposal of trees, vegetation, and soil.

General discussions on construction of each alternative, along with main advantages and disadvantages are presented in the following sections.

#### 4.2.1 *Riprap Slope Repair Alternative*

This alternative includes using large stone riprap along the entire slope surface and below the slope toe (riprap toe key) to provide sufficient resisting forces to achieve minimum factor of safety values against instability. Our preliminary analysis suggests a riprap layer up to approximately 8 feet thick with a 1-foot thick crushed stone bedding layer along the slope surface and an approximately 10-foot deep riprap toe key would be needed to achieve minimum factor of safety values. Larger riprap would be placed from the slope toe up to El. 134.0 feet to provide sufficient protection against scour and undercutting flows in the Cobbosseecontee Stream and through the New Mills Dam outlet control.

Excavation for riprap placement closer to the slope crest would need to extend below Harrison Avenue, requiring removal and replacement of the pavement surface and road base material and possible temporary support of subsurface water and sewer utility pipes. Excavation for the riprap key at the slope toe would likely require installation of a steel sheet pile or soldier pile and lagging cofferdam to provide temporary excavation support and to allow the excavation to be completed in-the-dry.

Advantages and disadvantages of the riprap slope repair alternative are as follows:

##### Advantages

- Construction can be completed using conventional earthwork equipment and local contractors.
- Material can be locally sourced.
- Riprap surface does provide some resistance to stormwater flows over the slope surface.

##### Disadvantages

- Installation of a costly cofferdam/excavation support system will be required to construct the riprap toe key.
- Excavations along the failed slope to construct the required riprap thickness will need to extend into adjacent soil slope sections to maintain safe slope excavations.
- Risk of destabilizing adjacent soil slope sections during excavations.
- Risk of shallow bedrock at the slope toe that would add costs for installing the cofferdam/excavation support system.
- Excavations will need to extend below Harrison Avenue, likely requiring temporary support of subsurface water and sewer utility pipes.

#### 4.2.2 Soil Nail Slope Repair Alternative

This alternative is an earth retention approach that includes installing hollow steel tension bars (soil nails) along the slope face. High-tensile steel wire mesh can be used span between the soil nails to create a reinforced soil mass along the slope. Following soil nail and wire mesh installation, the surface can potentially be surfaced with loam and seed. We reviewed this approach with a specialty geotechnical contractor, and they indicated that soils nails installed on an approximate 5-foot by 5-foot grid pattern and to depths extending beyond the theoretical slope failure surface would likely provide adequate factor of safety values against instability.

A soil nail reinforced slope on its own will not provide protection against scour and undercutting from flows in Cobbosseecontee Stream and through the New Mills Dam outlet control. Therefore, this alternative would also include installation of large stone riprap extending from the slope toe up to approximately El. 134.0 feet.

Advantages and disadvantages of the soil nail slope repair alternative are as follows:

##### Advantages

- Costly cofferdams and excavation support systems are not necessary.
- Excavations below Harrison Avenue are not necessary.
- The slope surface can potentially be surfaced with loam and seed to match adjacent slope surfaces.
- The least costly slope repair alternative.

##### Disadvantages

- Soil nails installed by a specialty geotechnical contractor.
- Possible lag in construction schedule due to limited qualified contractors.

#### 4.3 Estimated Slope Repair Costs

In accordance with FEMA disaster relief funding requirements, we estimated slope repair construction cost ranges for both alternatives using raw (without considering overhead and profit) and total unit cost values. Our estimates considered unit cost values available from RSMeans, local contractors, and recent past projects. We also estimated future design, permitting, and construction administration (CA) cost ranges for both alternatives based on our experience with similar projects. The estimated costs do not include design and construction costs for a stormwater collection system. Final estimated costs will be evaluated for the selected alternative once design plans are developed. Estimated costs ranges for both alternatives are presented in the following table:

Alternative	Estimated Cost Range for Construction	Estimated Cost Range for Design, Permitting, and CA	Estimated Total Cost Range
Riprap Repair	\$650,000 to 750,000 (Raw) \$750,000 to \$850,000 (O&P)	\$250,000 to \$300,000	\$900,000 to \$1,050,000 (Raw) \$1,000,000 to \$1,150,000 (O&P)
Soil Nail Repair	\$600,000 to \$700,000 (Raw) \$700,000 to \$800,000 (O&P)	\$250,000 to \$300,000	\$850,000 to \$1,000,000 (Raw) \$950,000 to \$1,100,000 (O&P)

#### 4.4 Recommended Slope Repair Alternative

Based on the advantages and disadvantages and the estimated costs presented above, Weston & Sampson recommends selecting the soil nail method as the slope repair alternative. This alternative presents the least amount of risks during construction and will provide a repaired slope that is aesthetically consistent with other areas along the Cobbosseecontee Stream at the lowest cost. The city, however, should review both alternatives carefully and select the alternative that best fits their expectations.

#### 4.5 Additional Engineering Analyses

The slope repair alternatives included in this report are conceptual in nature and are intended to provide the city with a high level presentation of feasible slope repair alternatives. Additional engineering analyses are required to progress the selected slope repair alternative to final design.

P:\ME\Gardiner\Harrison Avenue slope failure\Alternatives Analysis Report\Alternatives Study Report - Harrison Ave Slope Repair.docx

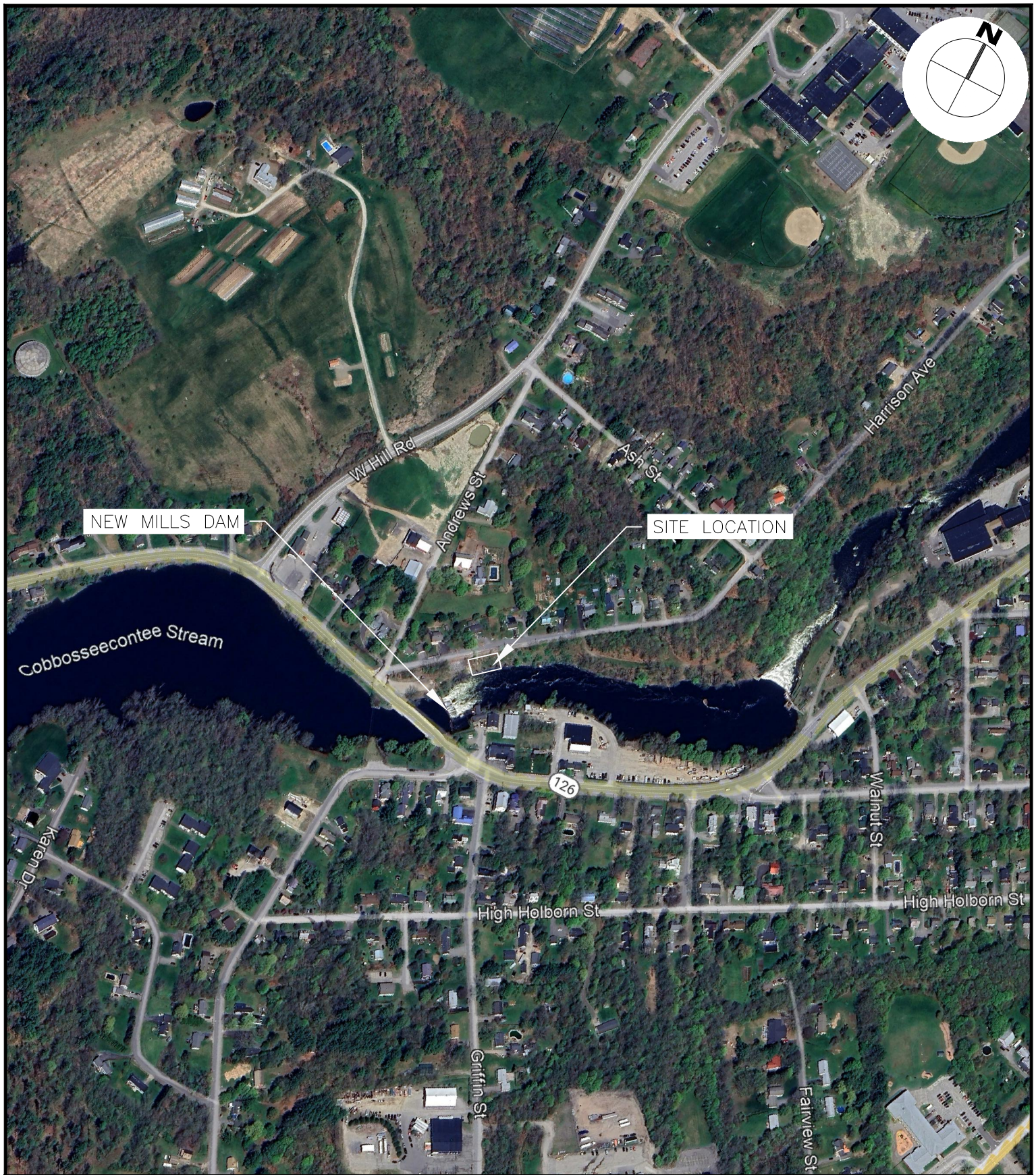
## 5.0 LIMITATIONS

We have prepared this report for use by the City of Gardiner, Maine for the subject project and this site only. The data and report can be used for estimating purposes, but our report, conclusions, and interpretations should not be construed as a warranty of the actual conditions and are not applicable to other sites.

This report has been prepared solely for the purpose of preliminary evaluation and analyses of conceptual-level slope repair alternatives. This is not a design-level report and should not be construed as such. Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, expressed or implied, is given.

## FIGURES



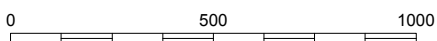


Weston & Sampson

**FIGURE 1  
LOCUS MAP**

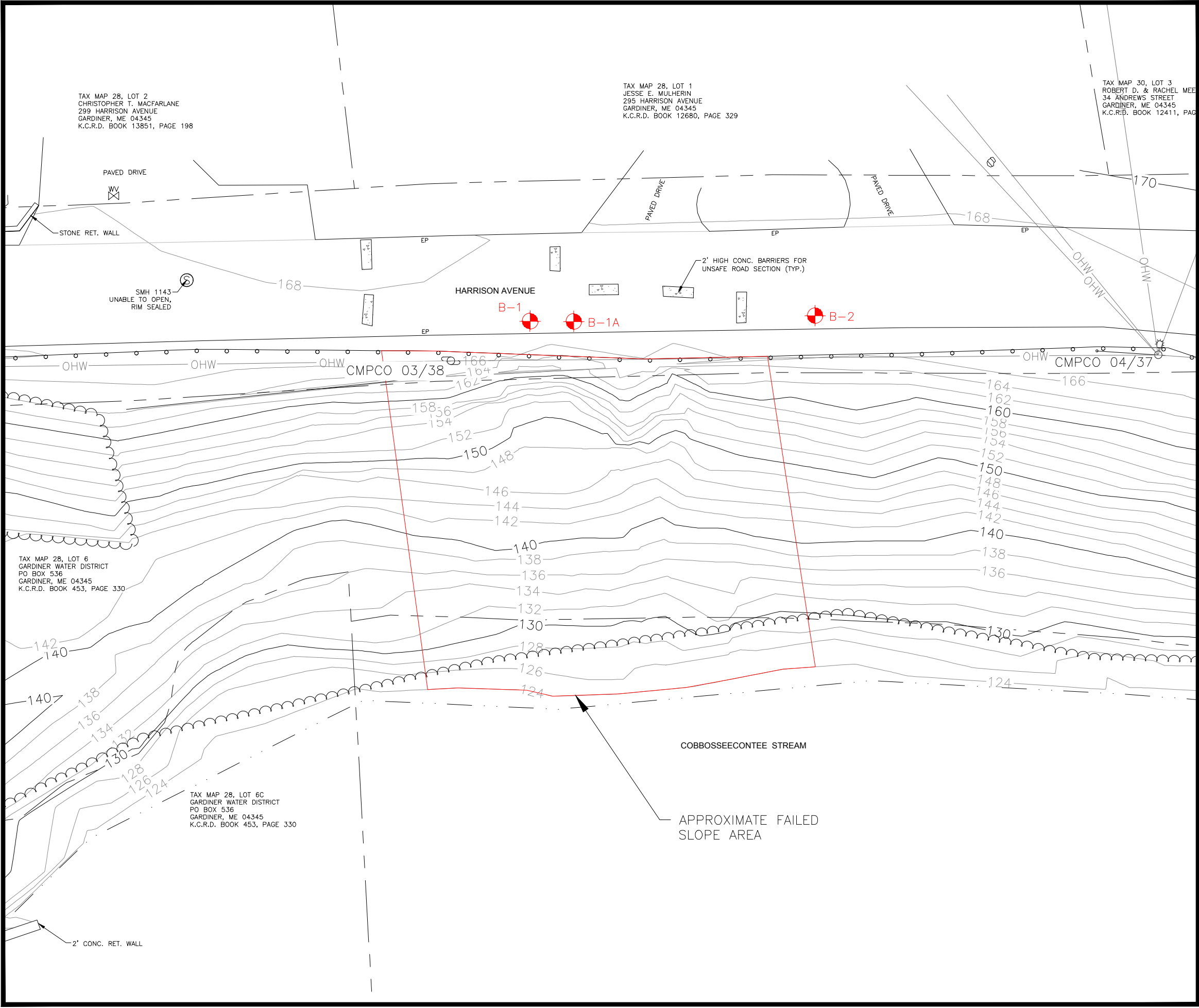
**HARRISON AVENUE SLOPE REPAIR  
GARDINER, MAINE  
KENNEBEC COUNTY**

SCALE IN FEET





P:\ME\Gardiner\Harrison Avenue slope failure\Alternatives Analysis Report\Figures\Working CAD\Figure 2 Site Plan.dwg



Weston & Sampson Engineers, Inc.  
150 Dow Street Tower 4, Suite 350  
Manchester, NH 03103  
603.263.9296 800.SAMPSON  
www.westonandsampson.com

#### NOTES

1. THIS PLAN WAS PREPARED USING A DECEMBER 14, 2023 TOPOGRAPHIC PLAN PREPARED BY DOUCET SURVEY, LLC.
2. BORINGS WERE COMPLETED BY NEW ENGLAND BORING CONTRACTORS, INC. OF HERMON, MAINE AND OBSERVED BY WESTON & SAMPSON ON FEBRUARY 6-7, 2024.
3. BORING LOCATIONS SHOWN ON THIS PLAN WERE LOCATED BASED ON EXISTING SITE FEATURES.

#### LEGEND

 B-1 DESIGNATION AND APPROXIMATE LOCATION OF BORING

#### GRAPHIC SCALE



SCALE: 1"=20'

#### ORIENTATION



#### TITLE

BORING LOCATION PLAN

#### PROJECT

HARRISON AVENUE SLOPE  
REPAIR

GARDINER, MAINE

#### FIGURE

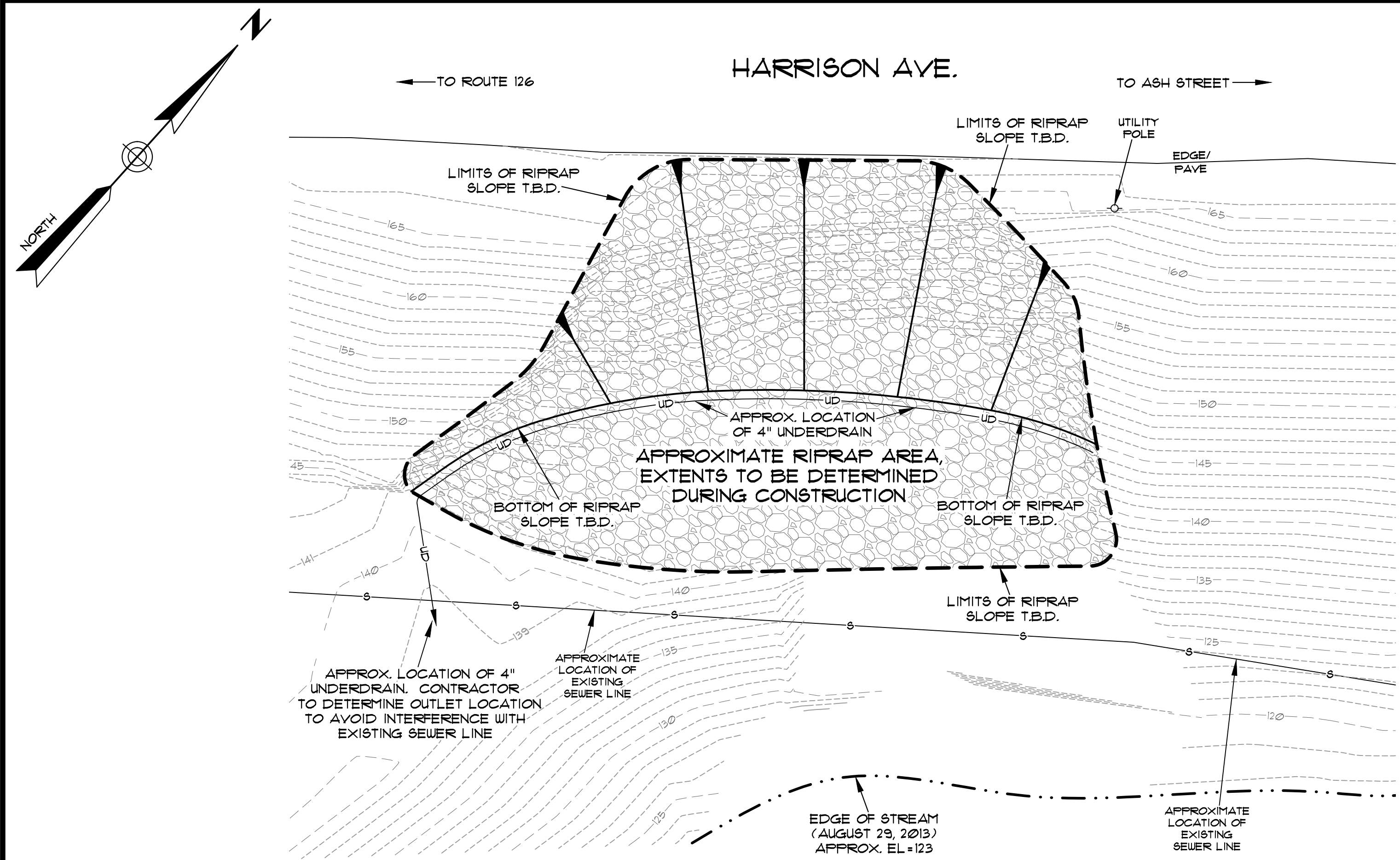
FIGURE 2

DATE	03/2024
DRWN BY	NMK
CHKD BY	TJS
PRJ. NO.	ENG23-0628
REV. NO.	-

## APPENDIX A

### Summit Geoengineering Slope Restoration Plan

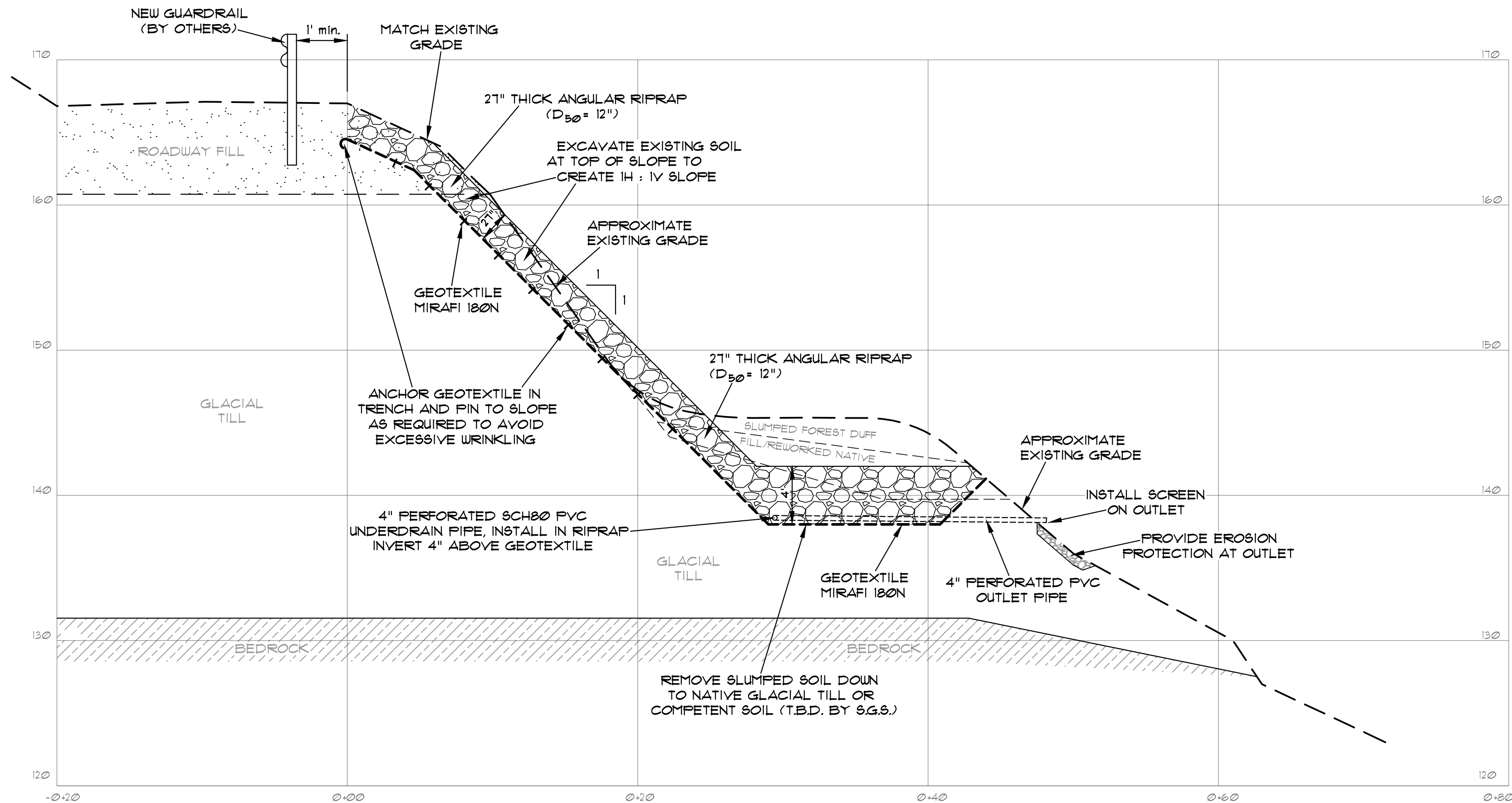




COBBOSSEECONTEE STREAM

PLAN VIEW

SCALE: 1" = 10'



PROFILE

SCALE: 1" = 6'

GENERAL NOTES

- 1) THIS SLOPE STABILIZATION PLAN IS BASED ON FIELD OBSERVATIONS BY S.G.S. AND LIMITED TOPOGRAPHIC DATA OF THE SLIDE AREA PROVIDED BY WRIGHT-PIERCE.
- 2) THIS SLOPE STABILIZATION DESIGN CONSIDERS TO OUR BEST ABILITY THE PRACTICALITIES OF CONSTRUCTING IT. S.G.S. IS NOT RESPONSIBLE FOR THE MEANS AND METHODS OF CONSTRUCTION, NOR IS S.G.S. RESPONSIBLE FOR THE ADDITIONAL SLOPE MOVEMENTS OR INSTABILITIES CAUSED BY CONSTRUCTION ACTIVITIES.
- 3) THE INTENT OF OUR DESIGNS ARE TO STABILIZE THE EXISTING SLOPE TO PREVENT FURTHER EROSION AND POTENTIAL UNDERMINING OF HARRISON AVENUE. THIS STABILIZATION PLAN IS NOT INTENDED AS A GLOBAL STABILIZATION OF HARRISON AVENUE.
- 4) THE LOCATION OF THE EXISTING SEWER LINE SHOULD BE ESTABLISHED PRIOR TO EXCAVATION AT THE BASE OF THE SLOPE. THE CONTRACTOR SHALL PROTECT THE EXISTING SEWER LINE FROM HIS WORK AS NECESSARY.
- 5) A QUALIFIED CONTRACTOR EMPLOYEE SHALL BE TASKED WITH OBSERVING THE CONSTRUCTION ACTIVITIES, FOCUSING ON SLOPE MOVEMENTS DURING CONSTRUCTION. SPECIAL ATTENTION SHALL BE PAID TO THE EXISTING SLOPE WHEN EQUIPMENT IS WORKING AT THE TOP OF THE SLOPE. SPECIAL ATTENTION SHALL ALSO BE PAID TO THE SLUMPED AREA DURING EXCAVATION AND PLACEMENT OF RIPRAP.
- 6) THE SLUMPED AREA/MATERIAL SHALL BE EXCAVATED DOWN TO THE NATIVE GLACIAL TILL SOIL, TO BE DETERMINED BY S.G.S.
- 7) GEOTEXTILE SHALL CONSIST OF MIRAFI 180N OR EQUIVALENT WITH AN A.D.S.  $\leq 0.18$  mm, A GRAB TENSILE STRENGTH  $\geq 205$  lbs AND A CBR PUNCTURE STRENGTH  $\geq 500$  lbs. ALTERNATIVE GEOTEXTILE SHALL BE REVIEWED AND APPROVED BY S.G.S. PRIOR TO USE.
- 8) RIPRAP SHALL CONSIST OF HARD ANGULAR BLASTED LEDGE ROCK OF A MIXTURE OF SIZES FROM 2" TO A MAXIMUM OF 18". 50% OF THE MATERIAL SHALL BE 12" OR LESS.
- 9) RIPRAP SHALL BE CAREFULLY PLACED AND TAMPED WITH THE EXCAVATOR BUCKET OR OTHER MEANS TO "LOCK" IT IN PLACE.
- 10) RIPRAP SHALL BE PLACED ON THE GEOTEXTILE IN SUCH MANNER AS TO MINIMIZE THE POTENTIAL FOR TEARING OR OTHERWISE DAMAGING IT.

SHEET TITLE:		COBBOSSEE SEWER		DRAWN BY: KRF		CHECKED BY: WJP	
PROJECT:		SLOPE RESTORATION		SCALE: AS NOTED		DATE: FEB. 20, 2015	
CLIENT:		WRIGHT-PIERCE		95 MAIN STREET - TOPSHAM, MAINE			
145 US80N ST. - SUITE 601 ROCKLAND, ME 04841 Tel: (207) 516-3315		173 PLEASANT STREET ROCKLAND, ME 04841 Tel: (207) 318-1161		SUMMIT GEOENGINEERING SERVICES www.summitgeoeng.com		STATE OF MAINE WILLIAM M. PETERLEIN 5187 LICENSED PROFESSIONAL ENGINEER	
JOB NO. - 14244		SHEET		NO.		REVISION	
						DATE	

## APPENDIX B

### Slope Failure Photographs





Photo 1 – Slope conditions prior to failure from Google Maps®



Photo 2 – Top section of failed slope on June 8, 2023





Photo 3 – Failed Slope from east side of Cobbosseecontee Stream on June 8, 2023.



Photo 4 – Section of slope repaired after 2015 failure on August 3, 2023





Photo 5 – Cobbosseecontee Stream and flow from New Mills Dam on August 3, 2023



Photo 6 – Sloughed embankment soils on August 3, 2023





Photo 7 – Rotated utility pole and tree on overhead utility lines of August 3, 2023



Photo 8 – Sloughed embankment soils on November 14, 2023





Photo 9 – Failed Slope from east side of Cobbosseecontee Stream on November 14, 2023.



Photo 10 – New Mills Dam and flow form outlet control on November 14, 2023

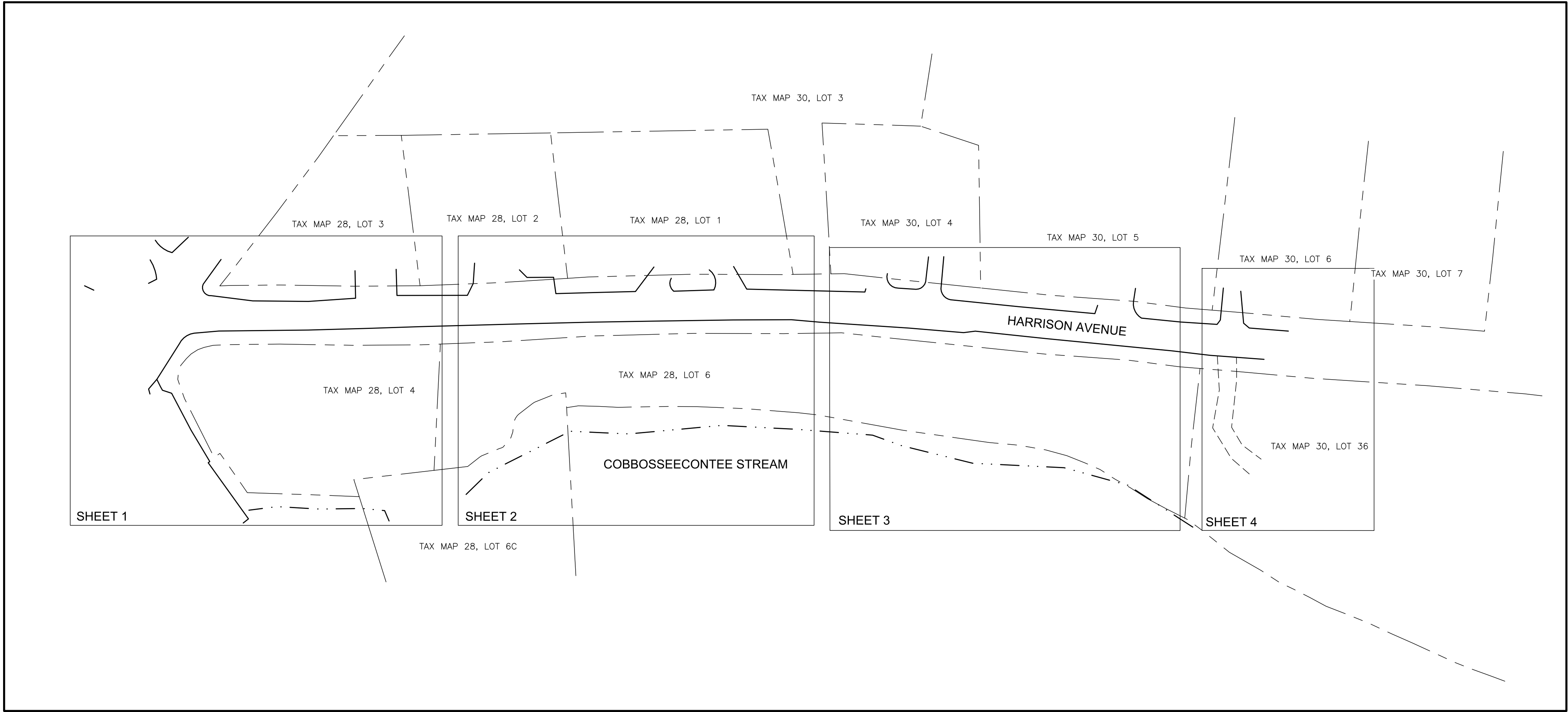
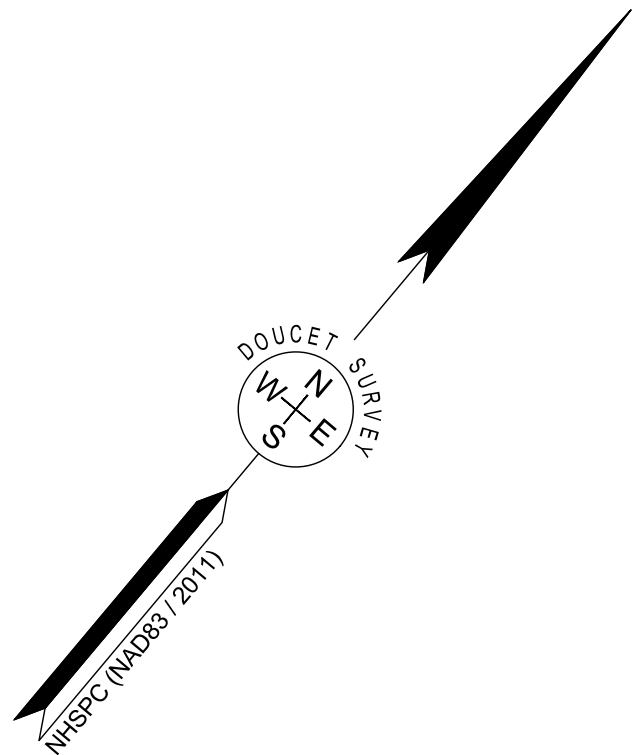




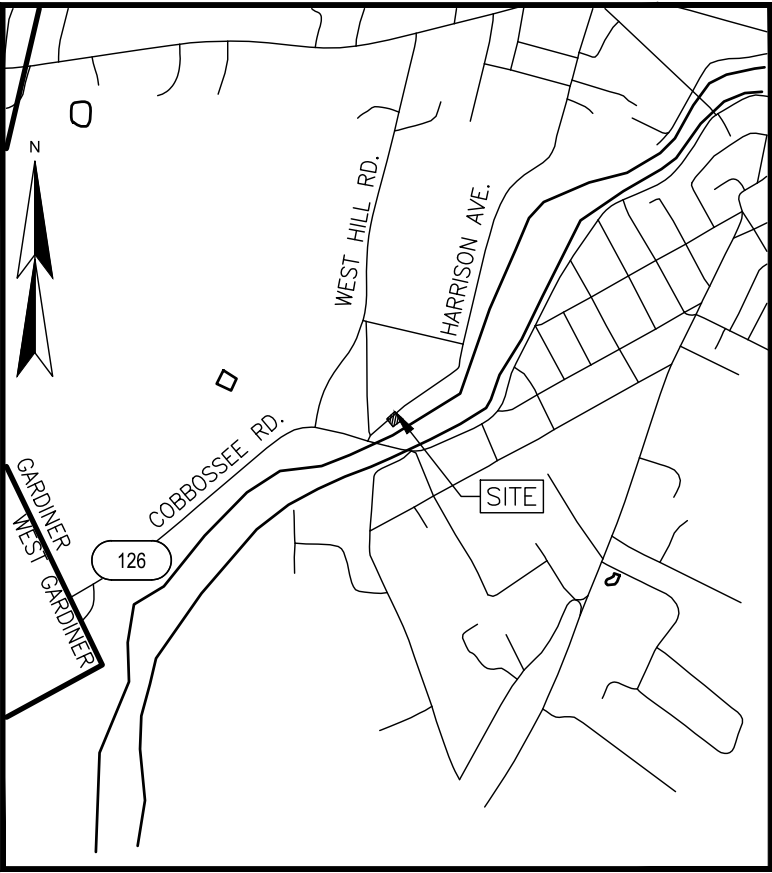
Photo 11 – Bedrock outcrops on east bank of the Cobbosseecontee Stream on November 14, 2023

## APPENDIX C

### Existing Conditions Plan Set



KEY MAP:  
SCALE: 1"=50'



LOCATION MAP (n.t.s.)

NOTES:

- REFERENCE: HARRISON AVENUE  
GARDINER, MAINE
- FIELD SURVEY PERFORMED BY A.E.K. & D.W.D. DURING NOVEMBER 2023 USING A TOTAL STATION AND A SURVEY GRADE GPS WITH A DATA COLLECTOR AND AN AUTO LEVEL. TRAVERSE ADJUSTMENT BASED ON LEAST SQUARE ANALYSIS.
- TERRESTRIAL LIDAR SURVEY PERFORMED BY W.J.D. (DOUCET SURVEY) ON AUGUST & NOVEMBER 2023 USING A LEICA HDS SCANNER. REGISTRATION ADJUSTMENT BASED ON LEAST SQUARE ANALYSIS.
- HORIZONTAL DATUM BASED ON NAD83(2011) MAINE WEST STATE PLANE COORDINATE ZONE (1802) DERIVED FROM REDUNDANT GPS OBSERVATIONS UTILIZING THE KEYNET GPS VRS NETWORK.
- VERTICAL DATUM IS BASED ON APPROXIMATE NAVD88 PER GAGING STATION RM (USGS) ELEV.=137.30.
- PROPER FIELD PROCEDURES WERE FOLLOWED IN ORDER TO GENERATE CONTOURS AT 2' INTERVALS. ANY MODIFICATION OF THIS INTERVAL WILL DIMINISH THE INTEGRITY OF THE DATA, AND DOUCET SURVEY WILL NOT BE RESPONSIBLE FOR ANY SUCH ALTERATION PERFORMED BY THE USER.
- NO WETLANDS WERE DELINEATED AS PART OF THIS SURVEY WORK.
- UNDERGROUND UTILITIES SHOWN HEREON ARE BASED ON OBSERVED PHYSICAL EVIDENCE AND PAINT MARKS FOUND ON-SITE.
- THE ACCURACY OF MEASURED UTILITY INVERTS AND PIPE SIZES/TYPES IS SUBJECT TO NUMEROUS FIELD CONDITIONS, INCLUDING; THE ABILITY TO MAKE VISUAL OBSERVATIONS, DIRECT ACCESS TO THE VARIOUS ELEMENTS, MANHOLE CONFIGURATION, ETC.
- ALL UNDERGROUND UTILITIES (ELECTRIC, GAS, TEL, WATER, SEWER DRAIN SERVICES) ARE SHOWN IN SCHEMATIC FASHION, THEIR LOCATIONS ARE NOT PRECISE OR NECESSARILY ACCURATE. NO WORK WHATSOEVER SHALL BE UNDERTAKEN USING THIS PLAN TO LOCATE THE ABOVE SERVICES. CONSULT WITH THE PROPER AUTHORITIES CONCERNED WITH THE SUBJECT SERVICE LOCATIONS FOR INFORMATION REGARDING SUCH. CALL DIG-SAFE AT 1-888-DIG-SAFE.

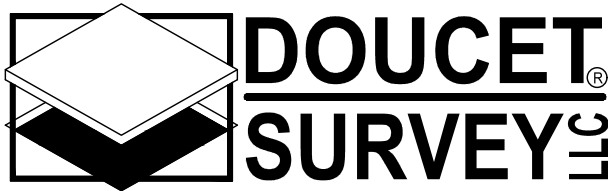
LEGEND

- |     |                               |
|-----|-------------------------------|
| --- | APPROXIMATE ABUTTERS LOT LINE |
| --- | 100' MAJOR CONTOUR LINE       |
| --- | 98' MINOR CONTOUR LINE        |
| --- | RETAINING WALL                |
| --- | CHAIN LINK FENCE              |
| --- | GUARDRAIL                     |
| --- | OVERHEAD WIRE                 |
| --- | TREE LINE                     |
| --- | EDGE OF WATER                 |
| --- | CONCRETE                      |
| --- | RIP RAP                       |
| --- | CRUSHED STONE                 |
| --- | PILE                          |
| --- | UTILITY POLE                  |
| --- | UTILITY POLE & GUY WIRE       |
| --- | UTILITY POLE W/LIGHT          |
| --- | DRAIN MANHOLE                 |
| --- | CATCH BASIN                   |
| --- | SEWER MANHOLE                 |
| --- | FIRE HYDRANT                  |
| --- | WATER GATE VALVE              |
| --- | SIGN (TWO POSTS)              |
| --- | POST                          |
| --- | BOLLARD                       |
| --- | ROCK/BOULDER                  |
| --- | CONIFEROUS TREE               |
| --- | TREE STUMP                    |
| --- | CONCRETE                      |
| --- | EDGE OF PAVEMENT              |
| --- | RETAINING WALL                |
| --- | TYPICAL                       |
| --- | VERTICAL GRANITE CURB         |

TOPOGRAPHIC PLAN  
FOR  
WESTON & SAMPSON  
OF  
SLOPE FAILURE AREA  
HARRISON AVENUE  
GARDINER, MAINE

NO.	DATE	DESCRIPTION	BY

DRAWN BY:	A.K.H.	DATE:	DECEMBER 14, 2023
CHECKED BY:	M.W.F.	DRAWING NO.	8253B
JOB NO.	8253	SHEET	1 OF 5

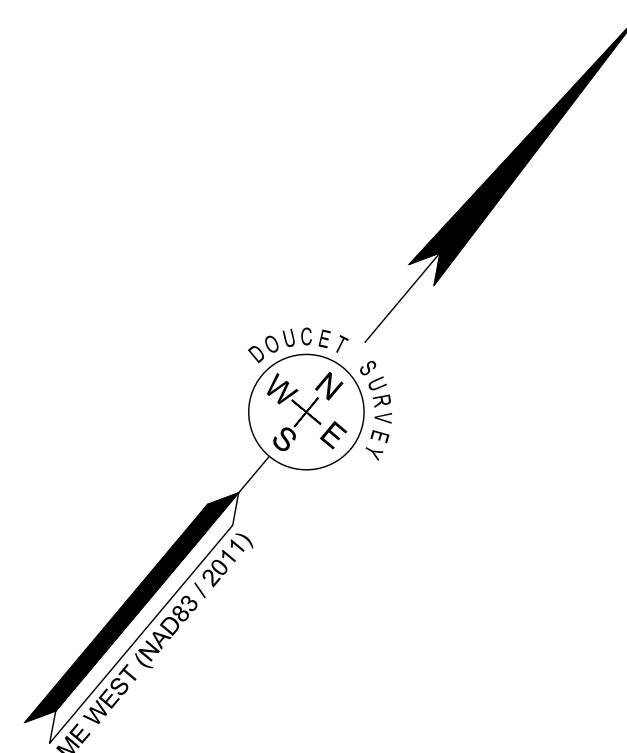


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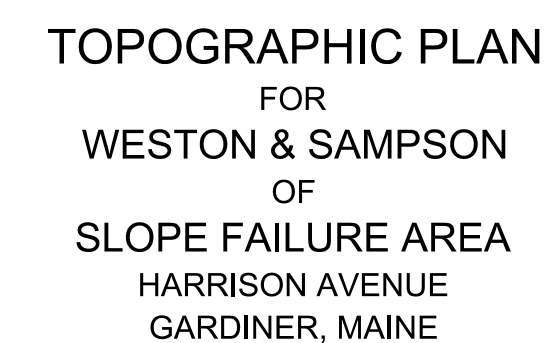
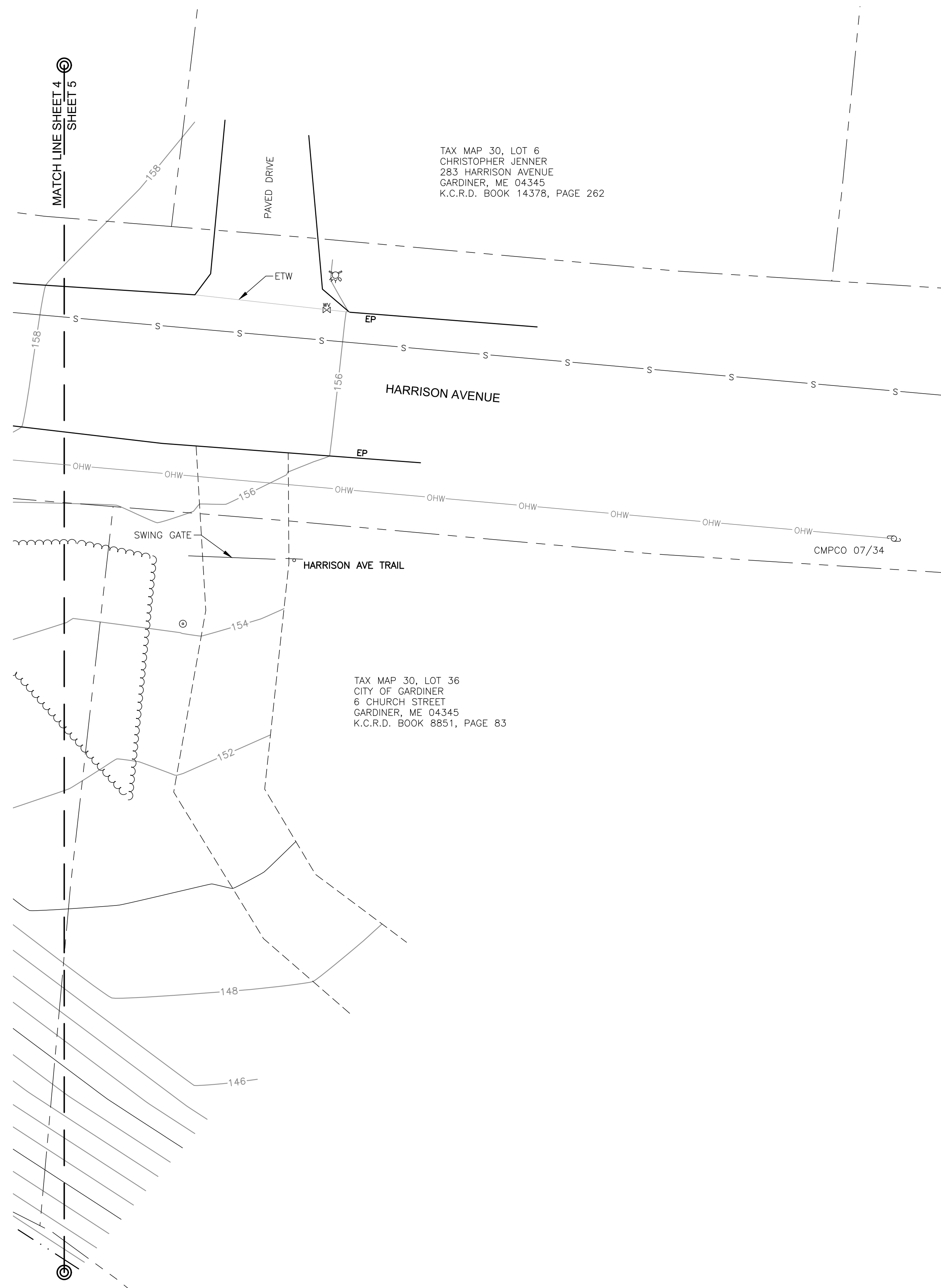
TOPOGRAPHIC PLAN  
FOR  
WESTON & SAMPSON  
OF  
SLOPE FAILURE AREA  
HARRISON AVENUE  
GARDINER, MAINE

NO.	DATE	DESCRIPTION	BY

DRAWN BY: A.K.H.	DATE: DECEMBER 14, 2023
CHECKED BY: M.W.F.	DRAWING NO. 8253B
JOB NO. 8253	SHEET 4 OF 5







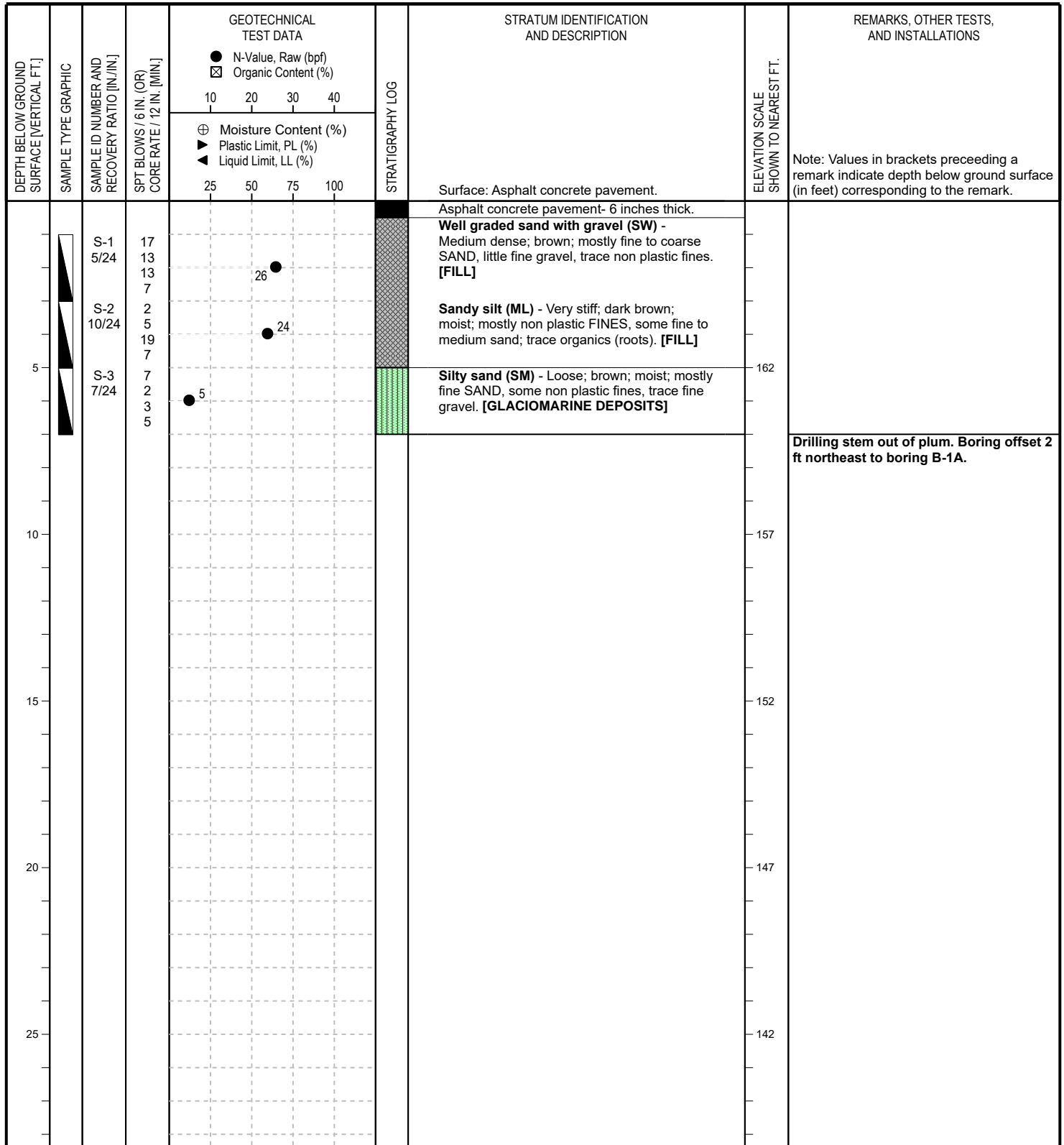
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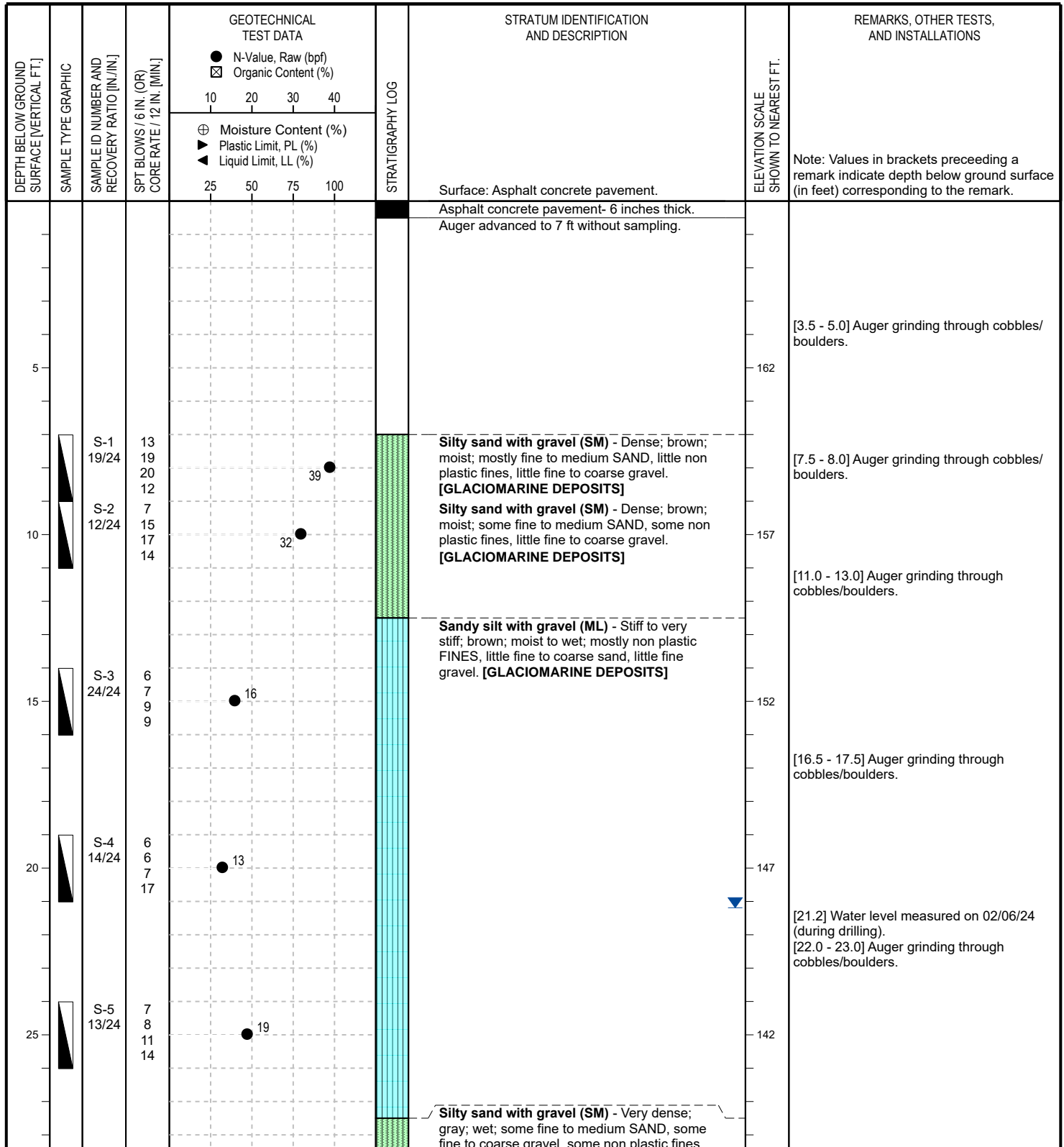
## APPENDIX D

### Borings Logs


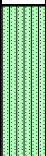

CONTRACTOR:	<b>NE Boring Contractors, Inc.</b>	BORING LOCATION:	<b>See Attached Figure</b>	DATE START:	<b>February 6, 2024</b>
FOREMAN:	<b>G. McDougal</b>	ADVANCE METHOD:	<b>Hollow-Stem Auger Drilling</b>	DATE FINISH:	<b>February 6, 2024</b>
LOGGED BY:	<b>S. Wuebbolt, EIT</b>	AUGER DIAMETER:	<b>2-1/4" ID (Stem), 5-5/8" OD (Flights)</b>	GROUND EL:	<b>167.0 ± (NAVD88)</b>
CHECKED BY:	<b>T. Strike, PE</b>	SUPPORT CASING:	<b>N/A</b>	FINAL DEPTH:	<b>7.0 ft.</b>
EQUIPMENT:	<b>Truck Mounted Drill Rig</b>	CORING METHOD:	<b>N/A</b>	GRID COORDS:	<b>N/A</b>
SPT HAMMER:	<b>Automatic (140-lb.)</b>	BACKFILL MATERIAL:	<b>Drill Cuttings and Asphalt Patch</b>	GRID SYSTEM:	<b>N/A</b>



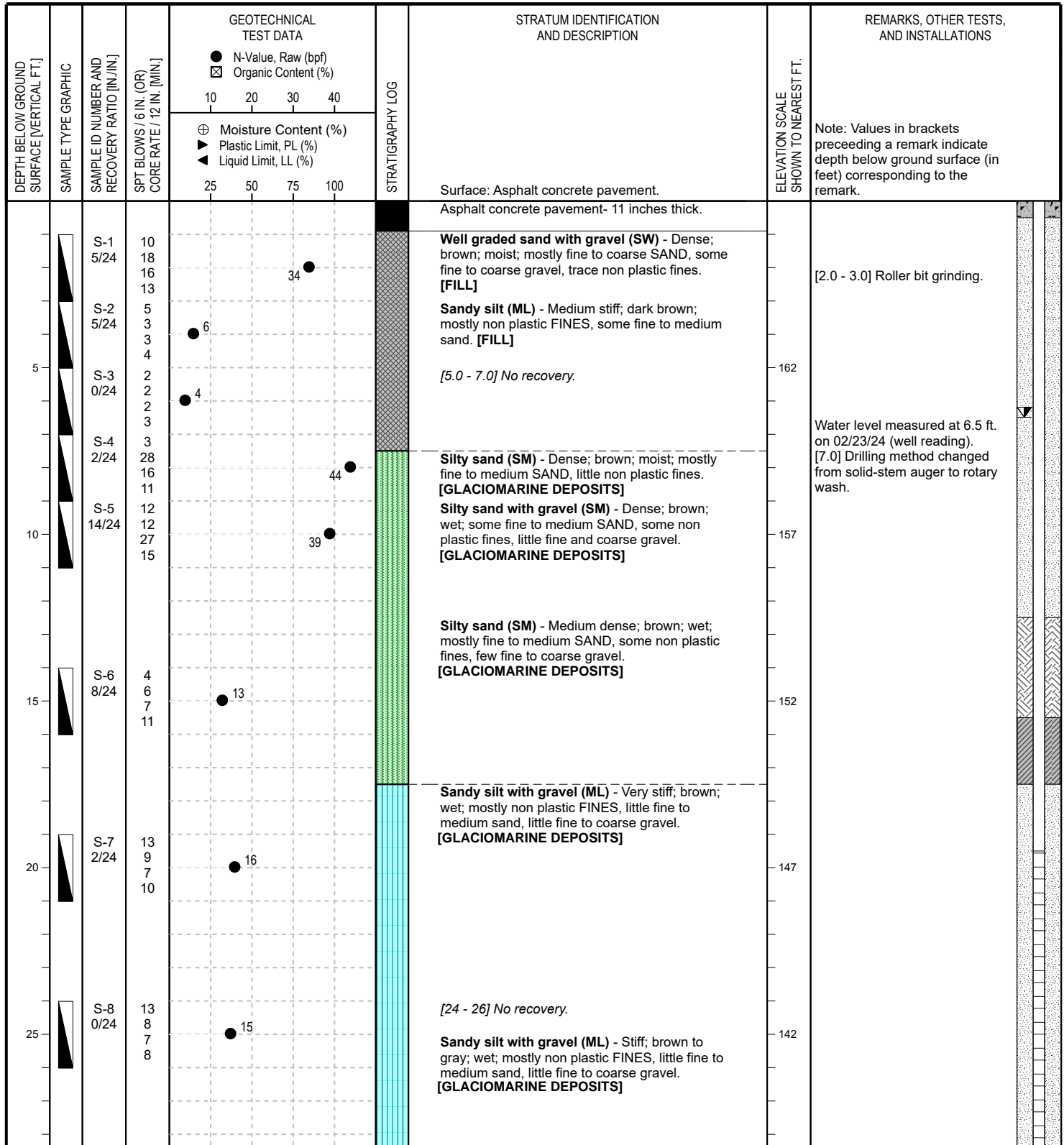
CONTRACTOR:	<b>NE Boring Contractors, Inc.</b>	BORING LOCATION:	<b>See Attached Figure</b>	DATE START:	<b>February 6, 2024</b>
FOREMAN:	<b>G. McDougal</b>	ADVANCE METHOD:	<b>Hollow-Stem Auger Drilling</b>	DATE FINISH:	<b>February 6, 2024</b>
LOGGED BY:	<b>S. Wuebbolt, EIT</b>	AUGER DIAMETER:	<b>2-1/4" ID (Stem), 5-5/8" OD (Flights)</b>	GROUND EL:	<b>167.0 ± (NAVD88)</b>
CHECKED BY:	<b>T. Strike, PE</b>	SUPPORT CASING:	<b>N/A</b>	FINAL DEPTH:	<b>31.8 ft.</b>
EQUIPMENT:	<b>Truck Mounted Drill Rig</b>	CORING METHOD:	<b>N/A</b>	GRID COORDS:	<b>N/A</b>
SPT HAMMER:	<b>Automatic (140-lb.)</b>	BACKFILL MATERIAL:	<b>Drill Cuttings and Asphalt Patch</b>	GRID SYSTEM:	<b>N/A</b>








*Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.*


DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	GEOTECHNICAL TEST DATA				STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS	
				● N-Value, Raw (bpf)								
				☒ Organic Content (%)								
				⊕ Moisture Content (%) ▶ Plastic Limit, PL (%) ▲ Liquid Limit, LL (%)								
				10	20	30	40					
				25	50	75	100					
30		S-6 16/24	17 24 31 38					>> 55 ●		Silty sand with gravel (SM) - Very dense; gray; wet; some fine to medium SAND, some fine to coarse gravel, some non plastic fines. [GLACIAL TILL DEPOSITS]	137	Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.  [31.5 - 31.6] Auger grinding to refusal on possible boulder. <b>Sampler and auger refusal at 31.8 ft. (exploration ended).</b>
		S-7 0/2	50/2									
35												
40												
45												
50												
55												
60												

CONTRACTOR:	NE Boring Contractors, Inc.	BORING LOCATION:	See Attached Figure	DATE START:	February 6, 2024
FOREMAN:	G. McDougal	ADVANCE METHOD:	Solid-Stem Auger to Rotary Wash	DATE FINISH:	February 7, 2024
LOGGED BY:	S. Wuebbolt, EIT	AUGER DIAMETER:	4-1/2" OD (Flights)	GROUND EL:	167.0 ± (NAVD88)
CHECKED BY:	T. Strike, PE	SUPPORT CASING:	Driven Flush-Joint Casing (4" ID)	FINAL DEPTH:	66.3 ft.
EQUIPMENT:	Truck Mounted Drill Rig	CORING METHOD:	N/A	GRID COORDS:	N/A
SPT HAMMER:	Automatic (140-lb.)	BACKFILL MATERIAL:	Monitoring Well Installed	GRID SYSTEM:	N/A





DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	GEOTECHNICAL TEST DATA				STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
				10	20	30	40				
				25	50	75	100				
				⊕ Moisture Content (%)							
				▶ Plastic Limit, PL (%)							
				▲ Liquid Limit, LL (%)							
30		S-9 2/24	5 7 7 9		14				<b>Sandy silt with gravel (ML)</b> - Stiff; brown to gray; wet; mostly non plastic FINES, little fine to medium sand, little fine to coarse gravel. <b>[GLACIOMARINE DEPOSITS]</b>	137	
35		S-10 9/24	15 22 36 37				>> 58		<b>Silty sand with gravel (SM)</b> - Very dense; gray; wet; some fine to medium SAND, some non plastic fines, little fine to coarse gravel. <b>[GLACIAL TILL DEPOSITS]</b>	132	[32.5 - 33.0] Roller bit grinding through cobbles/boulders.
40										127	[36.0 - 38.0] Roller bit grinding through cobbles/boulders.
45									<b>Silty sand (SM)</b> - Very dense; gray; wet; mostly fine SAND, some non plastic fines, few fine to coarse gravel. <b>[GLACIAL TILL DEPOSITS]</b>	122	[40.0 - 42.0] Roller bit grinding through cobbles/boulders.
50		S-11 9/15	27 33 50/3							117	[50.5 - 51.5] Roller bit grinding through cobbles/boulders.
55		S-12 7/7	34 50/1							112	[54.5 - 55.0] Roller bit grinding through cobbles/boulders.
60		S-13 7/10	70 50/3							107	[57.0 - 58.0] Roller bit grinding through cobbles/boulders.

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	GEOTECHNICAL TEST DATA				STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
				● N-Value, Raw (bpf) ☒ Organic Content (%)							
				10	20	30	40				
				⊕ Moisture Content (%) ▼ Plastic Limit, PL (%) ▲ Liquid Limit, LL (%)	25	50	75				
65		S-14 15/16	26 51 52¼						<b>Silty sand (SM)</b> - Very dense; gray; wet; mostly fine SAND, some non plastic fines, few fine to coarse gravel. <b>[GLACIAL TILL DEPOSITS]</b>	102	[61.0 - 62.0] Roller bit grinding through cobbles/boulders.  [63.0 - 63.5] Roller bit grinding through cobbles/boulders. [64.0 - 64.5] Roller bit grinding through cobbles/boulders.
70											
75											
80											
85											
90											
											Exploration ended at 66.3 ft.

# GUIDE TO SUBSURFACE EXPLORATION LOGS



# INDEX SHEET 1 GENERAL INFORMATION

## GENERAL NOTES AND USE OF LOGS

- 1.) Explorations were made by ordinary and conventional methods and with care adequate for Weston & Sampson's study and/or design purposes. The exploration logs are part of a specific report prepared by Weston & Sampson for the referenced project and client, and are an integral part of that report. Information and interpretations are subject to the explanations and limitations stated in the report. Weston & Sampson is not responsible for any interpretations, assumptions, projections, or interpolations made by others.
- 2.) Exploration logs represent general conditions observed at the point of exploration on the date(s) stated. Boundary lines separating soil and rock layers (strata) represent approximate boundaries only and are shown as solid lines where observed and dashed lines where inferred based on drilling action. Actual transitions may be gradual and changes may occur over time.
- 3.) Soil and rock descriptions are based on visual-manual examination of recovered samples, direct observation in test pits (when permissible), and laboratory testing (when conducted).
- 4.) Water level observations were made at the times and under the conditions stated. Fluctuations should be expected to vary with seasons and other factors. Use of fluids during drilling may affect water level observations. The absence of water level observations does not necessarily mean the exploration was dry or that subsurface water will not be encountered during construction.
- 5.) Standard split spoon samplers may not recover particles with any dimension larger than 1-3/8 inches. Reported gravel conditions or poor sample recovery may not reflect actual in-situ conditions.
- 6.) Sections of this guide provide a general overview of Weston & Sampson's practices and procedures for *identifying* and *describing* soil and rock. These procedures are predominantly based on ASTM D2488, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)*, the International Society of Rock Mechanics (ISRM) standards, and the *Engineering Geology Field Manual* published by the Bureau of Reclamation. Not all aspects of this guide relating to description and identification procedures of soil and rock may be applicable in all circumstances.

## SAMPLER GRAPHICS

- Split Spoon (Standard)  
2" OD, 1-3/8" ID
- Split Spoon (Oversize)  
3" OD, 2-3/8" ID
- Shelby or Piston Tube  
3" OD, 2-7/8" ID
- Double-Tube Rock Core Barrel  
2" Core Diameter
- Direct Push with Acetate Liner  
Various Liner Sizes
- Auger Sample  
(from cuttings or hand auger)
- Grab Sample  
(manual, from discrete point)
- Composite Sample  
(multiple grab samples)

## WELL GRAPHICS

- Cement concrete seal around casing or riser pipe
- Bentonite seal around casing or riser pipe
- Cement grout seal around casing or riser pipe
- Soil backfill around riser pipe or beneath screen
- Gravel backfill around screen or riser pipe
- Sand backfill around screen or riser pipe (filter sand)
- Solid-wall riser; Sch. 40 PVC, 1" ID unless noted otherwise
- Slotted screen; Sch. 40 PVC, 1" ID with machined slots

## CAVING / SEEPAGE TERMS

The following caving and/or seepage terms may appear on a test pit log.

Caving Term	Criteria
Minor.....	less than 1 cubic ft.
Moderate.....	1 to 3 cubic ft.
Severe.....	greater than 3 cubic ft.

Seepage Term	Criteria
Slow.....	less than 1 gpm
Moderate.....	1 to 3 gpm
Fast.....	greater than 3 gpm

## KEY TO WATER LEVELS

- Observed in exploration during advancement.
- Measured in exploration at completion, prior to backfilling or well installation.
- Measured in exploration after the stated stabilization period, prior to backfilling, or in well installation if noted.

## DEFINITIONS OF COMMON TERMS

**Sample Recovery Ratio** - The length of material recovered in a drive or push type sampler over the length of sampler penetration, in inches (e.g. 18/24).

**Standard Penetration Test (SPT)** - An in-situ test where a standard split-spoon sampler is driven a distance of 12 or 18 inches (after an initial 6-inch seating interval) using a 140-lb. hammer falling 30 inches for each blow.

**SPT Blows** - The number of hammer blows required to drive a split-spoon sampler each consecutive 6-inch interval during a *Standard Penetration Test*. If no discernable advancement of a split spoon sampler is made after 50 consecutive hammer blows, 50/X indicates *sampler refusal* and is the number of blows required to drive the sampler X inches.

**SPT N-Value (N)** - The uncorrected blow count representation of a soil's penetration resistance over a 12-inch interval after an initial 6-in. seating interval, reported in blows per foot (bpf). The N-value is correlated to soil engineering properties.

**Auger Refusal** - No discernable advancement of the auger over a period of 5 minutes with full rig down pressure applied.

**Casing Refusal (Driven)** - Casing penetration of less than 6 inches after a minimum 50 blows of a drop hammer weighing 300 lbs. or a minimum 100 blows of a drop hammer weighing 140 lbs.

**PID Measurement** - A measurement (electronic reading) taken in the field using a photoionization detector (PID) to detect the presence of volatile organic compounds in a soil sample. Values are reported as benzene equivalent units in parts per million (ppm) unless noted otherwise.

**Rock Quality Designation (RQD)** - A qualitative index measure of the degree of jointing and fracture of a rock core taken from a borehole. The RQD is defined as the sum length of solid core pieces 4 inches or longer divided by the run (cored) length, expressed as a percentage. Higher RQD values may indicate fewer joints and fractures in the rock mass.

**Fill (Made Ground)** - A deposit of soil and/or artificial waste materials that has been placed or altered by human processes.

## LABORATORY TESTS AND FIELD MEASUREMENTS

MC.....	Moisture Content	IC.....	1D Incremental Consolidation
OC.....	Organic Content	VS.....	Laboratory Vane Shear
PL.....	Plastic Limit	US.....	Unconfined Compression
LL.....	Liquid Limit	TC.....	Triaxial Compression
GC.....	Gravel Content	PP.....	Pocket (Hand) Penetrometer
SC.....	Sand Content	TV.....	Torvane (Hand Vane)
FC.....	Fines Content	PID.....	Photoionization Detector
DS.....	Direct Shear	FID.....	Flame Ionization Detector

## BORING ADVANCEMENT METHODS

**Hollow-Stem Auger Drilling** - Utilizes continuous flight auger sections with hollow stems to advance the borehole. Drill rods and a plug are inserted into the auger stem to prevent the entrance of soil cuttings into the augers.

**Rotary Wash Drilling** - Utilizes downward pressure and rotary action applied to a non-coring bit while washing the cuttings to the surface using a circulating fluid injected down the drill rods. The borehole is supported with either steel casing or the drilling fluid. Where a casing is used, the borehole is advanced sequentially by driving the casing to the desired depth and then cleaning out the casing. The process of driving and cleaning the casing is commonly referred to as the 'drive-and-wash' technique.

**Continuous Sampling** - Includes a variety of methods and procedures during which the borehole is advanced via continuous recovery of soil samples. *Direct Push* sampling is a common method that uses static downward pressure combined with percussive energy to drive a steel mandrel into the ground at continuous intervals while recovering soil samples in disposable acetate liners.

**Rock Coring** - Utilizes downward pressure and rotary action applied to a core barrel equipped with a diamond-set or tungsten carbide coring bit. During conventional coring, the entire barrel is retrieved from the hole upon completion of a core run. Wireline coring allows for removal of the inner barrel assembly containing the actual core while the drill rods and outer barrel remain in the hole. Various types and sizes of core barrels and bits are used.

# GUIDE TO SUBSURFACE EXPLORATION LOGS



# INDEX SHEET 2 SOIL DESCRIPTION

## SOIL CONSTITUENTS

Naturally occurring soils consist of one or more of the following matrix constituents defined in terms of particle size.

Constituent	U.S. Sieve Size	Observed Size (in.)
Gravel (Coarse)	3/4 in. - 3 in.	3/4 - 3
Gravel (Fine)	No. 4 - 3/4 in.	1/5 - 3/4
Sand (Coarse)	No. 10 - No. 40	1/16 - 1/5
Sand (Medium)	No. 40 - No. 10	1/64 - 1/16
Sand (Fine)	No. 200 - No. 40	1/300 - 1/64
Fines (Silt or Clay)	Smaller than No. 200	Less than 1/300

## SOIL IDENTIFICATION

Soil identification refers to the grouping of soils with similar physical characteristics into a category defined by a **group name** and corresponding **group symbol** based on estimation of the matrix soil constituents to the nearest 5% and simple manual tests. Proportions of cobbles, boulders, and other non-matrix soil materials are not considered during this procedure but are included in the overall soil description if observed or thought to be present. Refer to the following descriptions and tables adapted from ASTM D2488.

**Coarse-Grained Soil** - Coarse-grained soils contain fewer than 50% fines and are identified based on the following table.

Primary Constituent	Fines Percent	Type of Fines and Gradation	Group Symbol	Group Name <sup>(1)</sup>
GRAVEL % gravel > 10% % sand	≤ 5%	well graded	GW	Well graded gravel
		poorly graded	GP	Poorly graded gravel
	10% to 45%	clayey well graded	GW-GC	Well graded gravel with clay
		clayey poorly graded	GP-GC	Poorly graded gravel with clay
		silty well graded	GW-GM	Well graded gravel with silt
		silty poorly graded	GP-GM	Poorly graded gravel with silt
SAND % sand ≥ 10% % gravel	≤ 5%	clay fines	GC	Clayey gravel
		silt fines	GM	Silty gravel
	10% to 45%	well graded	SW	Well graded sand
		poorly graded	SP	Poorly graded sand
		clayey well graded	SW-SC	Well graded sand with clay
		clayey poorly graded	SP-SC	Poorly graded sand with clay
		silty well graded	SW-SM	Well graded sand with silt
		silty poorly graded	SP-SM	Poorly graded sand with silt
	15% to 45%	clay fines	SC	Clayey sand
		silt fines	SM	Silty sand

<sup>(1)</sup> If soil is a gravel and contains 15% or more sand, add "with sand" to the group name. If soil is a sand and contains 15% of more gravel, add "with gravel" to the group name.

**Inorganic Fine-Grained Soil** - Fine-grained soils contain 50% or more fines and are identified based on the following table.

Plasticity Criteria	Dry Strength	Coarse Fraction S = Sand, G = Gravel	Group Symbol	Group Name <sup>(1)</sup>
Medium	Medium to high	< 15% S + G	CL	Lean clay
		≥ 30% % S ≥ % G	CL	Sandy lean clay
		S + G % S < % G	CL	Gravelly lean clay
Non-plastic	None to low	< 15% S + G	ML	Silt
		≥ 30% % S ≥ % G	ML	Sandy silt
		S + G % S < % G	ML	Gravelly silt
High	High to very high	< 15% S + G	CH	Fat clay
		≥ 30% % S ≥ % G	CH	Sandy fat clay
		S + G % S < % G	CH	Gravelly fat clay
Low to Medium	Low to medium	< 15% S + G	MH	Elastic silt
		≥ 30% % S ≥ % G	MH	Sandy elastic silt
		S + G % S < % G	MH	Gravelly elastic silt

<sup>(1)</sup> If soil contains 15% to 25% sand or gravel, add "with sand" or "with gravel" to the group name.

**Organic Fine-Grained Soil** - Fine-grained soils that contain enough organic particles to influence the soil properties are identified as Organic Soil and assigned the group symbol OL or OH.

**Highly Organic Soil (Peat)** - Soils composed primarily of plant remains in various stages of decomposition are identified as Peat and given the group symbol PT. Peat usually has an organic odor, a dark brown to black color, and a texture ranging from fibrous (original plant structure intact or mostly intact) to amorphous (plant structure decomposed to fine particles).

## SOIL DESCRIPTION

Soils are described in the following general sequence. Deviations may occur in some instances.

### Identification Components

(1) Group Name and Group Symbol

### Description Components

- (2) Consistency (Fine-Grained) or Apparent Density (Coarse-Grained)
- (3) Color (*note, the term "to" may be used to indicate a gradational change*)
- (4) Soil Moisture
- (5) Matrix Soil Constituents (Gravel, Sand, Fines)
  - ↳ Proportion (*by weight*), particle size, plasticity of fines, angularity, etc.
- (6) Non-Matrix Soil Materials and Proportions (*by volume*)
- (7) Other Descriptive Information (Unusual Odor, Structure, Texture, etc.)
- (8) [Geologic Formation Name or Soil Survey Unit]

## SPT N-VALUE CORRELATIONS

Consistency	SPT N-Value	Apparent Density	SPT N-Value
Very soft	0 - 2	Very loose	0 - 5
Soft	2 - 4	Loose	5 - 10
Medium stiff	4 - 8	Medium dense	10 - 30
Stiff	8 - 15	Dense	30 - 50
Very stiff	15 - 30	Very dense	> 50
Hard	> 30		

## SOIL MOISTURE

**Dry**..... Apparent absence of moisture; dry to the touch.  
**Moist**..... Damp but no visible water.  
**Wet**..... Visible free water; saturated.

## PROPORTIONS / PERCENTAGES

Proportions of gravel, sand, and fines (excluding cobbles, boulders, and other constituents) are stated in the following terms indicating a range of percentages by weight (to nearest 5%) of the minus 3-in. soil fraction and add up to 100%.

Proportions of cobbles, boulders, and other non-matrix soil materials including artificial debris, roots, plant fibers, etc. are stated in the following terms indicating a range of percentages by volume (to the nearest 5%) of the total soil.

<b>Mostly</b> .....	50% - 100%	<b>Numerous</b> .....	40% - 50%
<b>Some</b> .....	30% - 45%	<b>Common</b> .....	25% - 35%
<b>Little</b> .....	15% - 25%	<b>Occasional</b> .....	10% - 20%
<b>Few</b> .....	5% - 10%	<b>Trace</b> .....	Less than 5%
<b>Trace</b> .....	Less than 5%		

## PLASTICITY (FINES ONLY)

**Non-plastic**..... Dry specimen ball falls apart easily. Cannot be rolled into thread at any moisture content.

**Low**..... Dry specimen ball easily crushed with fingers. Can be rolled into 1/8-in. thread with some difficulty.

**Medium**..... Difficult to crush dry specimen ball with fingers. Easily rolled into 1/8-in. thread.

**High**..... Cannot crush dry specimen ball with fingers. Easily rolled and re-rolled into 1/8-in. thread.

## COBBLES AND BOULDERS

**Cobbles** - Particles of rock that will pass a 12-in. square opening and be retained on a 3-in. sieve.

**Boulders** - Particles of rock that will not pass a 12-in. square opening.

*Note: Where the percentage (by volume) of cobbles and/or boulders cannot be accurately or reliably estimated, the terms "with cobbles", "with boulders", or "with cobbles and boulders" may be used to indicate observed or inferred presence.*



## GUIDE TO SUBSURFACE EXPLORATION LOGS



## INDEX SHEET 3 ROCK DESCRIPTION

### ROCK DEFINITION

Where reported on an exploration log, *rock* is defined as any naturally formed aggregate of mineral matter occurring in large masses or fragments. This definition of rock should not be taken as a replacement for any definitions relating to rock and/or rock excavation defined in construction documents. Intensely weathered or decomposed rock that is friable and can be reduced to gravel size particles or smaller by normal hand pressure is identified and described as soil. Poorly indurated formational materials which display both rock-like and soil-like properties are identified and described as rock followed by the soil description. In such cases, the term "poorly indurated" or "weakly cemented" is added to the rock name (e.g. weakly cemented sandstone).

### ROCK IDENTIFICATION

Rock is identified by a combination of *rock type* (igneous, metamorphic, or sedimentary) followed by the *rock name* (e.g. granite, schist, sandstone).

### ROCK DESCRIPTION

Rock descriptions are presented in the following general sequence. The detail of description is dictated by the complexity and objectives of the project.

#### Identification Components

(1) Rock Type and Name

#### Description Components

- (2) Rock Grain Size (*for clastic sedimentary rock*)
- (3) Crystal Size (*for igneous and metamorphic rock*)
- (4) Bedding Spacing (*for sedimentary rock*)
- (5) Color
- (6) Hardness and Weathering Descriptors
- (7) Fracture Density
- (8) [Geologic Formation Name]

### ROCK QUALITY DESIGNATION

$$RQD (\%) = \frac{\sum \text{Length of intact core pieces} \geq 4 \text{ inches}}{\text{Total length of core run (inches)}} \times 100$$

The RQD should correlate with the fracture density in most cases. Higher RQD values generally indicate fewer joints and fractures.

### GRAIN / CRYSTAL SIZE

#### Grain Size for Clastic Sedimentary Rock

The names of clastic sedimentary rocks are generally based on their predominant clast or grain size (e.g. fine sandstone, medium sandstone, coarse gravel conglomerate, cobble conglomerate, siltstone, claystone).

#### Crystal Size for Igneous and Metamorphic Rock

Grain Size Description	Average Crystal Size (in.)
Very coarse grained (pegmatitic)	Greater than or equal to 3/8
Coarse-grained	Between 3/16 and 3/8
Medium-grained	Between 1/32 and 3/16
Fine-grained	Between 1/250 and 1/32
Aphanitic	Less than or equal to 1/250

### BEDDING SPACING

Bedding Description	Thickness / Spacing
Massive	Less than 10 ft.
Very thickly bedded	3 ft. to 10 ft.
Thickly bedded	1 ft. to 3 ft.
Moderately bedded	4 in. to 1 ft.
Thinly bedded	1 in. to 4 in.
Very thinly bedded	1/4 in. to 1 in.
Laminated	Less than 1/4 in.

Note: Bedding is generally only applicable to sedimentary or bedded volcanic rocks.

### HARDNESS

Hardness	Criteria
Extremely hard	Cannot be scratched with a pocketknife or sharp pick. Can only be chipped with repeated heavy hammer blows.
Very hard	Cannot be scratched with a pocketknife or sharp pick with difficulty. Breaks with repeated heavy hammer blows.
Hard	Can be scratched with a pocketknife or sharp pick with difficulty. Breaks with heavy hammer blows.
Moderately hard	Can be scratched with a pocketknife or sharp pick with light or moderate pressure. Breaks with moderate hammer blows.
Moderately soft	Can be grooved 1/16 in. deep with a pocketknife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Can be grooved or gouged easily with a pocketknife or sharp pick. Breaks with light to moderate manual pressure.
Very soft	Can be readily indented, grooved, or gouged with fingernail, or carved with a pocketknife. Breaks with light manual pressure.

### WEATHERING (INTACT ROCK)

Weathering Description	Discoloration and/or Oxidation	General Characteristics
Fresh	Body of rock and fracture surfaces are not discolored or oxidized.	Rock texture unchanged. Hammer rings when crystalline rocks are struck.
Slightly weathered	Discoloration or oxidation limited to surface of, or short distance from, fractures. Most surfaces exhibit minor to complete discoloration.	Rock texture preserved. Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately weathered	Discoloration or oxidation extends usually throughout. Fe-Mg minerals appear rusty. All fracture surfaces are discolored or oxidized.	Rock texture generally preserved. Hammer does not ring when rock is struck. Body of rock slightly weakened.
Intensely weathered	Discoloration or oxidation throughout. Feldspar and Fe-Mg minerals altered to clay to some extent. All fracture surfaces are discolored or oxidized and friable.	Rock texture altered by chemical disintegration. Can usually be broken with moderate to heavy manual pressure or by light hammer blow. Body of rock is significantly weakened.
Decomposed	Discoloration or oxidation throughout but resistant minerals such as quartz may be unaltered. All feldspar and Fe-Mg minerals are completely altered to clay.	Resembles a soil; partial or complete remnant rock structure may be preserved. Can be granulated by hand. Resistant minerals may present as stringers or dikes.

### FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures
Very slightly fractured	Core lengths greater than 3 ft.
Slightly fractured	Core lengths mostly from 1 ft. to 3 ft.
Moderately fractured	Core lengths mostly from 4 in. to 1 ft.
Intensely fractured	Core lengths mostly from 1 in. to 4 in.
Very intensely fractured	Mostly chips and fragments

Note: Fracture density is based on the fracture spacing in recovered core, measured along the core axis (excluding mechanical breaks).



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# ALTERNATIVES ANALYSIS REPORT

August 15, 2024

CITY OF  
**GARDINER**  
MAINE

Harrison Avenue Slope Repair  
December 2023 Failure  
Gardiner, Maine



August 15, 2024

Mr. Andrew Carlton  
City Manager – City of Gardiner, Maine  
6 Church Street  
Gardiner, Maine 04345  
[ACarlton@gardinermaine.com](mailto:ACarlton@gardinermaine.com)

**Re: Alternatives Analysis Report  
Harrison Avenue Slope Repair – December 2023 Failure  
Gardiner, Maine**

Dear Mr. Carlton:

Weston & Sampson Engineers, Inc. (Weston & Sampson) is pleased to submit our Alternatives Analysis Report for the Harrison Avenue Slope Repair project related to the December 2023 failure. This report presents our findings and documents our visual observations, topographic survey, subsurface explorations, engineering assessments, and alternatives analysis. Slope mitigation repair concepts and estimated costs for feasible alternatives are provided along with our recommended mitigation repair alternative to assist the City in deciding how to best proceed with addressing the failed section of soil slope along Harrison Avenue.

We appreciate the opportunity to be of continued service to you. If you have questions concerning this report or require additional information, please contact me at 603-263-9499 ([striket@wseinc.com](mailto:striket@wseinc.com)).

Very truly yours,

WESTON & SAMPSON ENGINEERS, INC.



Thomas J. Strike  
Team Leader

P:\ME\Gardiner\Harrison Avenue slope failure\Alternatives Analysis Report\December 2023 Storm\Alternatives Study - Cover Letter.docx

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## 1.0 INTRODUCTION

The City of Gardiner, Maine (the City) retained Weston & Sampson to provide consulting engineering services for repair to a section of slope that failed along an embankment between Harrison Avenue and the Cobbosseecontee Stream in Gardiner on December 18, 2023. Our services to date have included site observations by professional geotechnical engineering staff, topographic survey, subsurface explorations, and preparation of a June 20, 2024 In-Kind Replacement Memorandum. This memorandum is included in **Appendix A**.

Our current geotechnical engineering assessment and analysis suggests that a slope repaired to pre-failure conditions (a steep, vegetated slope) will not meet current engineering design standards and will be at risk of future, similar failures. Therefore, mitigation repair of the slope is recommended so that the slope is appropriately designed and protected.

The June 20, 2024 Memorandum included our opinion of earthwork efforts needed to restore the failed slope to pre-failure (in-kind) conditions and our estimated raw cost (without considering overhead and profit) to complete this effort. In accordance with FEMA requirements, mitigation repair must be “cost-effective” to be eligible for mitigation funding. We understand that mitigation repair will be considered “cost effective” provided that the estimated raw cost for the mitigation portion of the repair construction cost does not exceed the total construction cost for in-kind repair. The raw construction cost indicated in our June 20, 2024 Memorandum to complete in-kind repair was estimated to be \$220,587. Therefore, the mitigation portion of the repair must not exceed \$220,587 to be considered “cost-effective.”

This report summarizes our services and findings and presents cost-effective, conceptual-level mitigation slope repair alternatives with advantages, disadvantages, and approximate estimated costs for each alternative.

Weston & Sampson has been providing the City with consulting engineering services for repair to a section of slope that failed along the same embankment on May 1, 2023. This failure is located approximately 20 feet south of the December 18, 2023 failure.

### 1.1 Site Conditions Prior to Failure

Harrison Avenue is a local roadway that extends from Andrews Street at its south end to Highland Avenue at its north end. Cobbosseecontee Stream is located along the east side of and below Harrison Avenue along much of its length. New Mills Dam is located at Cobbosseecontee Stream, near the intersection of Harrison Avenue and Andrews Street. A relatively steep soil embankment (slope) is located between Harrison Avenue and Cobbosseecontee Stream. Metal guardrails and timber utility poles are located along the east side of Harrison Avenue where it extends along the top of the slope. A wastewater pump station is located at the southeast intersection of Harrison Avenue and Andrews Street. Subsurface utility pipes are located along Harrison Avenue. The site area with respect to surrounding conditions is shown in **Figure 1**.

A section of slope north of the pump station failed in 2015 during construction for new subsurface utility pipes within the embankment. The 2015 failed section of slope was repaired with riprap and construction of a soil berm. A stone access road was constructed along the slope from the pump station area to the end of the failed slope section for construction access. An alternative utility pipe alignment was selected after the 2015 slope failure. A Slope Restoration Plan Sheet for the repair prepared by Summit Geoengineering Services is included in **Appendix B**. The intents of that slope stabilization, as noted in the Summit Plan Sheet, were to stabilize the existing slope

and to prevent further undermining of Harrison Avenue. The stabilization was not intended to provide protection against global slope instability.

An additional section of slope failed on May 1, 2023 during a period of significant rainfall and stormwater runoff and high flow velocities in the Cobbosseecontee Stream through/over the New Mills Dam. This slope failure, which is designated as FEMA Disaster #4719, occurred over the full slope height and measures approximately 70 feet wide by 12 feet deep. At the time of this report, repair design for this section of slope is in progress.

Based on observations during site visits for the May 1, 2023 failure project, the slope prior to the December 18, 2023 failure was covered with brush, weeds, and scattered trees. The photo to the right shows the slope in November 2023, with the May 1, 2023 failure immediately to the left (south) of the pre-failure slope section. According to a topographic survey completed in August and November 2023, the December 18, 2023 failed slope section was inclined at approximately 1.2H:1V at its upper portion and approximately 2H:1V at its lower portion prior to failure. Ground surface elevations prior to failure ranged from approximately El. 166 feet at the top of the slope to approximately El. 124 feet at the bottom of the slope.



*View of slope prior to failure in November 2023*

## 1.2 December 18, 2023 Failure and Existing Conditions

The section of Harrison Avenue slope that failed on December 18, 2023 is located approximately 200 feet downstream (north) of the New Mills Dam and approximately 20 feet north of the May 1, 2023 slope failure (see photo to the right). The dam's outlet control is located on the left (west) side of the dam, on the same side of the Cobbosseecontee Stream as the slope failure. The failure occurred during a period of significant rainfall and stormwater runoff, and high flow velocities in the Cobbosseecontee Stream and over the spillway and through the outlet control of New Mills Dam. Similar conditions were evident at the time of the May 1, 2023 failure. The failure caused surficial soils and most vegetative cover to slide into the Cobbosseecontee Stream and left a deep sloughed slope exposing embankment soils. The failed section of slope measures approximately 40 feet wide by 75 feet tall by 4 feet deep.



*View of May & December 2023 slope failures on May 3, 2023*

Post-failure slope inclinations are not known since the topographic survey was completed prior to failure. However, based on our observations, sections of the failed slope are inclined up to near vertical. Photos of the slope prior to and after the December 18, 2023 failure are included in **Appendix C**.

### 1.3 Topographic Survey

Weston & Sampson retained Doucet Survey, LLC to complete a topographic survey of the May 1, 2023 project area and adjacent slope sections. The adjacent slope areas included in the survey encompassed the eventual December 18, 2023 failed slope section. The survey was conducted in August and November 2023, so topographic information of the December 18, 2023 failed slope section was not collected. The survey was completed using a Leica Survey Grade Laser Scanner and conventional survey equipment. The horizontal datum is NAD83 (2011) Maine State Coordinate Zone (1802) and was established from redundant GPS observations utilizing the Keynet GPS VRS Network. The vertical datum is NAVD88 and was established using Gaging Station RM (USGS). An existing conditions plan set, with conditions prior to the December 18, 2023 failure, is provided in *Appendix D*.

## 2.0 SUBSURFACE CONDITIONS

### 2.1 Geologic Setting

Information from the Maine Geological Survey – Gardiner Quadrangle, Maine developed by the Maine Department of Conservation (MEDC) indicates that the site is located in an area of glaciomarine deposits above glacial till deposits. Information from the Bedrock Geologic Map of Maine developed by the MEDC indicates that bedrock in the site area is interbedded pelite and sandstone. Bedrock outcrops were observed on the east side of the Cobbosseecontee Stream.

### 2.2 Subsurface Exploration Program

#### 2.2.1 General

Weston & Sampson retained New England Boring Contractors, Inc. of Hermon, Maine to complete a subsurface exploration program in the areas of the May 1 and December 18, 2023 failures. The purpose of our exploration program was to collect information on soil and groundwater conditions within the slope embankment necessary to evaluate geotechnical considerations and appropriate conceptual slope mitigation repair alternatives for both failed sections.

The subsurface exploration program was completed on February 6 and 7, 2024 and included the advancement of three borings designated as B-1, B-1A, and B-2 and the installation of one groundwater observation well in B-2. Boring B-1 was offset to the location of B-1A due to misalignment of the augers at about 7 feet. Boring B-1A was advanced to refusal at 31.8 feet and B-2 was terminated at 66.3 feet. Approximate boring locations are shown in **Figure 2**. A Weston & Sampson geotechnical engineering representative observed boring activities, measured boring locations from existing site features, and prepared logs for each boring.

#### 2.2.2 Borings

The borings were advanced with an ATV-mounted drill rig using hollow-stem auger and drive-and-wash drilling methods. Standard penetration tests (SPTs) were conducted at 2 to 5-foot intervals in the borings by driving a 24-inch long by 1-3/8-inch inside diameter (2-inch outside diameter) split spoon sampler with blows from a 140-pound automatic safety hammer falling 30-inches per blow. Hammer blows per 6-inches of sampler penetration (for 24-inches) were recorded. The blow counts for the middle 12-inches are combined and designated as the SPT blow count, which is correlated to soil consistencies and engineering soil properties. Split-spoon refusal, where noted in the boring logs, is defined as 100 hammer blows for less than 6-inches of sampler penetration. Drilling refusal is defined as no discernable advancement of the auger/roller bit under the full weight of the drill rig over a period of approximately 5 minutes.

#### 2.2.3 Encountered Subsurface Conditions

Subsurface conditions encountered in the borings below surficial asphalt concrete pavement generally consisted of up to approximately 7.5 feet of fill above native glaciomarine and glacial till deposits. The native subsurface conditions encountered in the borings were generally consistent with mapped surficial geology.



Descriptions of the subsurface conditions encountered in the borings are included in the boring logs in **Appendix E**. The major strata encountered in the borings described below. Variations may occur and should be expected outside and between boring locations.

**Asphalt Concrete Pavement** – Approximately 6 to 11-inches of asphalt concrete pavement was encountered at the ground surface at each boring location.

**Fill** – Approximately 5 to 7.5 feet of medium dense to dense and medium stiff to very stiff fill was encountered in B-1 and B-2. The fill generally consisted of a mixture of fine to coarse sand, gravel, and non-plastic fines, and up to trace organics (roots).

**Glaciomarine Deposits** – Glaciomarine deposits were encountered in B-1A and B-2 below the fill to depths ranging from approximately 27.5 to 32.5 feet. Boring B-1 was terminated at 7 feet in the glaciomarine deposits due to the condition previously discussed. These deposits generally consisted of loose to dense, fine to medium sand with up to some non-plastic fines, and up to little gravel and stiff to very stiff non plastic fines with up to little fine to coarse sand and up to little gravel.

**Glacial Till** – Very dense glacial till was encountered below the glaciomarine deposits in B-1A and B-2. These deposits generally consisted of fine to medium sand with up to some gravel and up to some non-plastic fines. Boring B-2 was terminated in the glacial till at 66.3 feet.

**Refusal** – Sampler and auger refusals were encountered in B-1A at approximately 31.8 feet. Rock coring was not completed to evaluate the nature of refusal; therefore, the refusal could have been caused by very dense soils, a boulder, or bedrock.

**Groundwater** – Groundwater was encountered at approximately 21.2 feet in B-1A based on observation of saturated samples. A groundwater observation well was installed in B-2 to a depth of approximately 29.5 feet on February 7, 2024. Groundwater was measured at approximately 6.5 feet in the well on February 23, 2024.

We anticipate that groundwater levels will fluctuate with season, variations in precipitation, construction in the area, and other factors. Perched groundwater conditions could exist close to the ground surface, especially during and after extended periods of wet weather.

### 3.0 ENGINEERING ASSESSMENT AND EVALUATION

#### 3.1 Summary of Pre-Failure Conditions

The Harrison Avenue soil slope in the area of the December 18, 2023 failure is approximately 40 feet tall (as measured vertically from the Cobbosseecontee Stream up to Harrison Avenue). Based on our topographic survey, the failed slope section was inclined as steep as approximately 1.2H:1V at its upper portion and as steep as approximately 2H:1V at its lower portion prior to failure. As previously discussed, topographic survey post failure has not been completed, so present slope inclinations are not known. Based on our observations, however, sections of the failed slope are inclined up to near vertical. The presence of any undercutting, shallow slides, and/or erosion rills along the slope prior to failure was not evident during observations completed for the May 1, 2023 failure. However, the presence of these conditions may have been obscured by vegetation existing on the slope prior to failure.

The embankment supports Harrison Avenue, which is an approximately 20-foot wide, paved roadway with metal guardrails and timber utility poles along the crest. The ground surface along the west side of Harrison Avenue, in the area of the failure, slopes up and away from Harrison Avenue. Subsurface utilities along Harrison Avenue include sewer and water utility pipes. Stormwater catch basin and subsurface stormwater utility pipes are not located along Harrison Avenue in the area of the failure. Based on area topography and the absence of stormwater collection systems or curbs, stormwater runoff from areas west of Harrison Avenue likely flows directly over the roadway and the soil slope.

Cobbosseecontee Stream flows south to north along the slope toe. New Mills Dam is located approximately 200 feet south of the failed section of slope and the outlet control for the dam is located on the left (west) side of the dam. During periods of heavy precipitation and/or runoff, high flow velocities appear to flow over the dam spillway and through the outlet control. Protective measures against scour along the slope toe, such as large stone riprap, are present immediately downstream of the dam but are not evident beginning at approximately the 2015 failed slope area and continuing further downstream (north) including the December 18, 2023 failed slope area. Based on review of information provided in the Kennebec County, Maine Flood Insurance Study document prepared by FEMA and FEMA's National Flood Hazard Layer (NFHL) Viewer, the FEMA 100-year flood elevation for the Cobbosseecontee Stream near the slope failure location is El. 129.0 feet. For reference, the bottom of slope in the area of failure is approximately El. 124.0 feet.

#### 3.2 Assessment of December 18, 2023 Failure

Based on our observations, the December 18, 2023 slope failure included a near surface sliding of surficial organic and underling embankment soils (known as veneer failure), as opposed to a deep-seated failure that would have likely caused a failure surface to extend from behind the slope crest to beyond the slope toe. Veneer failures are more prevalent on steep slopes, such as those along the Harrison Avenue embankment, and the degree of failure can be exacerbated by any or all of the following conditions: (1) stormwater runoff over the slope surface, (2) an elevated groundwater table in the embankment, and (3) undercutting (scour) of soils near the slope toe. As previously discussed, the failure occurred during a period of significant rainfall and stormwater runoff, and high flow velocities in the Cobbosseecontee Stream and over the spillway and through the outlet control of New Mills Dam. Therefore, all three conditions likely existed at the time of failure. It is possible, however, that slope conditions

had been deteriorating over an extended time period (failure creep) and the conditions experienced on December 18, 2023 accelerated the failure. In our opinion, the slope experienced a similar type and cause(s) of failure as the section of slope that failed on May 1, 2023.

### 3.3 Slope Stability

We completed stability analysis to evaluate factor of safety values for pre-failure slope conditions. The factor of safety against slope instability is defined as the ratio of forces resisting slope failure to those driving slope failure along a given failure surface. A factor of safety less than 1.0 indicates failure and a factor of safety approximately equal to 1.0 indicates marginal stability. The industry standard for minimum factor of safety values against instability for embankments supporting roadways are 1.3 under static conditions and 1.0 for seismic (earthquake) conditions.

We completed our analysis using the computer program SLIDE2 Modeler by Rocscience and slope inclination configurations discussed in **Section 3.1**. Soil strength properties were estimated based on conditions encountered in the borings and a stream elevation of El. 123.0 feet was used for the water surface elevation of Cobbosseecontee Stream. Seismic factor of safety values were evaluated using a peak ground surface acceleration (PGA) available from the U.S. Geological Survey.

Our analysis indicates that the pre-failure slope configuration of the Harrison Avenue slope does not meet minimum factor of safety values against instability. The pre-failure slope configuration is marginally stable against deep-seated failure under static conditions and is unstable against near surface failure. The presence of vegetation on the slope at pre-failure conditions was not incorporated in our stability model and likely provides some measure of resistance to near surface failures, although localized minor surface raveling and/or sliding were likely present in steeper areas prior to failure.

Based on the foregoing, restoring the slope to pre-failure conditions would not provide a solution that meets the industry standards for minimum factor of safety values against instability. Conceptual mitigation repair alternatives that increase factor of safety values to acceptable values and that provide scour protection are discussed in the following section.

## 4.0 SLOPE REPAIR ALTERNATIVES ANALYSIS

### 4.1 General

Based on our engineering assessment and evaluation, restoration of the Harrison Avenue slope to pre-failure conditions is not recommended for this project since such a configured slope would not meet current engineering design standards and would be at risk of future, similar or more substantial failures. Slope repair will need to include mitigation measures that incorporate design elements that increase factor of safety values against instability to acceptable values and protection against scour and undercutting from flows in the Cobbosseecontee Stream.

Slope mitigation repair will need to restore pre-failure lines and grades since the slope crest and toe locations cannot be adjusted and soil slopes will remain at their current inclinations on both sides of the repaired slope area, including the area that will be repaired as a result of the May 1, 2023 failure. Therefore, slope mitigation repair alternatives that would have included flattening slopes or incorporated walls to increase stability factor of safety values were not considered.

It appears that stormwater runoff from higher ground areas west of Harrison Avenue flow over the embankment slope surface in the area of the December 18, 2023 failure. Best practice design of soil slopes typically includes measures to collect and/or divert stormwater flow away from the slope since flowing water will weaken surficial soils and cause erosion rills/gullies to develop along the slope. As discussed in **Section 3.2** above, our opinion is that progressive and excessive stormwater runoff was likely a contributing factor to the December 18, 2023 slope failure. We therefore recommend that slope repair include measures to collect and/or divert stormwater from flowing over the repaired slope surface. These measures could include installation of catch basins and subsurface stormwater pipes and construction of curbing along the east side of Harrison Avenue.

Conceptual slope mitigation repair alternatives considered and evaluated for this project are presented in the following section. These alternatives are the same as those recommended for the May 1, 2023 failed slope section since the December 18, 2023 failed slope section experienced a similar type and cause(s) of failure. Additionally, incorporating the same repair for the two failed slope sections is a practicable, cost-effective, and aesthetically appropriate approach.

### 4.2 Conceptual Slope Mitigation Repair Alternatives

We considered two cost-effective conceptual slope mitigation repair alternatives for the project that would achieve minimum factor of safety values against instability, provide protection from scour, and return the slope to pre-failure lines and grades. These alternatives included: (1) armoring the entire slope with stone riprap and (2) installing soil nail reinforcements in the embankment along with stone riprap toe protection. Although both slope mitigation repair alternatives are technically feasible, each have their own advantages and disadvantages that should be considered.

Although each slope mitigation repair alternative will include their own unique construction work, both will include similar site preparation work. This work will include at a minimum the following:

- Installation of environmental protection (straw wattles, stabilized construction entrances, etc.).



- Removal and reinstallation of guardrail and overhead utilities.
- Improvement to and extension of the existing stone access road constructed for the 2015 slope failure for equipment access.
- Tree/vegetation removal.
- Sloughed soil removal.
- Hauling and disposal of trees, vegetation, and soil.

General discussions on construction of each alternative, along with the primary advantages and disadvantages are presented in the following sections.

#### 4.2.1 *Riprap Slope Mitigation Repair Alternative*

This alternative includes using large stone riprap along the entire slope surface and below the slope toe (riprap toe key) to provide sufficient resisting forces to achieve minimum factor of safety values against instability. Our preliminary analysis suggests a riprap layer up to approximately 8 feet thick with a 1-foot thick crushed stone bedding layer along the slope surface and an approximately 10-foot deep riprap toe key would be needed to achieve minimum factor of safety values.

We recommend that scour protection extend a minimum of 5 feet above the FEMA 100-year flood elevation of El. 129.0 feet. Therefore, larger riprap would be placed from the slope toe up to El. 134.0 feet to provide sufficient protection against scour and undercutting flows in the Cobbosseecontee Stream.

Excavation for riprap placement closer to the slope crest would need to extend below Harrison Avenue, requiring removal and replacement of the pavement surface and road base material and possible temporary support of subsurface water and sewer utility pipes. Excavation for the riprap key at the slope toe would likely require installation of a steel sheet pile or soldier pile and lagging cofferdam to provide temporary excavation support and to allow the excavation to be completed in-the-dry.

Primary advantages and disadvantages of the riprap slope mitigation repair alternative are as follows:

##### Advantages

- Construction can be completed using conventional earthwork equipment and local contractors.
- Material can be locally sourced.
- Riprap surface does provide some resistance to stormwater flows over the slope surface.

##### Disadvantages

- Installation of a costly cofferdam/excavation support system will be required to construct the riprap toe key.
- Excavations along the failed slope to construct the required riprap thickness will need to extend into adjacent soil slope sections to maintain safe slope excavations.
- Risk of destabilizing adjacent soil slope sections during excavations.
- Risk of shallow bedrock at the slope toe that would add costs for installing the cofferdam/excavation support system.

- Excavations will need to extend below Harrison Avenue, likely requiring temporary support of subsurface water and sewer utility pipes.

#### 4.2.2 *Soil Nail Slope Mitigation Repair Alternative*

This alternative is an earth retention approach that includes installing hollow steel tension bars (soil nails) along the slope face. High-tensile steel wire mesh can be used span between the soil nails to create a reinforced soil mass along the slope. Following soil nail and wire mesh installation, the surface can potentially be surfaced with loam and seed. We reviewed this approach with a specialty geotechnical contractor, and they indicated that soils nails installed on an approximate 5-foot by 5-foot grid pattern and to depths extending beyond the theoretical slope failure surface would likely provide adequate factor of safety values against instability.

A soil nail reinforced slope on its own will not provide protection against scour and undercutting from flows in Cobbosseecontee Stream. Therefore, this alternative would also include installation of large stone riprap extending from the slope toe up to approximately El. 134.0 feet.

Primary advantages and disadvantages of the soil nail slope mitigation repair alternative are as follows:

##### Advantages

- Costly cofferdams and excavation support systems are not necessary.
- Excavations below Harrison Avenue are not necessary.
- The slope surface can potentially be surfaced with loam and seed to match adjacent slope surfaces.
- The least costly slope repair alternative.

##### Disadvantages

- Soil nails installed by a specialty geotechnical contractor.
- Possible lag in construction schedule due to limited qualified contractors.

#### 4.3 **Estimated Slope Repair Costs**

In accordance with FEMA disaster relief funding requirements, we estimated slope repair construction costs for both mitigation repair alternatives using raw (without considering overhead and profit) unit cost values. Our estimates considered unit cost values available from RSMeans, local contractors, and recent past projects. We also estimated future design, permitting, and construction administration (CA) cost ranges for both mitigation alternatives based on our experience with similar projects. The estimated costs do not include design and construction costs for a stormwater collection system. Final estimated costs will be evaluated for the selected alternative once design plans are developed.

The following table presents estimated costs for each alternative. Included in the table is the estimated raw cost of the mitigation repair portion of the project to demonstrate that each alternative should be considered cost effective.

Mitigation Alternative	Estimated Raw Cost for Mitigation Portion of Construction	Total Estimated Raw Construction Cost	Estimated Engineering, Permitting, and CA Cost	Total Estimated Raw Project Cost <sup>1</sup>
Riprap Repair	\$218,852	\$418,446	\$180,000	\$661,213
Soil Nail Repair	\$209,138	\$408,732	\$180,000	\$650,042

Note 1: The total estimated raw project cost includes a 15 percent contingency on the total estimated raw construction cost.

Detailed breakdown of costs for each mitigation repair alternative is provided in the Engineer's Opinion of Probable Construction Costs documents included in **Appendix F**. The estimated raw construction cost for the mitigation portion of repair construction is shown in Task 5 of the documents.

#### 4.4 Recommended Slope Repair Alternative

Based on the advantages and disadvantages and the estimated costs presented above, Weston & Sampson recommends selecting the soil nail method as the slope mitigation repair alternative. This alternative presents the least amount of risks during construction and will provide a repaired slope that is aesthetically consistent with other areas along the Cobbosseecontee Stream at the lowest cost. The city, however, should review both alternatives carefully and select the alternative that best fits their expectations.

#### 4.5 Additional Engineering Analyses

The slope mitigation repair alternatives included in this report are conceptual in nature and are intended to provide the city with a high-level presentation of feasible slope mitigation repair alternatives. Additional engineering analyses are required to progress the selected slope mitigation repair alternative to final design and to provide final design cost estimates.

## 5.0 LIMITATIONS

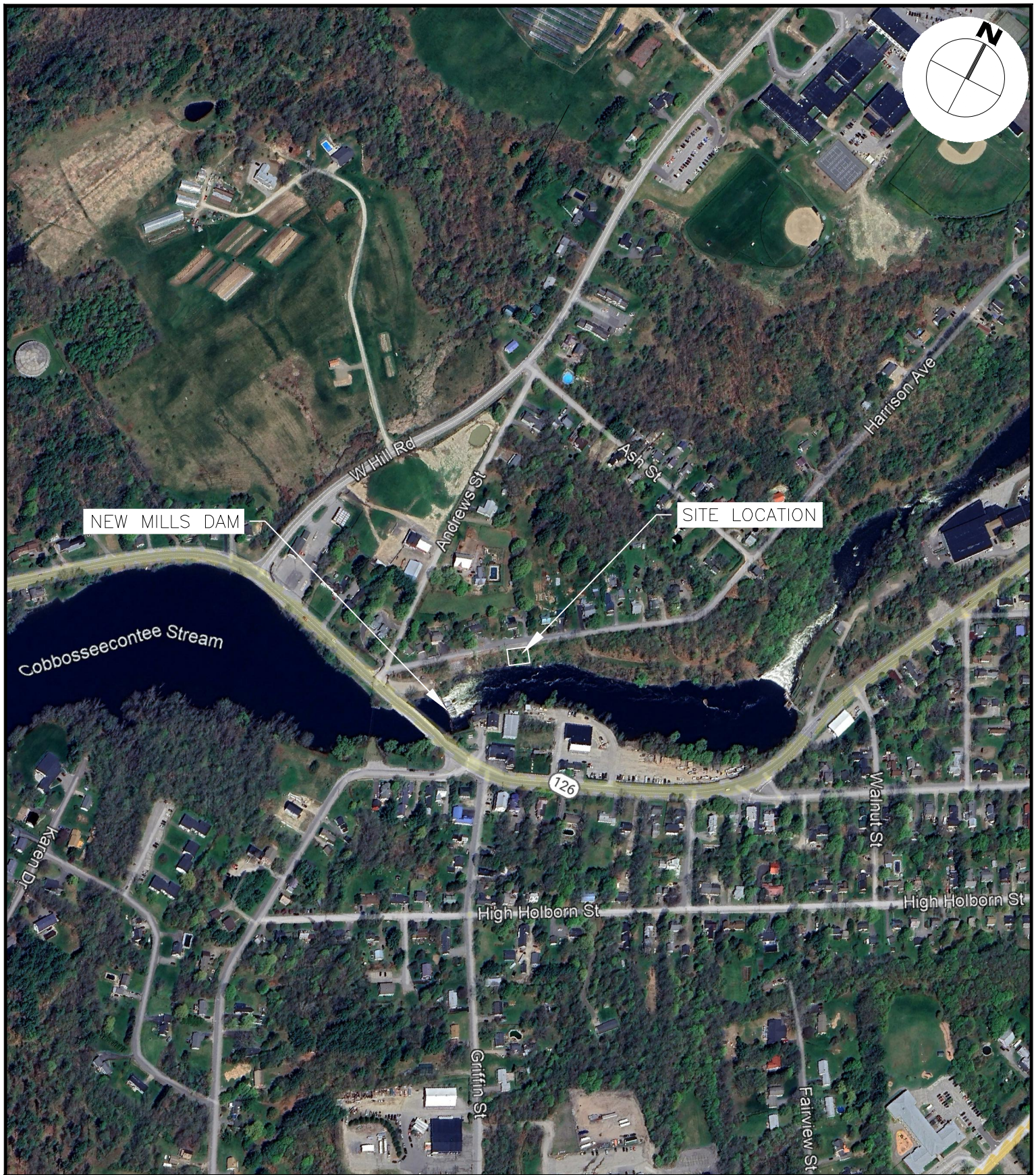
We have prepared this report for use by the City of Gardiner, Maine for the subject project and this site only. The data and report can be used for estimating purposes, but our report, conclusions, and interpretations should not be construed as a warranty of the actual conditions and are not applicable to other sites.

This report has been prepared solely for the purpose of preliminary evaluation and analyses of conceptual-level slope mitigation repair alternatives. This is not a design-level report and should not be construed as such. Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, expressed or implied, is given.



## FIGURES



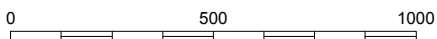


Weston & Sampson

**FIGURE 1  
LOCUS MAP**

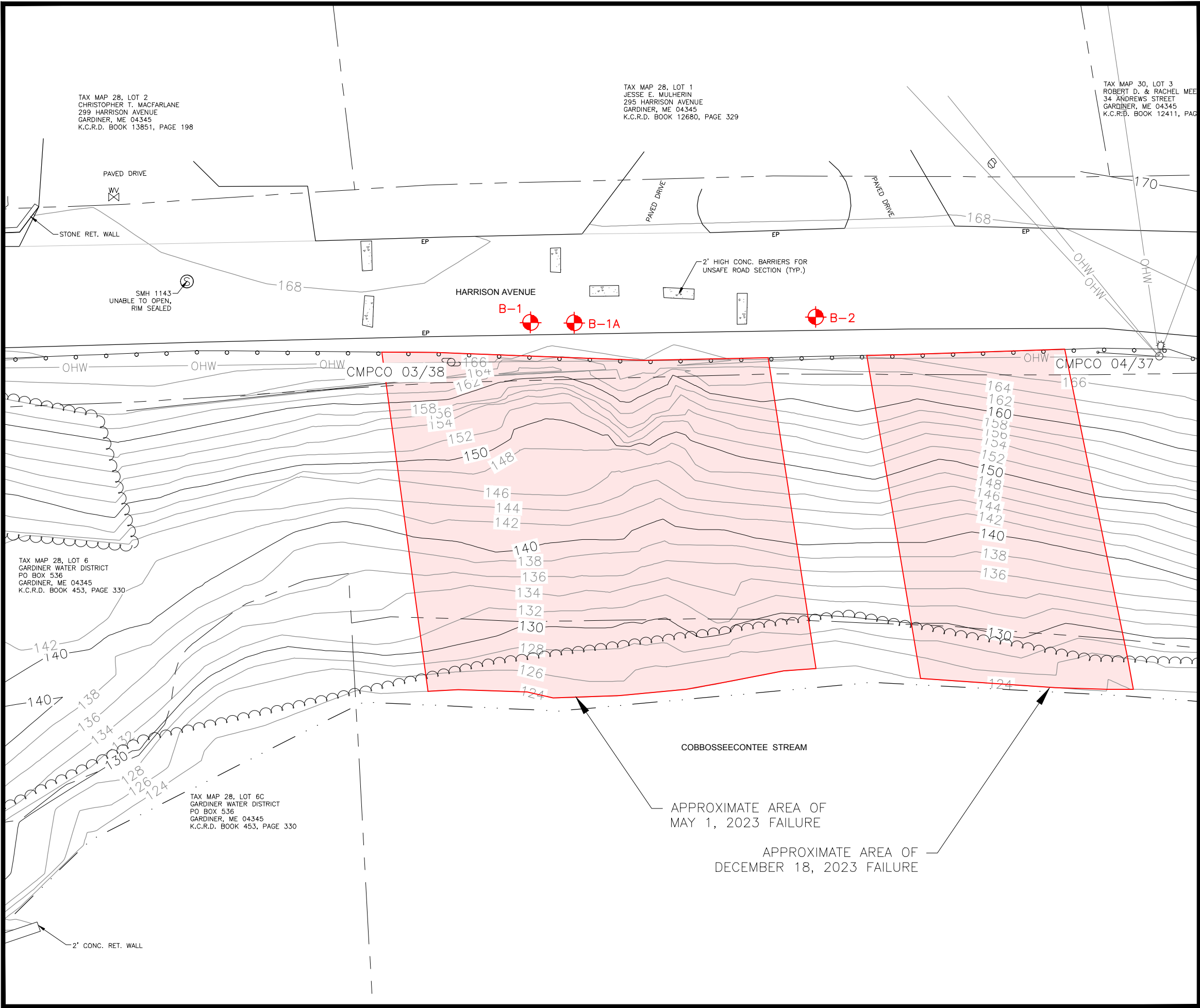
**HARRISON AVENUE SLOPE REPAIR -  
DECEMBER 2023 FAILURE  
GARDINER, MAINE  
KENNEBEC COUNTY**

SCALE IN FEET





P:\ME\Gardner-Harrison Avenue slope failure\Alternatives Analysis Report\December 2023 Storm Figures\Working CAD\Figure 2 Site Plan.dwg



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#### NOTES

1. THIS PLAN WAS PREPARED USING A DECEMBER 14, 2023 TOPOGRAPHIC PLAN PREPARED BY DOUCET SURVEY, LLC.
2. BORINGS WERE COMPLETED BY NEW ENGLAND BORING CONTRACTORS, INC. OF HERMON, MAINE AND OBSERVED BY WESTON & SAMPSON ON FEBRUARY 6-7, 2024.
3. BORING LOCATIONS SHOWN ON THIS PLAN WERE LOCATED BASED ON EXISTING SITE FEATURES.

#### LEGEND



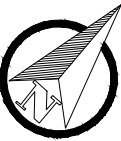
B-1 DESIGNATION AND APPROXIMATE  
LOCATION OF BORING

#### GRAPHIC SCALE



SCALE: 1"=20'

#### ORIENTATION



#### TITLE

BORING LOCATION PLAN

#### PROJECT

HARRISON AVENUE SLOPE REPAIR  
- DECEMBER 2023 FAILURE

GARDINER, MAINE

#### FIGURE

FIGURE 2

DATE	08/2024
DRWN BY	NMK
CHKD BY	TJS
PRJ. NO.	ENG23-0628
REV. NO.	-

## APPENDIX A

June 24, 2024 In-Kind Replacement Memorandum



## *M E M O R A N D U M*

**TO:** Andrew Carlton – City Manager – Gardiner, Maine

**FROM:** Tom Strike, PE, Team Leader – Weston & Sampson Engineers, Inc.

**DATE:** June 20, 2024

**SUBJECT:** Harrison Avenue Slope Repair (Disaster #4754)  
Required Earthwork and Estimated Costs for In-Kind Replacement  
Gardiner, Maine

---

A section of soil slope along Harrison Avenue, and above the Cobbosseecontee Stream, in Gardiner, Maine failed on December 18, 2023. The City of Gardiner is seeking disaster relief funding through the Federal Emergency Management Agency (FEMA) to cover costs to design, permit, and repair the failed section of slope. It is the intent of the project to design and construct a resilient repair approach that will mitigate the potential for future failures. This approach will not include restoration to pre-failure conditions (in-kind replacement). As part of the disaster relief funding process, however, FEMA requires a cost estimate to restore the failed section of slope to pre-failure conditions. Provided in this memorandum are descriptions of the slope prior to and after failure, earthwork required for in-kind slope repair, and our engineers estimates for design, permitting, and construction of the in-kind replacement.

### **SITE CONDITIONS PRIOR TO FAILURE**

Harrison Avenue is a local roadway that extends from Andrews Street at its south end to Highland Avenue at its north end. Cobbosseecontee Stream is located along the east side of and below Harrison Avenue along much of its length. New Mills Dam is located at Cobbosseecontee Stream, near the intersection of Harrison Avenue and Andrews Street. A relatively steep soil slope is located between Harrison Avenue and Cobbosseecontee Stream. Metal guardrails and timber utility poles are located along the east side of Harrison Avenue where it extends along the top of the slope. A wastewater pump station is located at the southeast intersection of Harrison Avenue and Andrews Street. Subsurface utility pipes are located along Harrison Avenue.

A section of slope north of the pump station failed in 2015 during construction for new subsurface utility pipes within the slope. The 2015 failed section of slope was repaired with riprap and construction of a soil berm.

An additional section of slope failed on May 1, 2023 during a period of significant rainfall and stormwater runoff and high flow velocities in the Cobbosseecontee Stream through/over the New Mills Dam. This slope failure, which is designated as FEMA Disaster #4719, occurred over the full slope height and measures approximately 70 feet wide by 12 feet deep. At the time of this memorandum, repair design is in progress.

The December 18, 2023 failed section of slope is located approximately 20 feet north of the May 1, 2023 failed slope section. Based on historical street view photos from Google Maps®, the slope was covered with brush, weeds, and scattered trees prior to failure. Based on a topographic survey completed in August and November 2023 as part of the May 1, 2023 failure project, the December 18, 2023 failed slope section was inclined at approximately 1.2H:1V at its upper portion and approximately 2H:1V at its lower portion prior to failure.

## DECEMBER 18, 2023 SLOPE FAILURE CONDITIONS

The December 18, 2023 slope failure occurred during a period of significant rainfall and stormwater runoff and high flow velocities in the Cobbosseecontee Stream through/over the New Mills Dam, similar to conditions at the time of the May 1, 2023 failure. The failure caused surficial soils and most vegetative cover to slide into the Cobbosseecontee Stream and left a deep sloughed slope exposing embankment soils. The failed section of slope measures approximately 40 feet wide by 75 feet tall by 4 feet deep.

## IN-KIND REPAIR EARTHWORK

In-kind replacement of the failed soil slope would include installation of embankment materials to restore previous lines and grades and installation of loam, seeding, and trees to restore previous ground cover conditions. Construction equipment access would be from Harrison Avenue for work at the top portion of the slope and from near the slope toe for work at the lower portion of the slope. Access to the slope toe would begin via the existing wastewater pump station site and a stone access road that was constructed from the pump station and along the slope for work on the 2015 slope failure. Access improvements would be needed to reach the failed section of slope. These improvements would include vegetation removal, grading, and stone placement necessary to extend the access road to the toe of the failed slope. A summary of earthwork efforts necessary for in-kind repair is presented below:

- Installation of environmental protection (straw wattles) in the work, access, and material stockpile areas and installation of a stabilized construction entrance at the existing wastewater pump station site.
- Installation of a sandbag cofferdam and pumps in the Cobbosseecontee Stream to allow repair work at the toe to occur in-the-dry.
- Removal of a section of steel guardrail along Harrison Avenue and temporary relocation of overhead utility lines to allow access to the top portion of the slope.
- Brush removal along the existing stone access road and in the extended section of stone access road.
- Grading and placement of stone along the extended section of access road.
- Removal, chipping, and disposal of existing trees and brush that remain at the failed slope.
- Removal and disposal of loose, sloughed soil (assumed 12-inches thick) along the failed slope.
- All excavations/slopes will need to be inclined and/or supported in accordance with safe slope requirements set forth in OSHA Laws and Regulations Manual Part 1926 (Safety and Health Regulations for Construction) Subpart P (Excavations). Additionally, all site features will need to be protected from loss of support that could cause undermining, failure, and safety risk to workers. Based on the consistency of the site soils and OSHA requirements, all excavation soil slopes will need to be inclined at no steeper than 1.5 Horizontal (H):1.0 Vertical (V).

Sections of the top portion of the failed slope are inclined near vertical. Soil along the top portion will require both removal and flattening to remove loose soils and restore site grades. This effort would likely undermine portions of Harrison Avenue and create unsafe slope conditions. Our evaluation suggests installation of a steel sheet pile support of excavation system will be needed along the top of the slope to support Harrison Avenue and to meet OSHA safe slope requirements.

- Replacement and compaction of failed/eroded embankment soils with imported fill to restore slope lines and grades. All required soil laboratory testing and soil compaction testing would be completed by a certified geotechnical testing laboratory.
- Installation of loam, erosion control matting, and seed.

- Replacement of trees.
- Re-installation of the metal guardrail.
- Reconnect overhead utilities.
- Removal of erosion control measures at the end of construction.
- Full-time observation of construction to evaluate if work is completed in accordance with design requirements.

## IN-KIND REPLACEMENT COST ESTIMATE

Our cost estimates for in-kind replacement were based on the required earthwork discussed above and estimated engineering design, permitting, and construction administration fees. The estimated in-kind replacement costs (considering both raw and overhead values as requested by FEMA) are summarized as follows:

	RAW VALUES	OVERHEAD AND PROFIT VALUES
Estimated Construction Cost	\$220,587	\$255,364
15% Project Contingency	\$33,088	\$38,304
Estimated Engineering, Permitting, and CA Fee	\$180,000	\$180,000
Estimated Total Construction and Engineering Costs	\$433,676	\$473,668

Unit costs for each element of earthwork repair were mostly obtained from RSMeans. Our professional judgement was used for element unit costs not listed with RSMeans. A detailed breakdown of costs is provided in the attached Engineer's Opinion of Probable Construction Costs table.

Please call with any questions.

P:\ME\Gardiner\Harrison Avenue slope failure\Replace In-Kind Memo and Estimate\December 2023 Failure\Harrison Ave Slope Failure\_Dec 2023\_In-Kind Replacement Construction and Earthwork Memo.docx

Attachment:

Engineer's Opinion of Probable Construction Costs

Harrison Avenue In-Kind Slope Repair - FEMA Disaster #4754						
Gardiner, Maine						
Engineer's Opinion of Probable Construction Costs						
Weston & Sampson Project No.: ENG23-0628						
Description/Task	Unit	Estimated Quantity	RAW COSTS		OVERHEAD AND PROFIT COSTS	
			Cost/Unit (Raw)	Total Cost (Raw)	Cost/Unit (with O&P)	Total Cost (with O&P)
1 Contractor Mobilization/Demobilization, Admin. (assume 5%)	LS	1	\$10,500.00	\$10,500.00	\$12,200	\$12,200
			<b>Total Cost for Task 1</b>	<b>\$10,500.00</b>	<b>Total Cost for Task 1</b>	<b>\$12,200.00</b>
2 Water Control						
a Sand Bags in Stream (5 ft. tall) at slope toe	CY	45	\$25.09	\$1,129.05	\$32.34	\$1,455.30
b Laborer to Install and Remove Sand Bags (assume 2 laborers)	Week	0.8	\$1,651.10	\$1,320.88	\$2,445.30	\$1,956.24
c 2" Pumps	DAY	2	\$819.55	\$1,639.10	\$1,190.93	\$2,381.86
			<b>Total Cost for Task 2</b>	<b>\$4,089.03</b>	<b>Total Cost for Task 2</b>	<b>\$5,793.40</b>
3 Environmental Protection						
a Straw Wattles	LF	1180	\$4.44	\$5,239.20	\$5.37	\$6,336.60
b Stabilized Construction Entrance	CY	10	\$23.68	\$236.80	\$28.93	\$289.30
			<b>Total Cost for Task 3</b>	<b>\$5,476.00</b>	<b>Total Cost for Task 3</b>	<b>\$6,625.90</b>
4 Site Preparation						
a Remove/Re-Set Guardrail	LF	60	\$43.92	\$2,635.20	\$60.19	\$3,611.40
b Temporary Relocation of Overhead Utilities	LS	1	\$8,000.00	\$8,000.00	\$10,000.00	\$10,000.00
c Brush Removal for Site Access to Lower Section of Slope	ACRE	0.5	\$1,614.38	\$807.19	\$2,754.59	\$1,377.30
d Grading to Extend Access to Lower Section of Slope	CY	50	\$8.36	\$418.00	\$11.58	\$579.00
e Stone Placement for Equipment Access to Lower Section of Slope	TON	10.5	\$40.49	\$425.15	\$44.49	\$467.15
f Tree Removal/Chipping at Access Path and Slope	Each	9	\$257.13	\$2,314.17	\$338.96	\$3,050.64
g Sloughed Soil Removal	CY	110	\$8.36	\$919.60	\$11.58	\$1,273.80
h Soil Disposal (assume 15% O&P) - sloughed soil and grading	TON	320	\$25.00	\$8,000.00	\$28.75	\$9,200.00
i Tree Chipping Disposal (assume 15% O&P)	TON	5	\$65.00	\$325.00	\$74.75	\$373.75
j Hauling Soil and Vegetation	CY	165	\$9.09	\$1,499.85	\$11.27	\$1,859.55
k Sheet Pile Excavation Support	SF	2520	\$58.01	\$146,185.20	\$65.96	\$166,219.20
			<b>Total Cost for Task 4</b>	<b>\$171,529.36</b>	<b>Total Cost for Task 4</b>	<b>\$198,011.78</b>
5 Slope Repair In-Kind.						
a Replace Sloughed/Lossed Soil and Compact	CY	450	\$22.11	\$9,949.50	\$25.97	\$11,686.50
b Install Loam and Compact	CY	110	\$20.37	\$2,240.70	\$24.05	\$2,645.50
c Erosion Control Matting	SY	315	\$1.91	\$601.65	\$2.41	\$759.15
d Seeding	SY	315	\$1.50	\$472.50	\$2.00	\$630.00
e Replace Trees	Each	9	\$303.19	\$2,728.71	\$334.62	\$3,011.58
f Re-Connect Overhead Utilities	LS	1	\$5,000.00	\$5,000.00	\$5,500.00	\$5,500.00
			<b>Total Cost for Task 5</b>	<b>\$20,993.06</b>	<b>Total Cost for Task 5</b>	<b>\$24,232.73</b>
6 Materials Testing During Construction (Soil)	Per Day	10	\$800.00	\$8,000.00	\$850.00	\$8,500.00
			<b>Total Cost for Task 6</b>	<b>\$8,000.00</b>	<b>Total Cost for Task 6</b>	<b>\$8,500.00</b>
			Estimated Raw Total	\$220,587.45	Estimated O&P Total	\$255,363.81
			Raw Project Contingency (15%)	\$33,088.12	O&P Project Contingency (15%)	\$38,304.57
			<b>ESTIMATED RAW CONSTRUCTION COST TOTAL</b>	<b>\$253,675.56</b>	<b>ESTIMATED O&amp;P CONSTRUCTION COST TOTAL</b>	<b>\$293,668.38</b>
7 Engineering Assessment, Design, Permitting, and Construction Administration Fee				\$180,000.00		\$180,000.00
			<b>ESTIMATED RAW CONSTRUCTION AND ENGINEERING COST TOTAL</b>	<b>\$433,675.56</b>	<b>ESTIMATED O&amp;P CONSTRUCTION AND ENGINEERING COST TOTAL</b>	<b>\$473,668.38</b>
Updated June 20, 2024						

\$10,500.00 \$12,200.00 Average of 5% (with bonds)

From RSMeans 312323160200 and 312323200016  
From RSMeans 013113200160  
From RSMeans 312319200800

From RSMeans 312514160710  
From RSMeans 312316130050 and 312323156000

From RSMeans 024113300850  
Assumed Cost (will be based on utility company rates)  
From RSMeans 311313100020  
From RSMeans 312316130050  
From RSMeans 313713100350  
From RSMeans 311313203050  
From RSMeans 312316130050  
Disposal Fee at Riverside Recycling in Portland = \$25/TON  
Disposal Fee at Riverside Recycling in Portland = \$65/TON  
From RSMeans 312323204282  
From RSMeans 314116101800

From RSMeans 312323154010 and 312323237040  
From RSMeans 312323157050 and 312323237040  
From RSMeans 312514160120  
Assumed  
From RSMeans 329343300140  
Assumed (will be based on utility company rates)

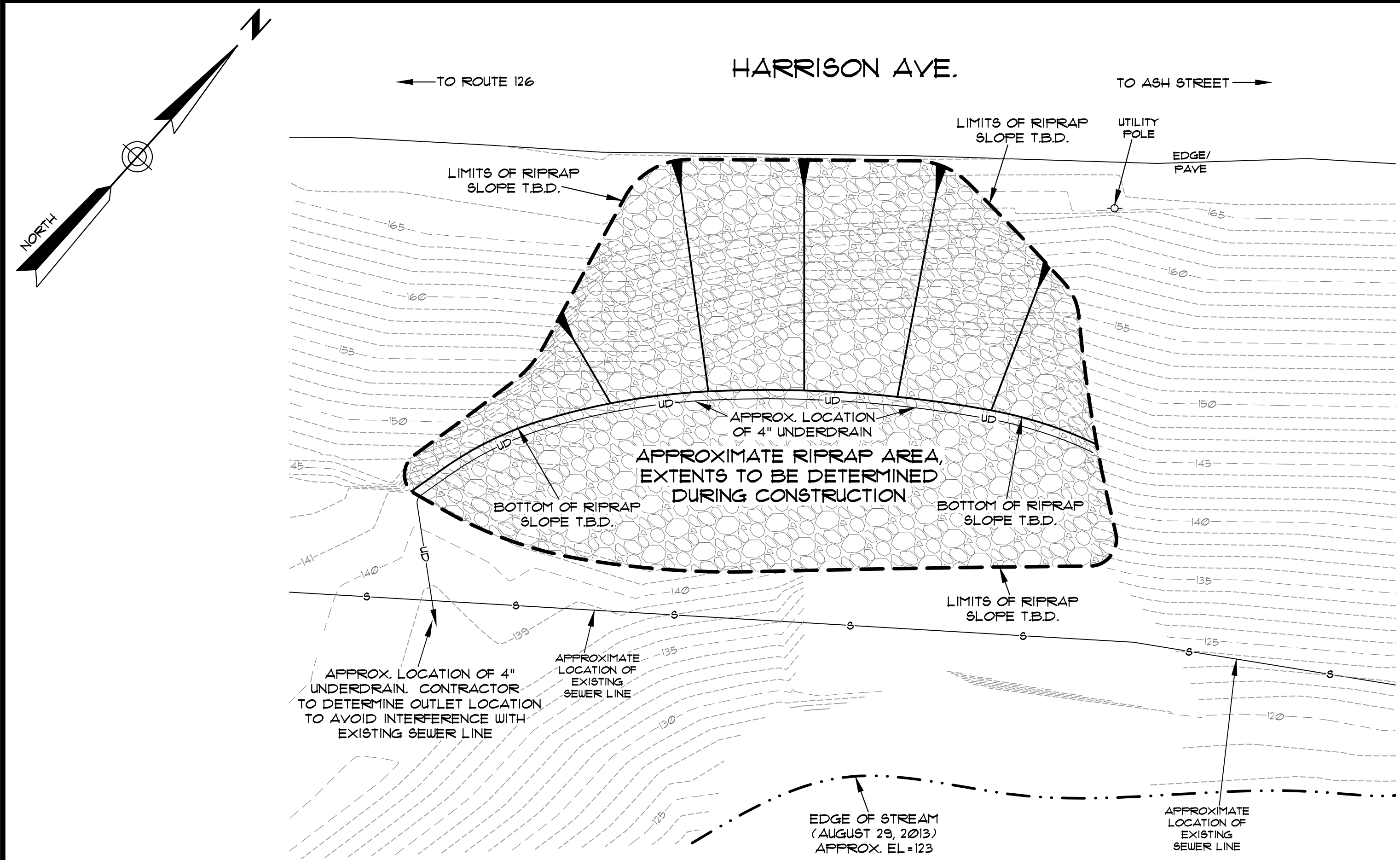
Assume 10 day soil placement period

Estimated Engineering Fee



## APPENDIX B

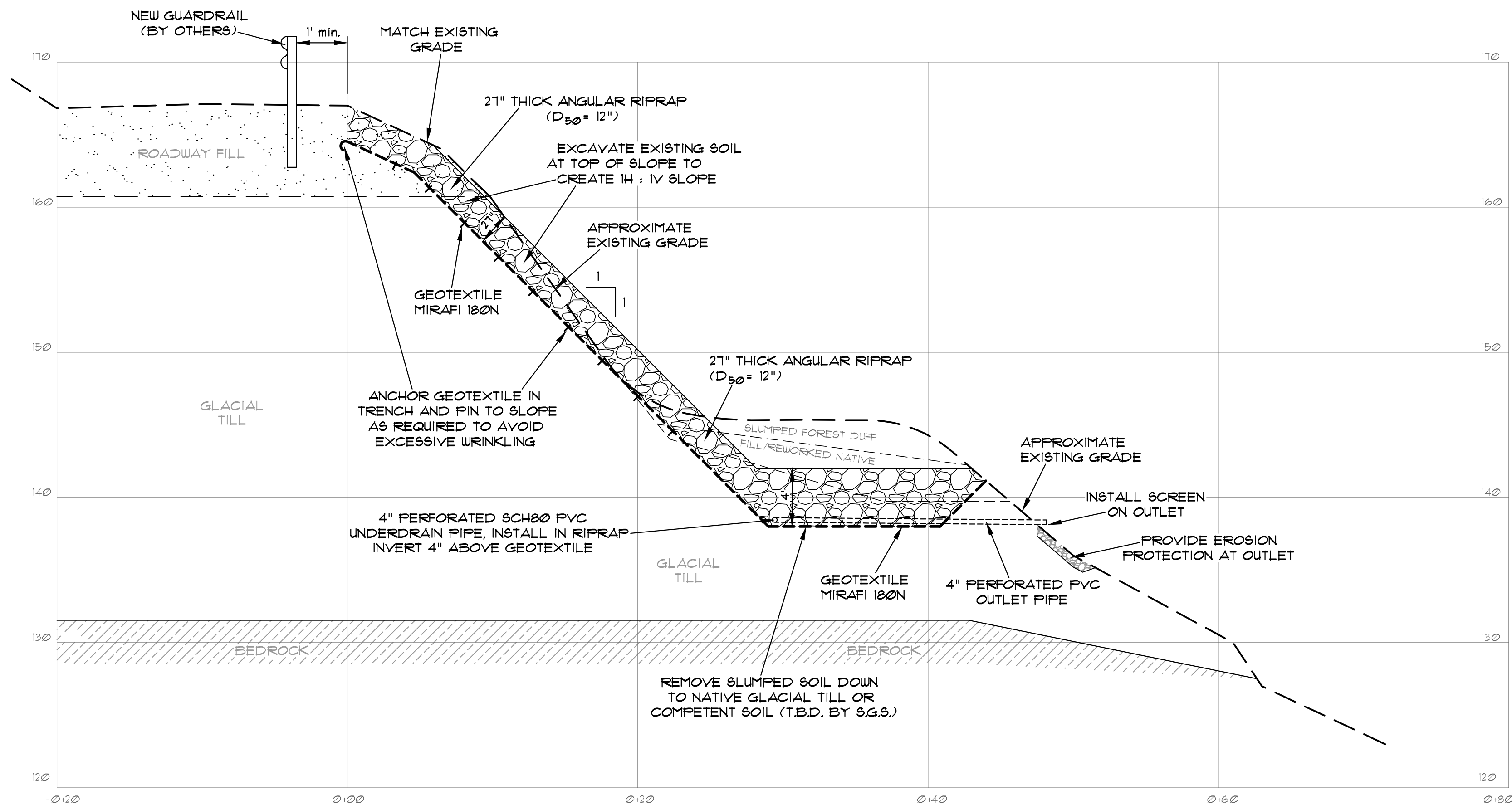
### Summit GeoEngineering Slope Restoration Plan



COBBOSSEECONTEE STREAM

PLAN VIEW

SCALE: 1" = 10'



PROFILE

SCALE: 1" = 6'

GENERAL NOTES

- 1) THIS SLOPE STABILIZATION PLAN IS BASED ON FIELD OBSERVATIONS BY S.G.S. AND LIMITED TOPOGRAPHIC DATA OF THE SLIDE AREA PROVIDED BY WRIGHT-PIERCE.
- 2) THIS SLOPE STABILIZATION DESIGN CONSIDERS TO OUR BEST ABILITY THE PRACTICALITIES OF CONSTRUCTING IT. S.G.S. IS NOT RESPONSIBLE FOR THE MEANS AND METHODS OF CONSTRUCTION, NOR IS S.G.S. RESPONSIBLE FOR THE ADDITIONAL SLOPE MOVEMENTS OR INSTABILITIES CAUSED BY CONSTRUCTION ACTIVITIES.
- 3) THE INTENT OF OUR DESIGNS ARE TO STABILIZE THE EXISTING SLOPE TO PREVENT FURTHER EROSION AND POTENTIAL UNDERMINING OF HARRISON AVENUE. THIS STABILIZATION PLAN IS NOT INTENDED AS A GLOBAL STABILIZATION OF HARRISON AVENUE.
- 4) THE LOCATION OF THE EXISTING SEWER LINE SHOULD BE ESTABLISHED PRIOR TO EXCAVATION AT THE BASE OF THE SLOPE. THE CONTRACTOR SHALL PROTECT THE EXISTING SEWER LINE FROM HIS WORK AS NECESSARY.
- 5) A QUALIFIED CONTRACTOR EMPLOYEE SHALL BE TASKED WITH OBSERVING THE CONSTRUCTION ACTIVITIES, FOCUSING ON SLOPE MOVEMENTS DURING CONSTRUCTION. SPECIAL ATTENTION SHALL BE PAID TO THE EXISTING SLOPE WHEN EQUIPMENT IS WORKING AT THE TOP OF THE SLOPE. SPECIAL ATTENTION SHALL ALSO BE PAID TO THE SLUMPED AREA DURING EXCAVATION AND PLACEMENT OF RIPRAP.
- 6) THE SLUMPED AREA/MATERIAL SHALL BE EXCAVATED DOWN TO THE NATIVE GLACIAL TILL SOIL, TO BE DETERMINED BY S.G.S.
- 7) GEOTEXTILE SHALL CONSIST OF MIRAFI 180N OR EQUIVALENT WITH AN A.D.S.  $\leq 0.18$  mm, A GRAB TENSILE STRENGTH  $\geq 205$  lbs AND A CBR PUNCTURE STRENGTH  $\geq 500$  lbs. ALTERNATIVE GEOTEXTILE SHALL BE REVIEWED AND APPROVED BY S.G.S. PRIOR TO USE.
- 8) RIPRAP SHALL CONSIST OF HARD ANGULAR BLASTED LEDGE ROCK OF A MIXTURE OF SIZES FROM 2" TO A MAXIMUM OF 18". 50% OF THE MATERIAL SHALL BE 12" OR LESS.
- 9) RIPRAP SHALL BE CAREFULLY PLACED AND TAMPED WITH THE EXCAVATOR BUCKET OR OTHER MEANS TO "LOCK" IT IN PLACE.
- 10) RIPRAP SHALL BE PLACED ON THE GEOTEXTILE IN SUCH MANNER AS TO MINIMIZE THE POTENTIAL FOR TEARING OR OTHERWISE DAMAGING IT.

MATERIALS & INSTALLATION

SHEET TITLE:		COBBOSSEE SEWER GARDNER, MAINE	
PROJECT:		SLOPE RESTORATION	
CLIENT:		WRIGHT-PIERCE 99 MAIN STREET - TOPSHAM, MAINE	
DRAWN BY:		KRF	
CHECKED BY:		WJP	
SCALE:		AS NOTED	
DATE:		FEB. 20, 2015	
PROJECT:		173 PLEASANT STREET ROCKFORD, VT 05765 Tel: (207) 318-1161	
145 USBN ST - SUITE 601 ROCKFORD, VT 05765 Tel: (207) 516-3315		<b>SUMMIT</b> GEOENGINEERING SERVICES www.summitgeoeng.com	
STATE OF MAINE WILLIAM M. PETERLEIN 5787 LICENSED PROFESSIONAL ENGINEER		JOB NO. - 14244	
SHEET		1	

## APPENDIX C

### Site Photographs



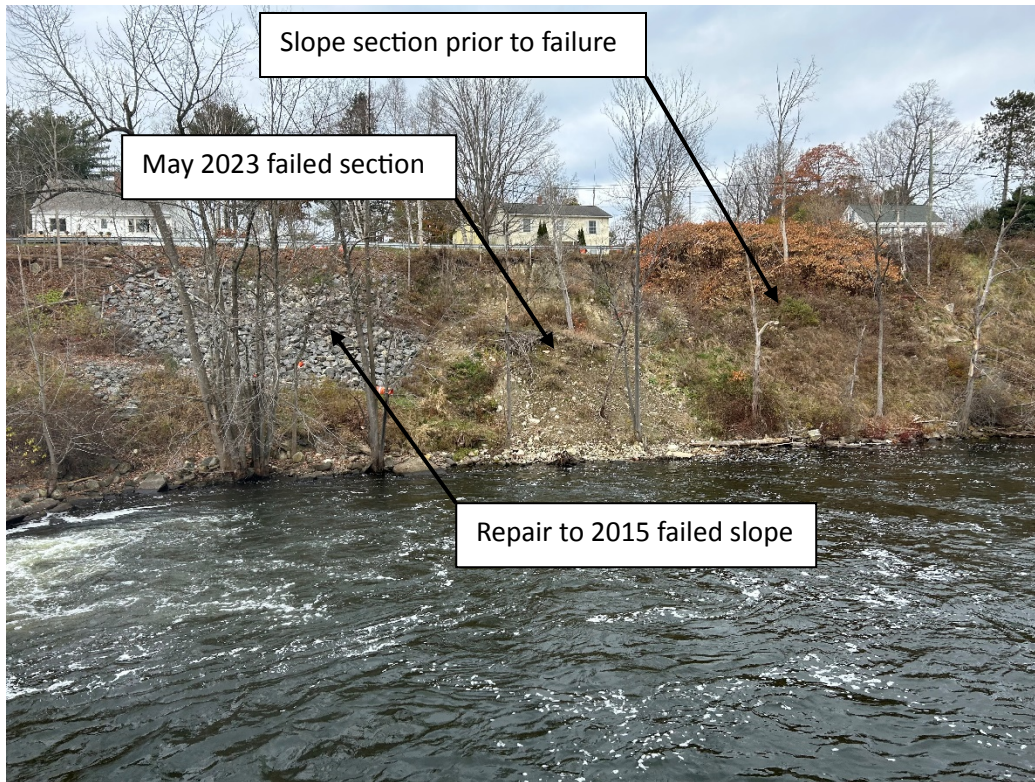


Photo 1 – Slope conditions prior to failure on November 14, 2023



Photo 2 – Failed slope and stone access road on January 12, 2024





Photo 3 – Failed Slope on May 3, 2024.



Photo 4 – Section of slope repaired after 2015 failure on August 3, 2023



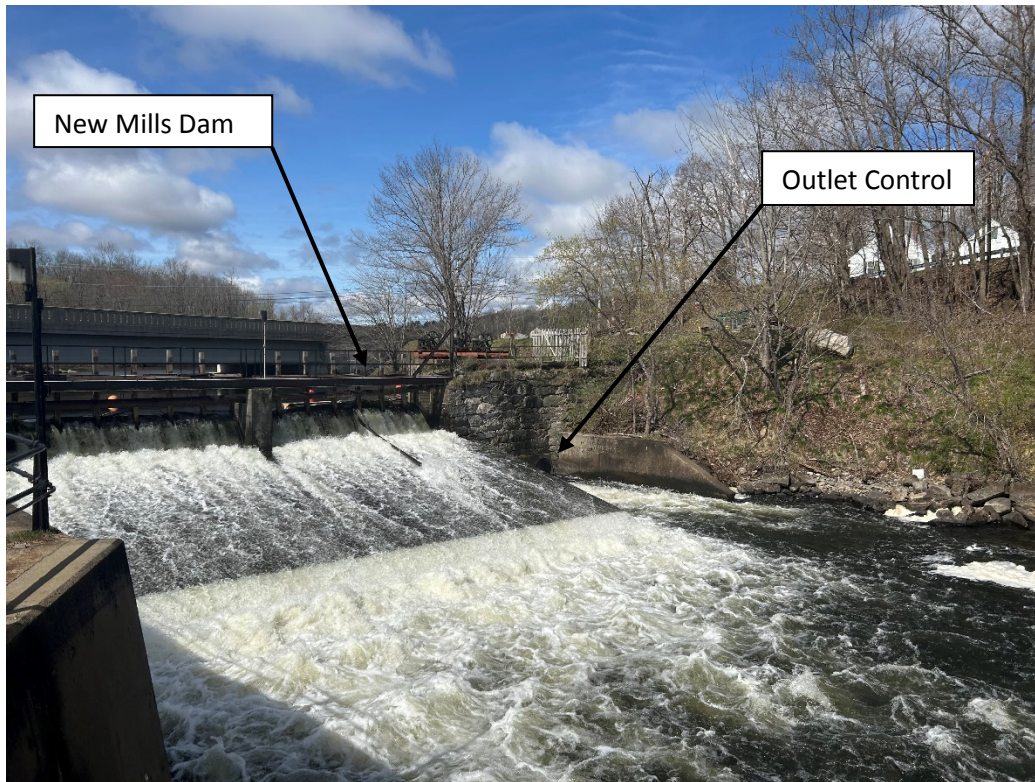


Photo 5 – Cobbosseecontee Stream and flow from New Mills Dam on May 3, 202



Photo 6 – View of Harrison Ave looking north on May 3, 2024



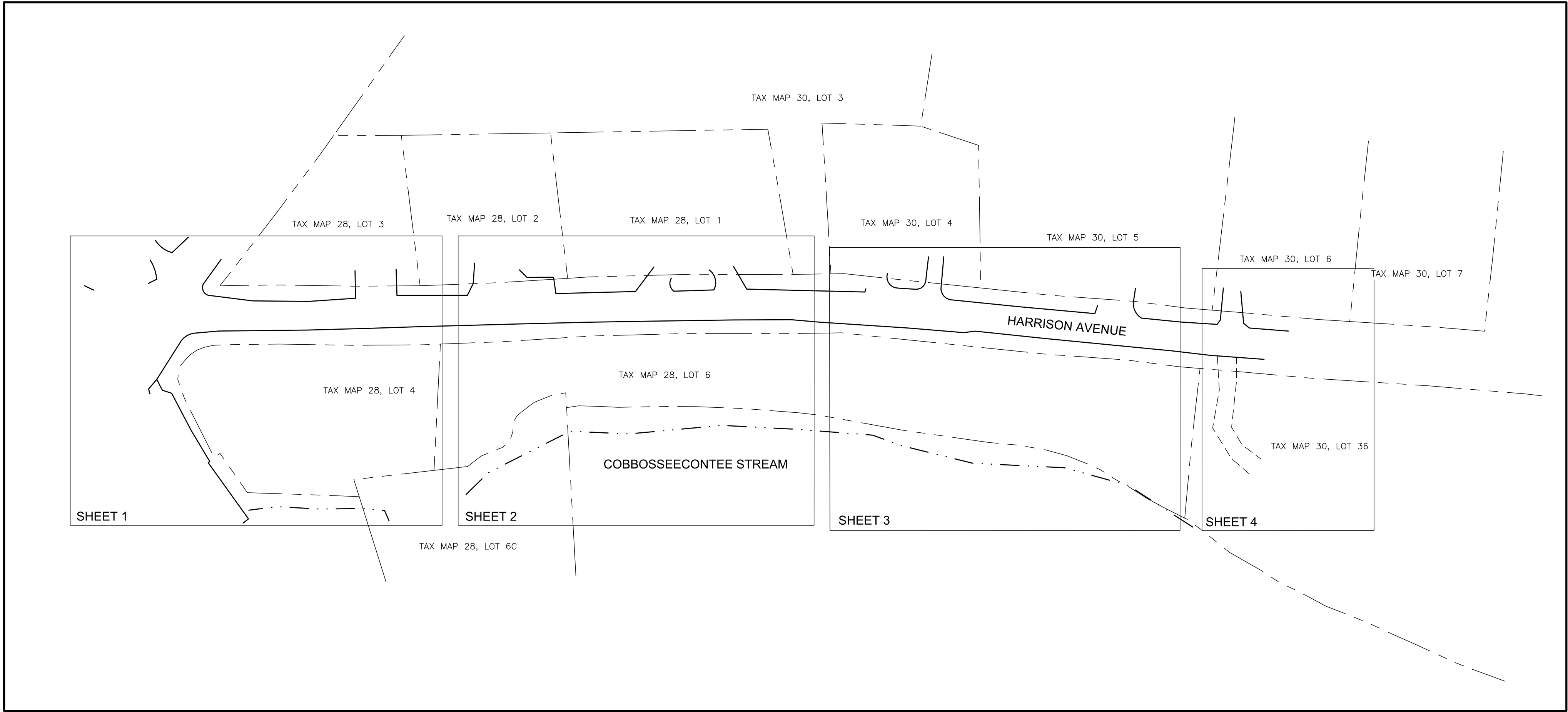
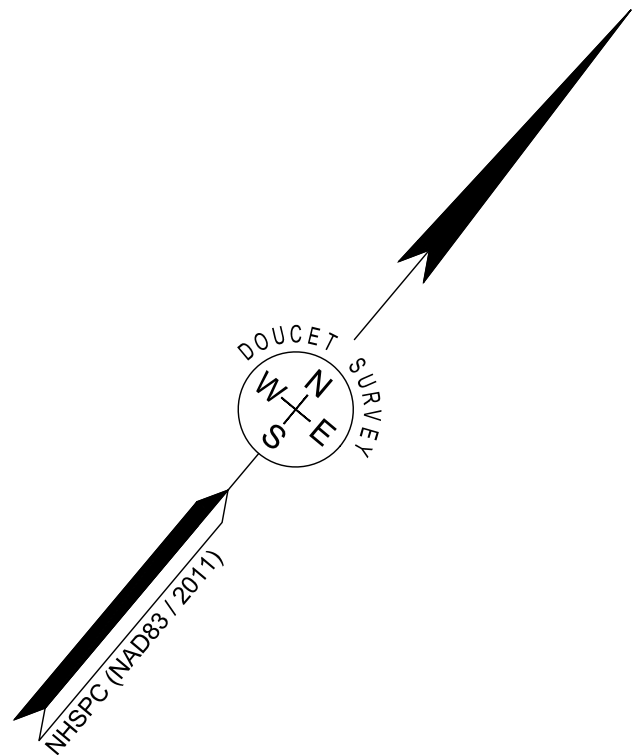


Photo 7 – Bedrock outcrops on east bank of the Cobbosseecontee Stream on November 14, 2023

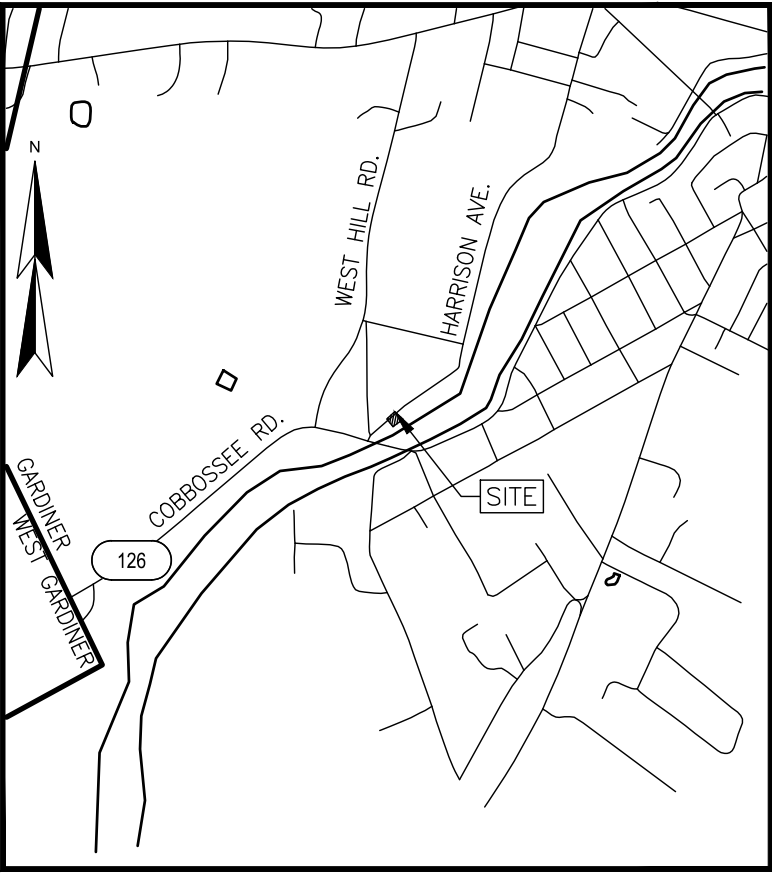
## APPENDIX D

### Existing Conditions Plan Set





KEY MAP:  
SCALE: 1"=50'



LOCATION MAP (n.t.s.)

NOTES:

- REFERENCE: HARRISON AVENUE  
GARDINER, MAINE
- FIELD SURVEY PERFORMED BY A.E.K. & D.W.D. DURING NOVEMBER 2023 USING A TOTAL STATION AND A SURVEY GRADE GPS WITH A DATA COLLECTOR AND AN AUTO LEVEL. TRAVERSE ADJUSTMENT BASED ON LEAST SQUARE ANALYSIS.
- TERRESTRIAL LIDAR SURVEY PERFORMED BY W.J.D. (DOUCET SURVEY) ON AUGUST & NOVEMBER 2023 USING A LEICA HDS SCANNER. REGISTRATION ADJUSTMENT BASED ON LEAST SQUARE ANALYSIS.
- HORIZONTAL DATUM BASED ON NAD83(2011) MAINE WEST STATE PLANE COORDINATE ZONE (1802) DERIVED FROM REDUNDANT GPS OBSERVATIONS UTILIZING THE KEYNET GPS VRS NETWORK.
- VERTICAL DATUM IS BASED ON APPROXIMATE NAVD88 PER GAGING STATION RM (USGS) ELEV.=137.30.
- PROPER FIELD PROCEDURES WERE FOLLOWED IN ORDER TO GENERATE CONTOURS AT 2' INTERVALS. ANY MODIFICATION OF THIS INTERVAL WILL DIMINISH THE INTEGRITY OF THE DATA, AND DOUCET SURVEY WILL NOT BE RESPONSIBLE FOR ANY SUCH ALTERATION PERFORMED BY THE USER.
- NO WETLANDS WERE DELINEATED AS PART OF THIS SURVEY WORK.
- UNDERGROUND UTILITIES SHOWN HEREON ARE BASED ON OBSERVED PHYSICAL EVIDENCE AND PAINT MARKS FOUND ON-SITE.
- THE ACCURACY OF MEASURED UTILITY INVERTS AND PIPE SIZES/TYPES IS SUBJECT TO NUMEROUS FIELD CONDITIONS, INCLUDING; THE ABILITY TO MAKE VISUAL OBSERVATIONS, DIRECT ACCESS TO THE VARIOUS ELEMENTS, MANHOLE CONFIGURATION, ETC.
- ALL UNDERGROUND UTILITIES (ELECTRIC, GAS, TEL. WATER, SEWER DRAIN SERVICES) ARE SHOWN IN SCHEMATIC FASHION, THEIR LOCATIONS ARE NOT PRECISE OR NECESSARILY ACCURATE. NO WORK WHATSOEVER SHALL BE UNDERTAKEN USING THIS PLAN TO LOCATE THE ABOVE SERVICES. CONSULT WITH THE PROPER AUTHORITIES CONCERNED WITH THE SUBJECT SERVICE LOCATIONS FOR INFORMATION REGARDING SUCH. CALL DIG-SAFE AT 1-888-DIG-SAFE.

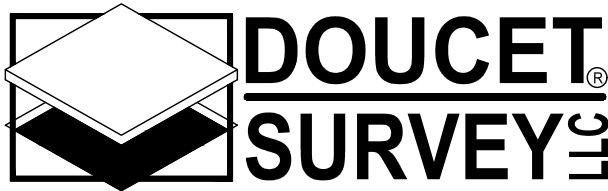
LEGEND

- |     |                               |
|-----|-------------------------------|
| --- | APPROXIMATE ABUTTERS LOT LINE |
| --- | 100' MAJOR CONTOUR LINE       |
| --- | 98' MINOR CONTOUR LINE        |
| --- | RETAINING WALL                |
| --- | CHAIN LINK FENCE              |
| --- | GUARDRAIL                     |
| --- | OVERHEAD WIRE                 |
| --- | TREE LINE                     |
| --- | EDGE OF WATER                 |
| --- | CONCRETE                      |
| --- | RIP RAP                       |
| --- | CRUSHED STONE                 |
| --- | PILE                          |
| --- | UTILITY POLE                  |
| --- | UTILITY POLE & GUY WIRE       |
| --- | UTILITY POLE W/LIGHT          |
| --- | DRAIN MANHOLE                 |
| --- | CATCH BASIN                   |
| --- | SEWER MANHOLE                 |
| --- | FIRE HYDRANT                  |
| --- | WATER GATE VALVE              |
| --- | SIGN (TWO POSTS)              |
| --- | POST                          |
| --- | BOLLARD                       |
| --- | ROCK/BOULDER                  |
| --- | CONIFEROUS TREE               |
| --- | TREE STUMP                    |
| --- | CONCRETE                      |
| --- | EDGE OF PAVEMENT              |
| --- | RETAINING WALL                |
| --- | TYPICAL                       |
| --- | VERTICAL GRANITE CURB         |

TOPOGRAPHIC PLAN  
FOR  
WESTON & SAMPSON  
OF  
SLOPE FAILURE AREA  
HARRISON AVENUE  
GARDINER, MAINE

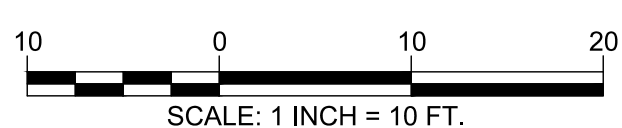
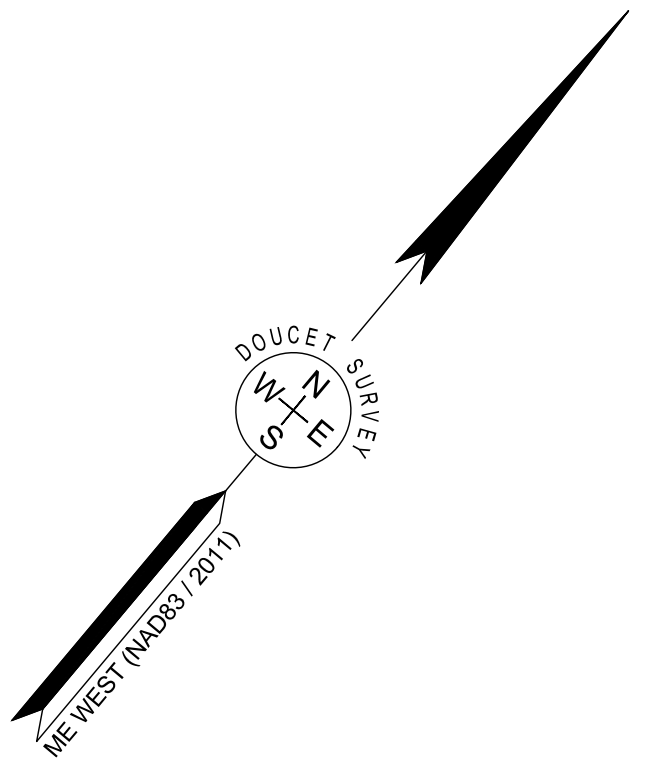
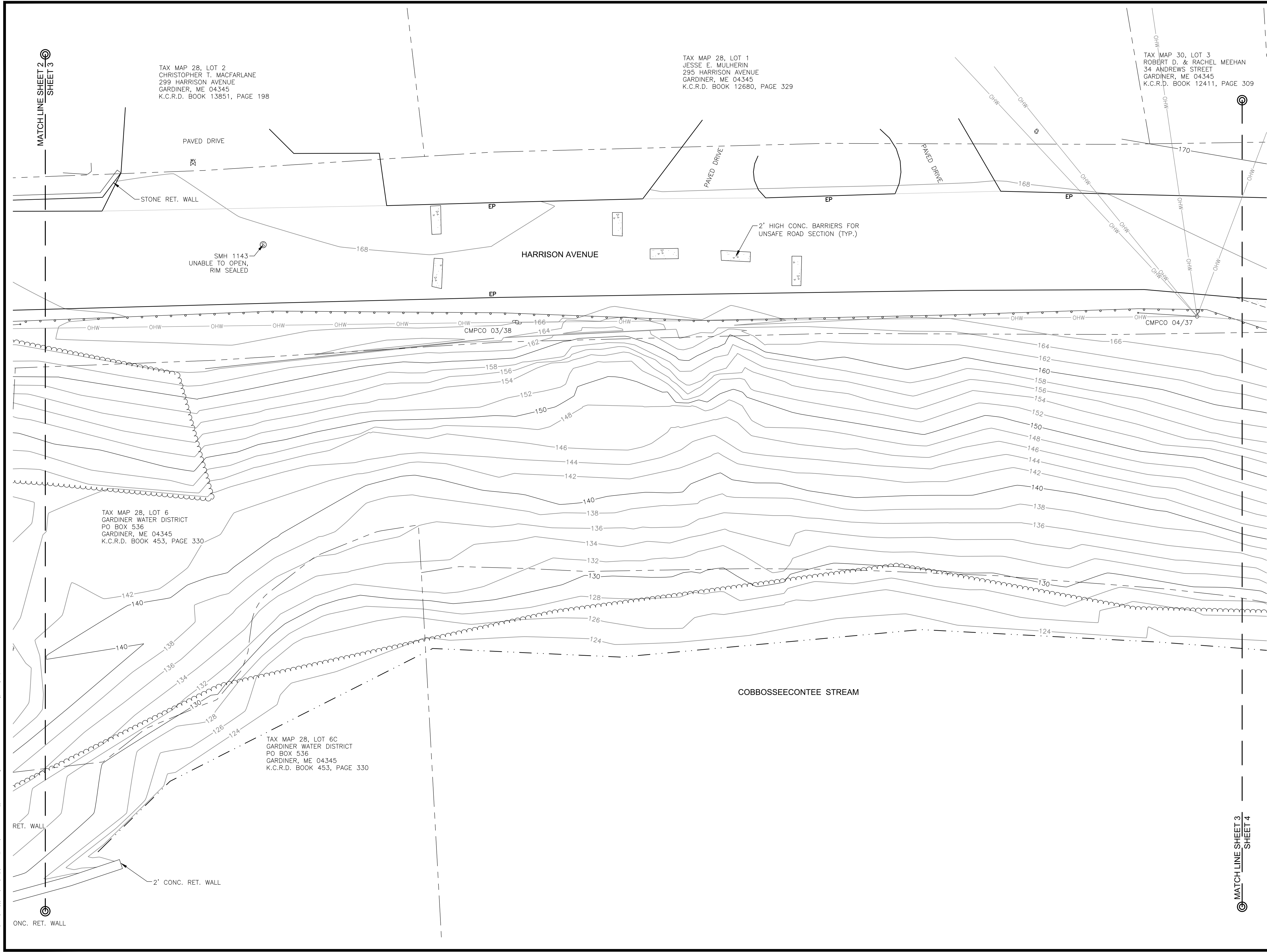
NO.	DATE	DESCRIPTION	BY

DRAWN BY:	A.K.H.	DATE:	DECEMBER 14, 2023
CHECKED BY:	M.W.F.	DRAWING NO.	8253B
JOB NO.	8253	SHEET	1 OF 5



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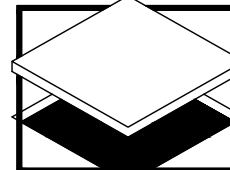




TOPOGRAPHIC PLAN  
FOR  
WESTON & SAMPSON  
OF  
SLOPE FAILURE AREA  
HARRISON AVENUE  
GARDINER, MAINE

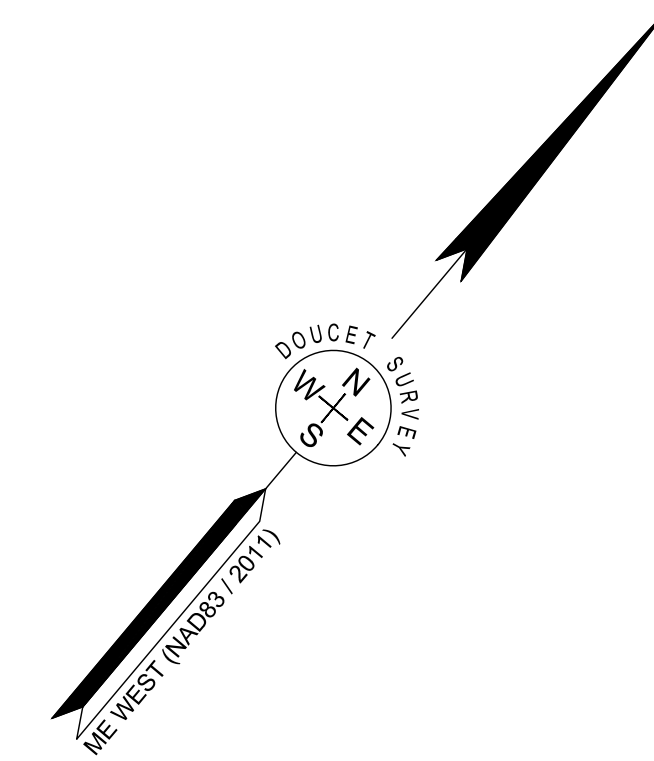
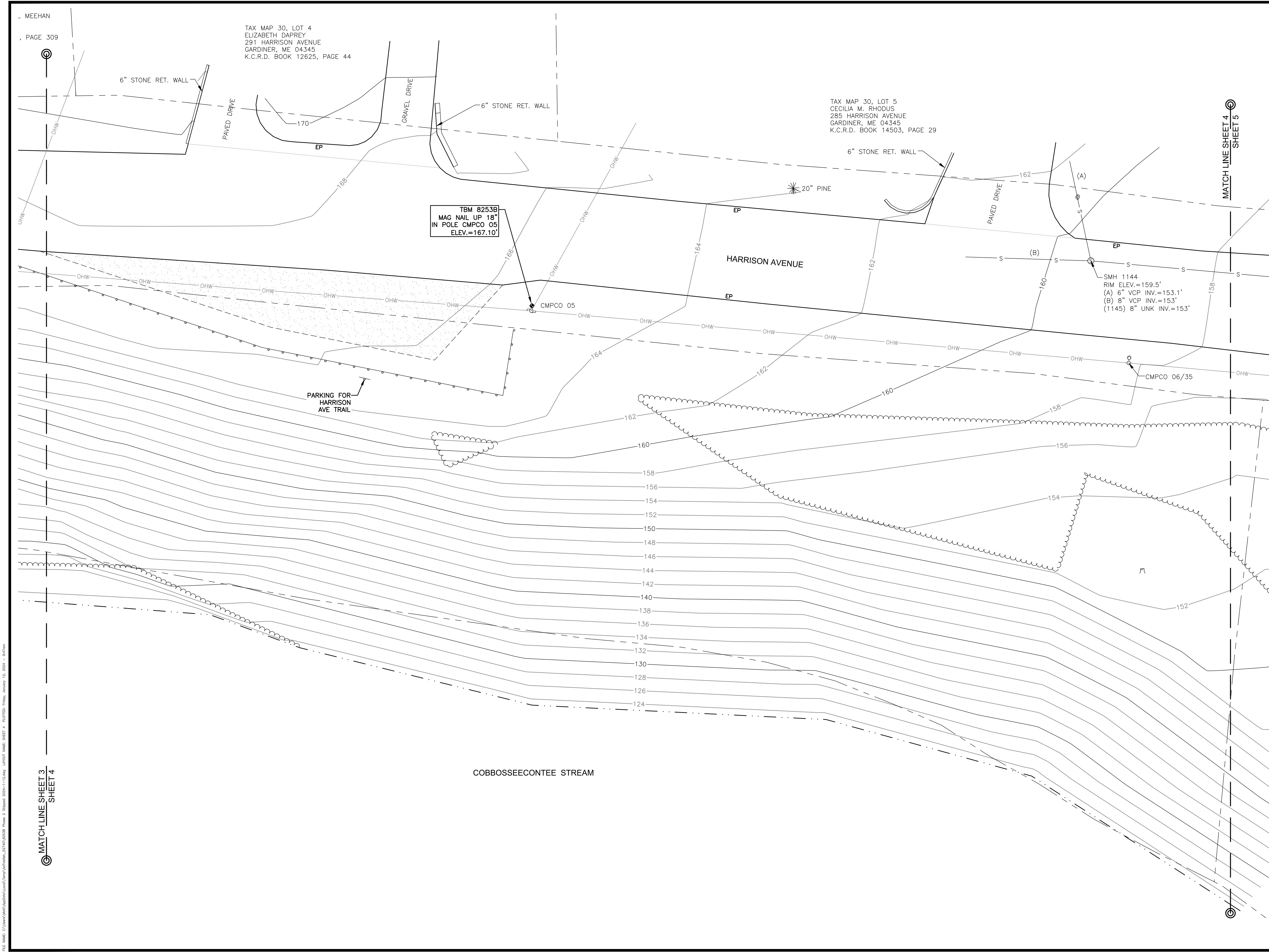
NO.	DATE	DESCRIPTION	BY

DRAWN BY:	A.K.H.	DATE:	DECEMBER 14, 2023
CHECKED BY:	M.W.F.	DRAWING NO.	8253B
JOB NO.	8253	SHEET	3 OF 5

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FILE NAME: C:\Users\Akhil\Documents\Survey\Projects\8253\8253B.dwg PLOT DATE: 12/14/2023 PLOT TIME: 12:00:00 PLOT BY: A.K.H.



10 0 10 20  
SCALE: 1 INCH = 10 FT.

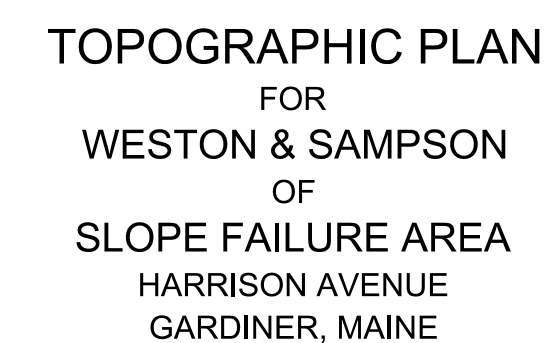
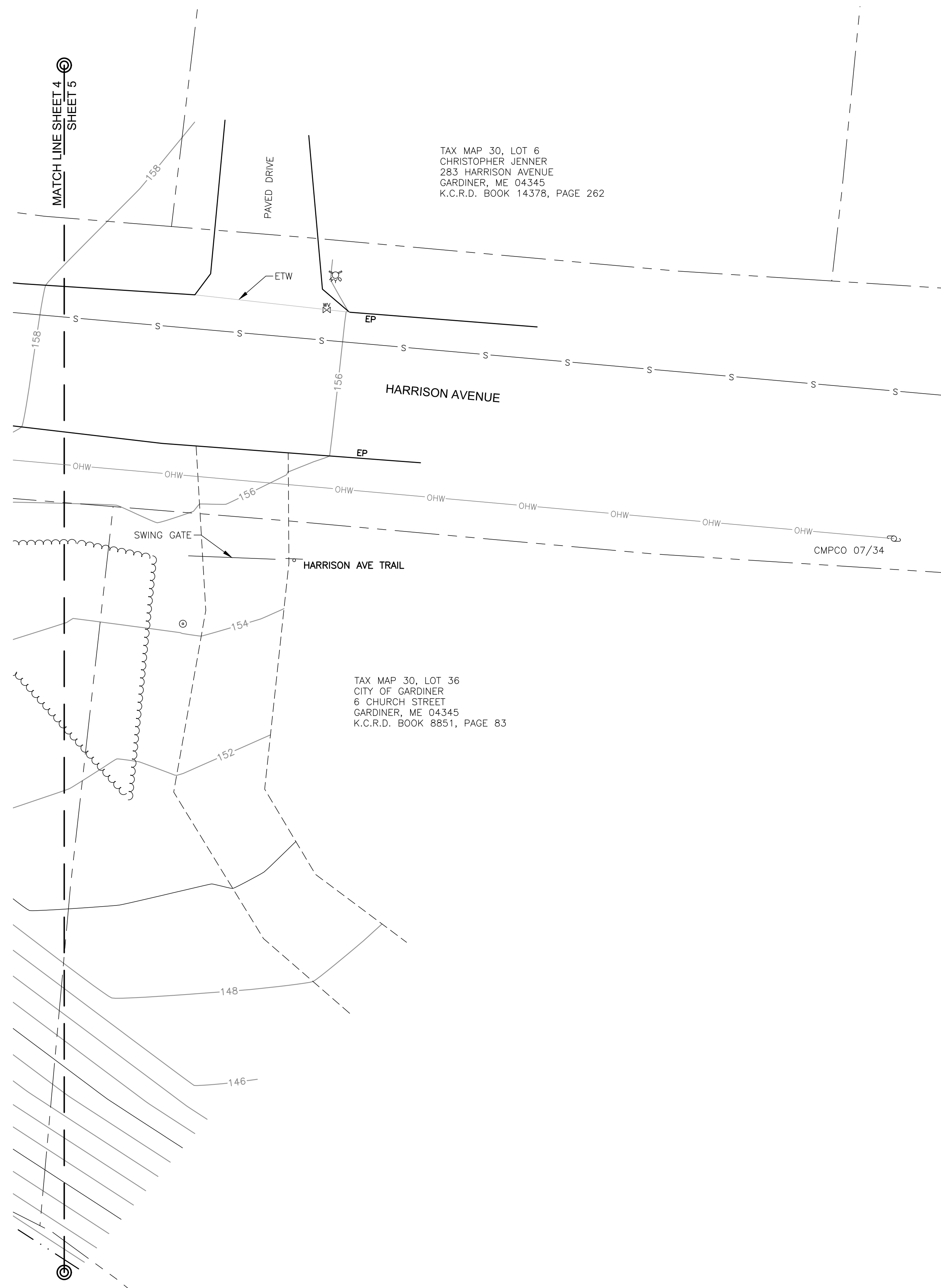
TOPOGRAPHIC PLAN  
FOR  
WESTON & SAMPSON  
OF  
SLOPE FAILURE AREA  
HARRISON AVENUE  
GARDINER, MAINE

NO.	DATE	DESCRIPTION	BY

DRAWN BY:	A.K.H.	DATE:	DECEMBER 14, 2023
CHECKED BY:	M.W.F.	DRAWING NO.	8253B
JOB NO.	8253	SHEET	4 OF 5

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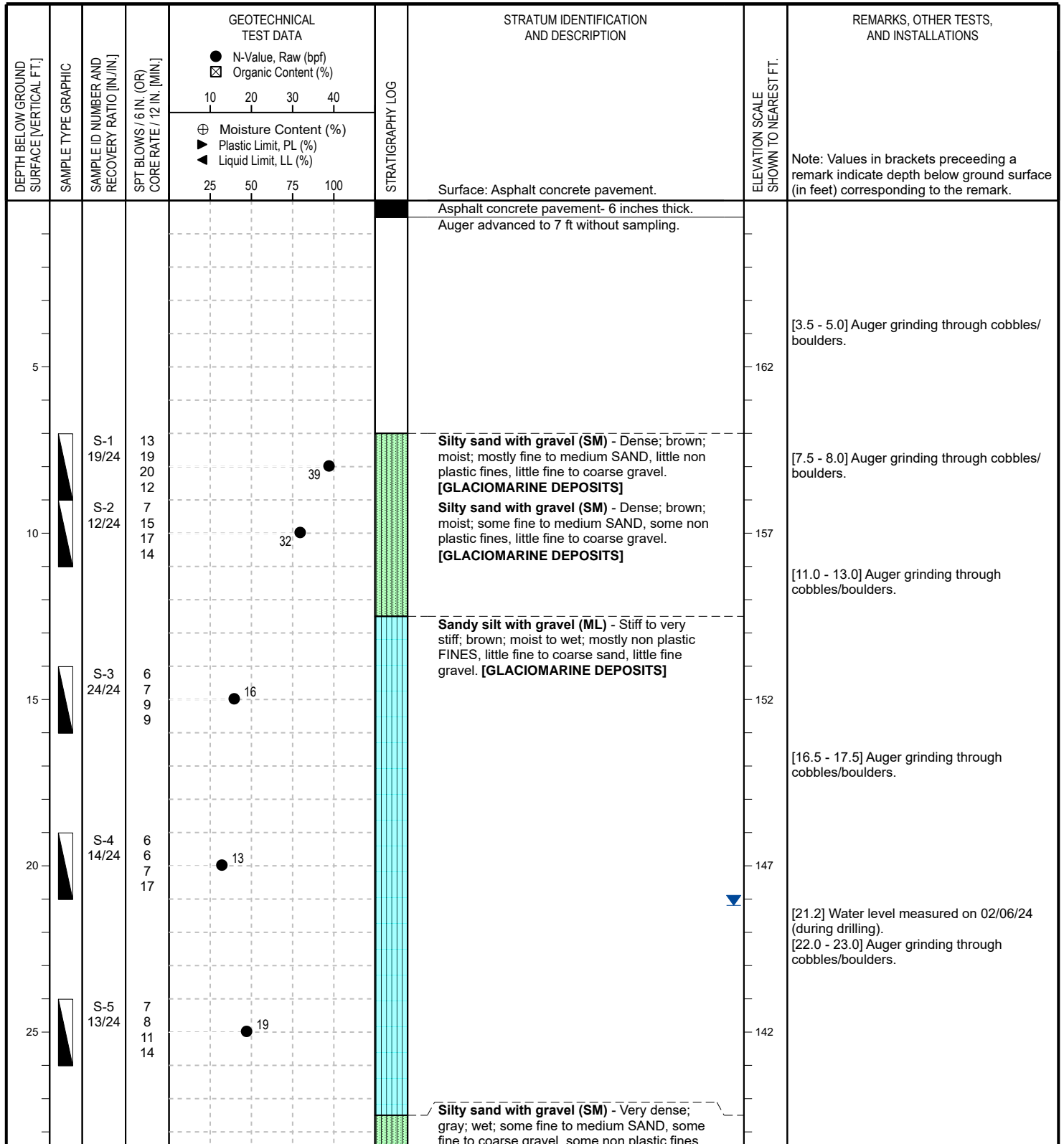
## APPENDIX E

### Boring Logs


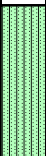

CONTRACTOR:	<b>NE Boring Contractors, Inc.</b>	BORING LOCATION:	<b>See Attached Figure</b>	DATE START:	<b>February 6, 2024</b>
FOREMAN:	<b>G. McDougal</b>	ADVANCE METHOD:	<b>Hollow-Stem Auger Drilling</b>	DATE FINISH:	<b>February 6, 2024</b>
LOGGED BY:	<b>S. Wuebbolt, EIT</b>	AUGER DIAMETER:	<b>2-1/4" ID (Stem), 5-5/8" OD (Flights)</b>	GROUND EL:	<b>167.0 ± (NAVD88)</b>
CHECKED BY:	<b>T. Strike, PE</b>	SUPPORT CASING:	<b>N/A</b>	FINAL DEPTH:	<b>7.0 ft.</b>
EQUIPMENT:	<b>Truck Mounted Drill Rig</b>	CORING METHOD:	<b>N/A</b>	GRID COORDS:	<b>N/A</b>
SPT HAMMER:	<b>Automatic (140-lb.)</b>	BACKFILL MATERIAL:	<b>Drill Cuttings and Asphalt Patch</b>	GRID SYSTEM:	<b>N/A</b>

[illegible]

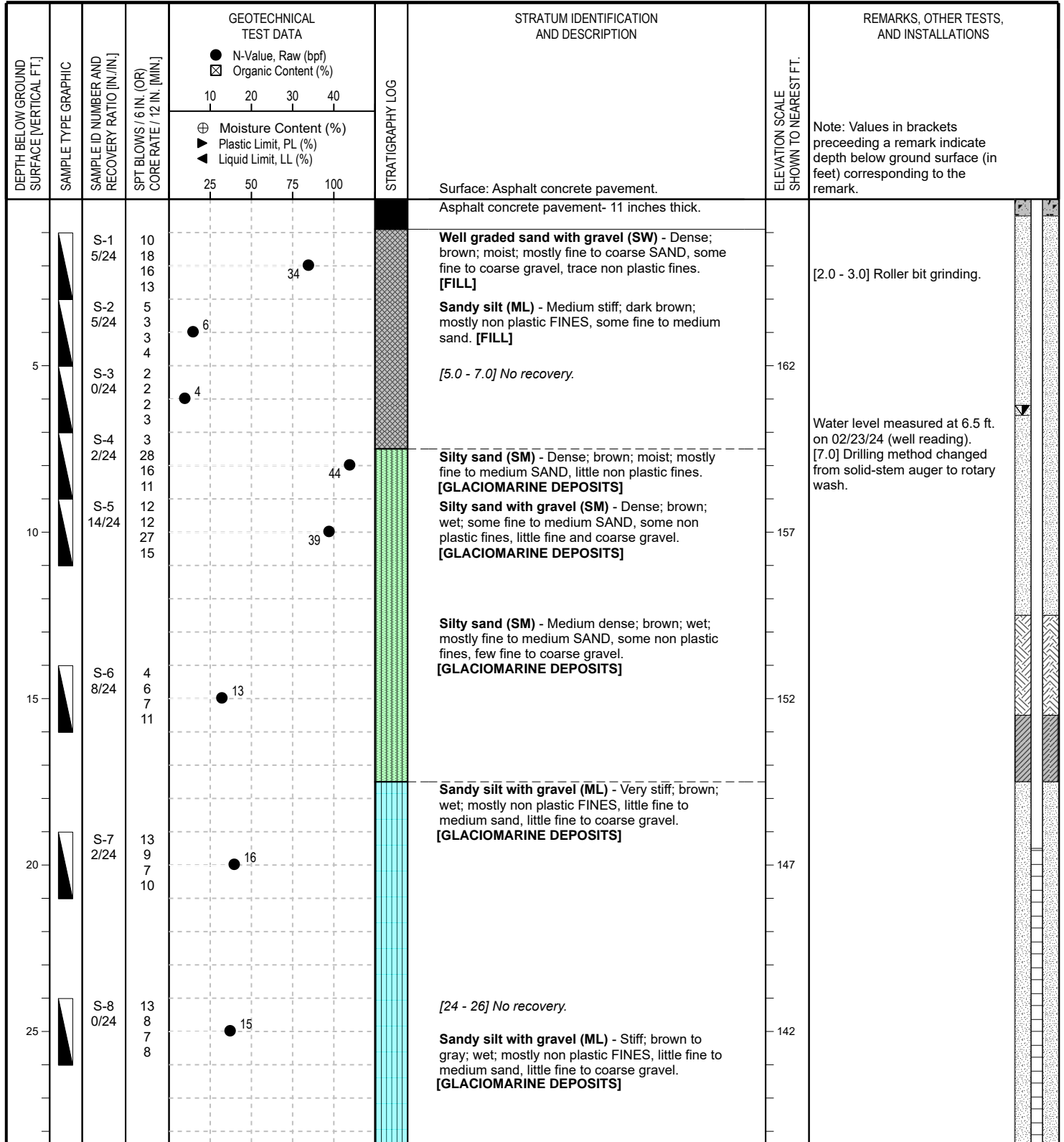
CONTRACTOR:	NE Boring Contractors, Inc.	BORING LOCATION:	See Attached Figure	DATE START:	February 6, 2024
FOREMAN:	G. McDougal	ADVANCE METHOD:	Hollow-Stem Auger Drilling	DATE FINISH:	February 6, 2024
LOGGED BY:	S. Wuebbolt, EIT	AUGER DIAMETER:	2-1/4" ID (Stem), 5-5/8" OD (Flights)	GROUND EL:	167.0 ± (NAVD88)
CHECKED BY:	T. Strike, PE	SUPPORT CASING:	N/A	FINAL DEPTH:	31.8 ft.
EQUIPMENT:	Truck Mounted Drill Rig	CORING METHOD:	N/A	GRID COORDS:	N/A
SPT HAMMER:	Automatic (140-lb.)	BACKFILL MATERIAL:	Drill Cuttings and Asphalt Patch	GRID SYSTEM:	N/A

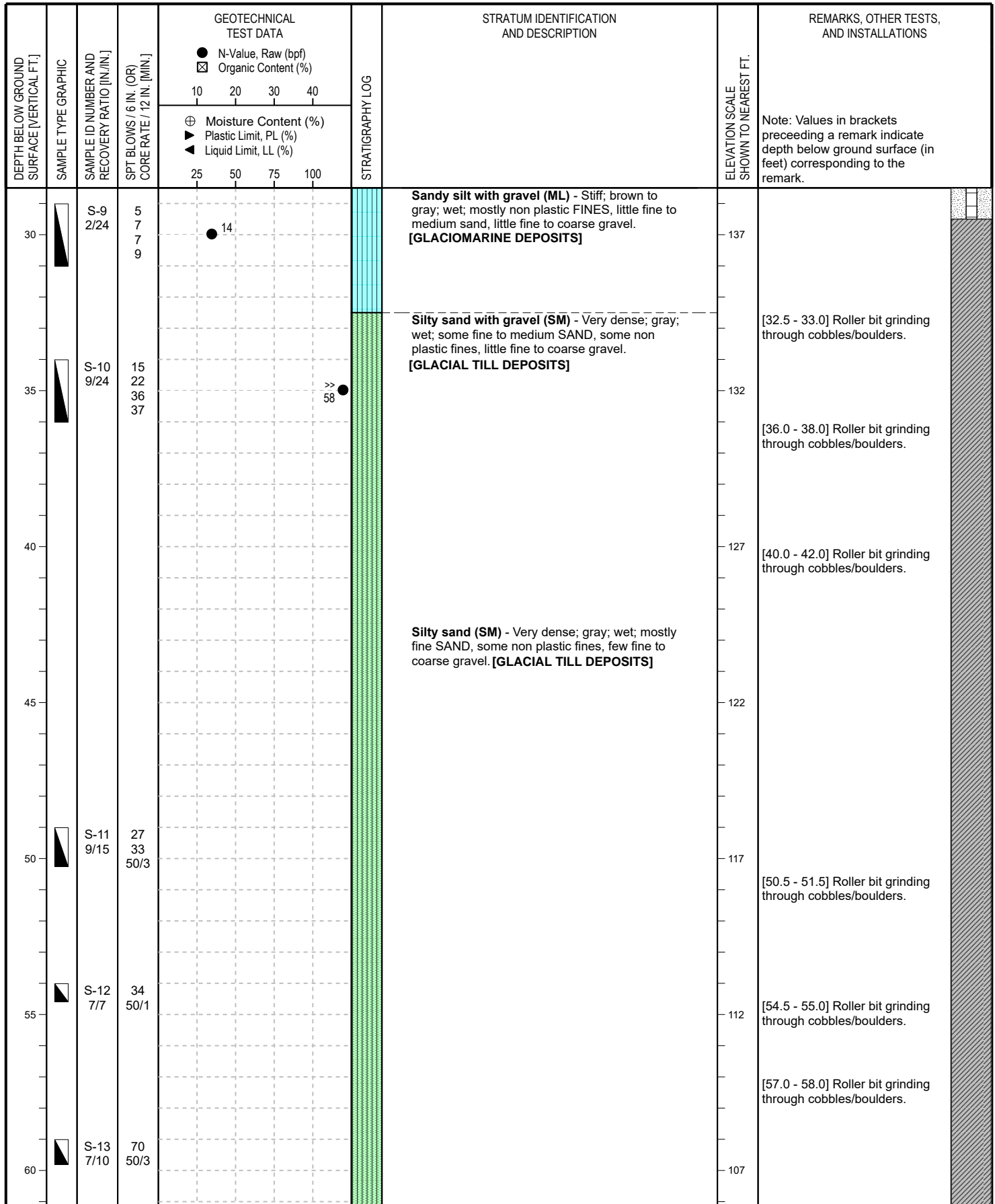




DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	GEOTECHNICAL TEST DATA				STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS	
				● N-Value, Raw (bpf)								
				☒ Organic Content (%)								
				⊕ Moisture Content (%) ▶ Plastic Limit, PL (%) ▲ Liquid Limit, LL (%)								
				10	20	30	40					
				25	50	75	100					
30		S-6 16/24	17 24 31 38					>> 55 ●		Silty sand with gravel (SM) - Very dense; gray; wet; some fine to medium SAND, some fine to coarse gravel, some non plastic fines. [GLACIAL TILL DEPOSITS]	137	Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
		S-7 0/2	50/2									[31.5 - 31.6] Auger grinding to refusal on possible boulder. Sampler and auger refusal at 31.8 ft. (exploration ended).
35												
40												
45												
50												
55												
60												

CONTRACTOR:	NE Boring Contractors, Inc.	BORING LOCATION:	See Attached Figure	DATE START:	February 6, 2024
FOREMAN:	G. McDougal	ADVANCE METHOD:	Solid-Stem Auger to Rotary Wash	DATE FINISH:	February 7, 2024
LOGGED BY:	S. Wuebbolt, EIT	AUGER DIAMETER:	4-1/2" OD (Flights)	GROUND EL:	167.0 ± (NAVD88)
CHECKED BY:	T. Strike, PE	SUPPORT CASING:	Driven Flush-Joint Casing (4" ID)	FINAL DEPTH:	66.3 ft.
EQUIPMENT:	Truck Mounted Drill Rig	CORING METHOD:	N/A	GRID COORDS:	N/A
SPT HAMMER:	Automatic (140-lb.)	BACKFILL MATERIAL:	Monitoring Well Installed	GRID SYSTEM:	N/A





DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	GEOTECHNICAL TEST DATA				STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
				● N-Value, Raw (bpf)							
				☒ Organic Content (%)							
				⊕ Moisture Content (%) ▶ Plastic Limit, PL (%) ▲ Liquid Limit, LL (%)							
				10	20	30	40				
				25	50	75	100				
65		S-14 15/16	26 51 52/4						<b>Silty sand (SM)</b> - Very dense; gray; wet; mostly fine SAND, some non plastic fines, few fine to coarse gravel. <b>[GLACIAL TILL DEPOSITS]</b>	102	[61.0 - 62.0] Roller bit grinding through cobbles/boulders.  [63.0 - 63.5] Roller bit grinding through cobbles/boulders. [64.0 - 64.5] Roller bit grinding through cobbles/boulders.
70											
75											
80											
85											
90											
											Exploration ended at 66.3 ft.



# GUIDE TO SUBSURFACE EXPLORATION LOGS



# INDEX SHEET 1 GENERAL INFORMATION

## GENERAL NOTES AND USE OF LOGS

- 1.) Explorations were made by ordinary and conventional methods and with care adequate for Weston & Sampson's study and/or design purposes. The exploration logs are part of a specific report prepared by Weston & Sampson for the referenced project and client, and are an integral part of that report. Information and interpretations are subject to the explanations and limitations stated in the report. Weston & Sampson is not responsible for any interpretations, assumptions, projections, or interpolations made by others.
- 2.) Exploration logs represent general conditions observed at the point of exploration on the date(s) stated. Boundary lines separating soil and rock layers (strata) represent approximate boundaries only and are shown as solid lines where observed and dashed lines where inferred based on drilling action. Actual transitions may be gradual and changes may occur over time.
- 3.) Soil and rock descriptions are based on visual-manual examination of recovered samples, direct observation in test pits (when permissible), and laboratory testing (when conducted).
- 4.) Water level observations were made at the times and under the conditions stated. Fluctuations should be expected to vary with seasons and other factors. Use of fluids during drilling may affect water level observations. The absence of water level observations does not necessarily mean the exploration was dry or that subsurface water will not be encountered during construction.
- 5.) Standard split spoon samplers may not recover particles with any dimension larger than 1-3/8 inches. Reported gravel conditions or poor sample recovery may not reflect actual in-situ conditions.
- 6.) Sections of this guide provide a general overview of Weston & Sampson's practices and procedures for *identifying* and *describing* soil and rock. These procedures are predominantly based on ASTM D2488, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)*, the International Society of Rock Mechanics (ISRM) standards, and the *Engineering Geology Field Manual* published by the Bureau of Reclamation. Not all aspects of this guide relating to description and identification procedures of soil and rock may be applicable in all circumstances.

## SAMPLER GRAPHICS

- Split Spoon (Standard)  
2" OD, 1-3/8" ID
- Split Spoon (Oversize)  
3" OD, 2-3/8" ID
- Shelby or Piston Tube  
3" OD, 2-7/8" ID
- Double-Tube Rock Core Barrel  
2" Core Diameter
- Direct Push with Acetate Liner  
Various Liner Sizes
- Auger Sample  
(from cuttings or hand auger)
- Grab Sample  
(manual, from discrete point)
- Composite Sample  
(multiple grab samples)

## WELL GRAPHICS

- Cement concrete seal around casing or riser pipe
- Bentonite seal around casing or riser pipe
- Cement grout seal around casing or riser pipe
- Soil backfill around riser pipe or beneath screen
- Gravel backfill around screen or riser pipe
- Sand backfill around screen or riser pipe (filter sand)
- Solid-wall riser; Sch. 40 PVC, 1" ID unless noted otherwise
- Slotted screen; Sch. 40 PVC, 1" ID with machined slots

## CAVING / SEEPAGE TERMS

The following caving and/or seepage terms may appear on a test pit log.

Caving Term	Criteria
Minor.....	less than 1 cubic ft.
Moderate.....	1 to 3 cubic ft.
Severe.....	greater than 3 cubic ft.

Seepage Term	Criteria
Slow.....	less than 1 gpm
Moderate.....	1 to 3 gpm
Fast.....	greater than 3 gpm

## KEY TO WATER LEVELS

- Observed in exploration during advancement.
- Measured in exploration at completion, prior to backfilling or well installation.
- Measured in exploration after the stated stabilization period, prior to backfilling, or in well installation if noted.

## DEFINITIONS OF COMMON TERMS

**Sample Recovery Ratio** - The length of material recovered in a drive or push type sampler over the length of sampler penetration, in inches (e.g. 18/24).

**Standard Penetration Test (SPT)** - An in-situ test where a standard split-spoon sampler is driven a distance of 12 or 18 inches (after an initial 6-inch seating interval) using a 140-lb. hammer falling 30 inches for each blow.

**SPT Blows** - The number of hammer blows required to drive a split-spoon sampler each consecutive 6-inch interval during a *Standard Penetration Test*. If no discernable advancement of a split spoon sampler is made after 50 consecutive hammer blows, 50/X indicates *sampler refusal* and is the number of blows required to drive the sampler X inches.

**SPT N-Value (N)** - The uncorrected blow count representation of a soil's penetration resistance over a 12-inch interval after an initial 6-in. seating interval, reported in blows per foot (bpf). The N-value is correlated to soil engineering properties.

**Auger Refusal** - No discernable advancement of the auger over a period of 5 minutes with full rig down pressure applied.

**Casing Refusal (Driven)** - Casing penetration of less than 6 inches after a minimum 50 blows of a drop hammer weighing 300 lbs. or a minimum 100 blows of a drop hammer weighing 140 lbs.

**PID Measurement** - A measurement (electronic reading) taken in the field using a photoionization detector (PID) to detect the presence of volatile organic compounds in a soil sample. Values are reported as benzene equivalent units in parts per million (ppm) unless noted otherwise.

**Rock Quality Designation (RQD)** - A qualitative index measure of the degree of jointing and fracture of a rock core taken from a borehole. The RQD is defined as the sum length of solid core pieces 4 inches or longer divided by the run (cored) length, expressed as a percentage. Higher RQD values may indicate fewer joints and fractures in the rock mass.

**Fill (Made Ground)** - A deposit of soil and/or artificial waste materials that has been placed or altered by human processes.

## LABORATORY TESTS AND FIELD MEASUREMENTS

MC.....	Moisture Content	IC.....	1D Incremental Consolidation
OC.....	Organic Content	VS.....	Laboratory Vane Shear
PL.....	Plastic Limit	US.....	Unconfined Compression
LL.....	Liquid Limit	TC.....	Triaxial Compression
GC.....	Gravel Content	PP.....	Pocket (Hand) Penetrometer
SC.....	Sand Content	TV.....	Torvane (Hand Vane)
FC.....	Fines Content	PID.....	Photoionization Detector
DS.....	Direct Shear	FID.....	Flame Ionization Detector

## BORING ADVANCEMENT METHODS

**Hollow-Stem Auger Drilling** - Utilizes continuous flight auger sections with hollow stems to advance the borehole. Drill rods and a plug are inserted into the auger stem to prevent the entrance of soil cuttings into the augers.

**Rotary Wash Drilling** - Utilizes downward pressure and rotary action applied to a non-coring bit while washing the cuttings to the surface using a circulating fluid injected down the drill rods. The borehole is supported with either steel casing or the drilling fluid. Where a casing is used, the borehole is advanced sequentially by driving the casing to the desired depth and then cleaning out the casing. The process of driving and cleaning the casing is commonly referred to as the 'drive-and-wash' technique.

**Continuous Sampling** - Includes a variety of methods and procedures during which the borehole is advanced via continuous recovery of soil samples. *Direct Push* sampling is a common method that uses static downward pressure combined with percussive energy to drive a steel mandrel into the ground at continuous intervals while recovering soil samples in disposable acetate liners.

**Rock Coring** - Utilizes downward pressure and rotary action applied to a core barrel equipped with a diamond-set or tungsten carbide coring bit. During conventional coring, the entire barrel is retrieved from the hole upon completion of a core run. Wireline coring allows for removal of the inner barrel assembly containing the actual core while the drill rods and outer barrel remain in the hole. Various types and sizes of core barrels and bits are used.

# GUIDE TO SUBSURFACE EXPLORATION LOGS



# INDEX SHEET 2 SOIL DESCRIPTION

## SOIL CONSTITUENTS

Naturally occurring soils consist of one or more of the following matrix constituents defined in terms of particle size.

Constituent	U.S. Sieve Size	Observed Size (in.)
Gravel (Coarse)	3/4 in. - 3 in.	3/4 - 3
Gravel (Fine)	No. 4 - 3/4 in.	1/5 - 3/4
Sand (Coarse)	No. 10 - No. 40	1/16 - 1/5
Sand (Medium)	No. 40 - No. 10	1/64 - 1/16
Sand (Fine)	No. 200 - No. 40	1/300 - 1/64
Fines (Silt or Clay)	Smaller than No. 200	Less than 1/300

## SOIL IDENTIFICATION

Soil identification refers to the grouping of soils with similar physical characteristics into a category defined by a **group name** and corresponding **group symbol** based on estimation of the matrix soil constituents to the nearest 5% and simple manual tests. Proportions of cobbles, boulders, and other non-matrix soil materials are not considered during this procedure but are included in the overall soil description if observed or thought to be present. Refer to the following descriptions and tables adapted from ASTM D2488.

**Coarse-Grained Soil** - Coarse-grained soils contain fewer than 50% fines and are identified based on the following table.

Primary Constituent	Fines Percent	Type of Fines and Gradation	Group Symbol	Group Name <sup>(1)</sup>
GRAVEL % gravel > 10% % sand	≤ 5%	well graded	GW	Well graded gravel
		poorly graded	GP	Poorly graded gravel
	10% to 45%	clayey well graded	GW-GC	Well graded gravel with clay
		clayey poorly graded	GP-GC	Poorly graded gravel with clay
		silty well graded	GW-GM	Well graded gravel with silt
		silty poorly graded	GP-GM	Poorly graded gravel with silt
SAND % sand ≥ 10% % gravel	≤ 5%	clay fines	GC	Clayey gravel
		silt fines	GM	Silty gravel
	10% to 45%	well graded	SW	Well graded sand
		poorly graded	SP	Poorly graded sand
		clayey well graded	SW-SC	Well graded sand with clay
		clayey poorly graded	SP-SC	Poorly graded sand with clay
		silty well graded	SW-SM	Well graded sand with silt
		silty poorly graded	SP-SM	Poorly graded sand with silt
	15% to 45%	clay fines	SC	Clayey sand
		silt fines	SM	Silty sand

<sup>(1)</sup> If soil is a gravel and contains 15% or more sand, add "with sand" to the group name. If soil is a sand and contains 15% of more gravel, add "with gravel" to the group name.

**Inorganic Fine-Grained Soil** - Fine-grained soils contain 50% or more fines and are identified based on the following table.

Plasticity Criteria	Dry Strength	Coarse Fraction S = Sand, G = Gravel	Group Symbol	Group Name <sup>(1)</sup>
Medium	Medium to high	< 15% S + G	CL	Lean clay
		≥ 30% % S ≥ % G	CL	Sandy lean clay
		S + G % S < % G	CL	Gravelly lean clay
Non-plastic	None to low	< 15% S + G	ML	Silt
		≥ 30% % S ≥ % G	ML	Sandy silt
		S + G % S < % G	ML	Gravelly silt
High	High to very high	< 15% S + G	CH	Fat clay
		≥ 30% % S ≥ % G	CH	Sandy fat clay
		S + G % S < % G	CH	Gravelly fat clay
Low to Medium	Low to medium	< 15% S + G	MH	Elastic silt
		≥ 30% % S ≥ % G	MH	Sandy elastic silt
		S + G % S < % G	MH	Gravelly elastic silt

<sup>(1)</sup> If soil contains 15% to 25% sand or gravel, add "with sand" or "with gravel" to the group name.

**Organic Fine-Grained Soil** - Fine-grained soils that contain enough organic particles to influence the soil properties are identified as Organic Soil and assigned the group symbol OL or OH.

**Highly Organic Soil (Peat)** - Soils composed primarily of plant remains in various stages of decomposition are identified as Peat and given the group symbol PT. Peat usually has an organic odor, a dark brown to black color, and a texture ranging from fibrous (original plant structure intact or mostly intact) to amorphous (plant structure decomposed to fine particles).

## SOIL DESCRIPTION

Soils are described in the following general sequence. Deviations may occur in some instances.

### Identification Components

(1) Group Name and Group Symbol

### Description Components

- (2) Consistency (Fine-Grained) or Apparent Density (Coarse-Grained)
- (3) Color (*note, the term "to" may be used to indicate a gradational change*)
- (4) Soil Moisture
- (5) Matrix Soil Constituents (Gravel, Sand, Fines)
  - ↳ Proportion (*by weight*), particle size, plasticity of fines, angularity, etc.
- (6) Non-Matrix Soil Materials and Proportions (*by volume*)
- (7) Other Descriptive Information (Unusual Odor, Structure, Texture, etc.)
- (8) [Geologic Formation Name or Soil Survey Unit]

## SPT N-VALUE CORRELATIONS

Consistency	SPT N-Value	Apparent Density	SPT N-Value
Very soft	0 - 2	Very loose	0 - 5
Soft	2 - 4	Loose	5 - 10
Medium stiff	4 - 8	Medium dense	10 - 30
Stiff	8 - 15	Dense	30 - 50
Very stiff	15 - 30	Very dense	> 50
Hard	> 30		

## SOIL MOISTURE

**Dry**..... Apparent absence of moisture; dry to the touch.  
**Moist**..... Damp but no visible water.  
**Wet**..... Visible free water; saturated.

## PROPORTIONS / PERCENTAGES

Proportions of gravel, sand, and fines (excluding cobbles, boulders, and other constituents) are stated in the following terms indicating a range of percentages by weight (to nearest 5%) of the minus 3-in. soil fraction and add up to 100%.

Proportions of cobbles, boulders, and other non-matrix soil materials including artificial debris, roots, plant fibers, etc. are stated in the following terms indicating a range of percentages by volume (to the nearest 5%) of the total soil.

<b>Mostly</b> .....	50% - 100%	<b>Numerous</b> .....	40% - 50%
<b>Some</b> .....	30% - 45%	<b>Common</b> .....	25% - 35%
<b>Little</b> .....	15% - 25%	<b>Occasional</b> .....	10% - 20%
<b>Few</b> .....	5% - 10%	<b>Trace</b> .....	Less than 5%
<b>Trace</b> .....	Less than 5%		

## PLASTICITY (FINES ONLY)

**Non-plastic**..... Dry specimen ball falls apart easily. Cannot be rolled into thread at any moisture content.

**Low**..... Dry specimen ball easily crushed with fingers. Can be rolled into 1/8-in. thread with some difficulty.

**Medium**..... Difficult to crush dry specimen ball with fingers. Easily rolled into 1/8-in. thread.

**High**..... Cannot crush dry specimen ball with fingers. Easily rolled and re-rolled into 1/8-in. thread.

## COBBLES AND BOULDERS

**Cobbles** - Particles of rock that will pass a 12-in. square opening and be retained on a 3-in. sieve.

**Boulders** - Particles of rock that will not pass a 12-in. square opening.

*Note: Where the percentage (by volume) of cobbles and/or boulders cannot be accurately or reliably estimated, the terms "with cobbles", "with boulders", or "with cobbles and boulders" may be used to indicate observed or inferred presence.*

## GUIDE TO SUBSURFACE EXPLORATION LOGS



## INDEX SHEET 3 ROCK DESCRIPTION

### ROCK DEFINITION

Where reported on an exploration log, *rock* is defined as any naturally formed aggregate of mineral matter occurring in large masses or fragments. This definition of rock should not be taken as a replacement for any definitions relating to rock and/or rock excavation defined in construction documents. Intensely weathered or decomposed rock that is friable and can be reduced to gravel size particles or smaller by normal hand pressure is identified and described as soil. Poorly indurated formational materials which display both rock-like and soil-like properties are identified and described as rock followed by the soil description. In such cases, the term "poorly indurated" or "weakly cemented" is added to the rock name (e.g. weakly cemented sandstone).

### ROCK IDENTIFICATION

Rock is identified by a combination of *rock type* (igneous, metamorphic, or sedimentary) followed by the *rock name* (e.g. granite, schist, sandstone).

### ROCK DESCRIPTION

Rock descriptions are presented in the following general sequence. The detail of description is dictated by the complexity and objectives of the project.

#### Identification Components

(1) Rock Type and Name

#### Description Components

- (2) Rock Grain Size (*for clastic sedimentary rock*)
- (3) Crystal Size (*for igneous and metamorphic rock*)
- (4) Bedding Spacing (*for sedimentary rock*)
- (5) Color
- (6) Hardness and Weathering Descriptors
- (7) Fracture Density
- (8) [Geologic Formation Name]

### ROCK QUALITY DESIGNATION

$$RQD (\%) = \frac{\sum \text{Length of intact core pieces} \geq 4 \text{ inches}}{\text{Total length of core run (inches)}} \times 100$$

The RQD should correlate with the fracture density in most cases. Higher RQD values generally indicate fewer joints and fractures.

### GRAIN / CRYSTAL SIZE

#### Grain Size for Clastic Sedimentary Rock

The names of clastic sedimentary rocks are generally based on their predominant clast or grain size (e.g. fine sandstone, medium sandstone, coarse gravel conglomerate, cobble conglomerate, siltstone, claystone).

#### Crystal Size for Igneous and Metamorphic Rock

Grain Size Description	Average Crystal Size (in.)
Very coarse grained (pegmatitic)	Greater than or equal to 3/8
Coarse-grained	Between 3/16 and 3/8
Medium-grained	Between 1/32 and 3/16
Fine-grained	Between 1/250 and 1/32
Aphanitic	Less than or equal to 1/250

### BEDDING SPACING

Bedding Description	Thickness / Spacing
Massive	Less than 10 ft.
Very thickly bedded	3 ft. to 10 ft.
Thickly bedded	1 ft. to 3 ft.
Moderately bedded	4 in. to 1 ft.
Thinly bedded	1 in. to 4 in.
Very thinly bedded	1/4 in. to 1 in.
Laminated	Less than 1/4 in.

Note: Bedding is generally only applicable to sedimentary or bedded volcanic rocks.

### HARDNESS

Hardness	Criteria
Extremely hard	Cannot be scratched with a pocketknife or sharp pick. Can only be chipped with repeated heavy hammer blows.
Very hard	Cannot be scratched with a pocketknife or sharp pick with difficulty. Breaks with repeated heavy hammer blows.
Hard	Can be scratched with a pocketknife or sharp pick with difficulty. Breaks with heavy hammer blows.
Moderately hard	Can be scratched with a pocketknife or sharp pick with light or moderate pressure. Breaks with moderate hammer blows.
Moderately soft	Can be grooved 1/16 in. deep with a pocketknife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Can be grooved or gouged easily with a pocketknife or sharp pick. Breaks with light to moderate manual pressure.
Very soft	Can be readily indented, grooved, or gouged with fingernail, or carved with a pocketknife. Breaks with light manual pressure.

### WEATHERING (INTACT ROCK)

Weathering Description	Discoloration and/or Oxidation	General Characteristics
Fresh	Body of rock and fracture surfaces are not discolored or oxidized.	Rock texture unchanged. Hammer rings when crystalline rocks are struck.
Slightly weathered	Discoloration or oxidation limited to surface of, or short distance from, fractures. Most surfaces exhibit minor to complete discoloration.	Rock texture preserved. Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately weathered	Discoloration or oxidation extends usually throughout. Fe-Mg minerals appear rusty. All fracture surfaces are discolored or oxidized.	Rock texture generally preserved. Hammer does not ring when rock is struck. Body of rock slightly weakened.
Intensely weathered	Discoloration or oxidation throughout. Feldspar and Fe-Mg minerals altered to clay to some extent. All fracture surfaces are discolored or oxidized and friable.	Rock texture altered by chemical disintegration. Can usually be broken with moderate to heavy manual pressure or by light hammer blow. Body of rock is significantly weakened.
Decomposed	Discoloration or oxidation throughout but resistant minerals such as quartz may be unaltered. All feldspar and Fe-Mg minerals are completely altered to clay.	Resembles a soil; partial or complete remnant rock structure may be preserved. Can be granulated by hand. Resistant minerals may present as stringers or dikes.

### FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures
Very slightly fractured	Core lengths greater than 3 ft.
Slightly fractured	Core lengths mostly from 1 ft. to 3 ft.
Moderately fractured	Core lengths mostly from 4 in. to 1 ft.
Intensely fractured	Core lengths mostly from 1 in. to 4 in.
Very intensely fractured	Mostly chips and fragments

Note: Fracture density is based on the fracture spacing in recovered core, measured along the core axis (excluding mechanical breaks).

## APPENDIX F

### Engineer's Opinion on Probable Construction Costs



<b>Harrison Avenue Slope Mitigation with Riprap - December 18, 2023 Failure</b> <b>Gardiner, Maine</b> <b>Engineer's Opinion of Probable Construction Costs</b> <b>Weston &amp; Sampson Project No.: ENG23-0628</b>				
			RAW COSTS	
Description/Task	Unit	Estimated Quantity	Cost/Unit (Raw)	Total Cost (Raw)
1 Contractor Mobilization/Demobilization, Admin.	LS	1	\$10,500.00	\$10,500.00
			<b>Total Cost for Task 1</b>	<b>\$10,500.00</b>
2 Water Control				
a Sand Bags in Stream (5 ft. tall) at slope toe	CY	45	\$25.09	\$1,129.05
b Laborer to Install and Remove Sand Bags (assume 2 laborers)	Week	0.8	\$1,651.10	\$1,320.88
c 2" Pumps	DAY	2	\$819.55	\$1,639.10
			<b>Total Cost for Task 2</b>	<b>\$4,089.03</b>
3 Environmental Protection				
a Straw Wattles	LF	1180	\$4.44	\$5,239.20
b Stabilized Construction Entrance	CY	10	\$23.68	\$236.80
			<b>Total Cost for Task 3</b>	<b>\$5,476.00</b>
4 Site Preparation				
a Remove/Re-Set Guardrail	LF	60	\$43.92	\$2,635.20
b Temporary Relocation of Overhead Utilities	LS	1	\$8,000.00	\$8,000.00
c Brush Removal for Site Access to Lower Section of Slope	ACRE	0.5	\$1,614.38	\$807.19
d Grading to Extend Access to Lower Section of Slope	CY	50	\$8.36	\$418.00
e Stone Placement for Equipment Access to Lower Section of Slope	TON	10.5	\$40.49	\$425.15
f Tree Removal/Chipping at Access Path and Slope	Each	9	\$257.13	\$2,314.17
g Sloughed Soil Removal	CY	110	\$8.36	\$919.60
h Soil Disposal - sloughed soil and grading	TON	320	\$25.00	\$8,000.00
i Tree Chipping Disposal	TON	5	\$65.00	\$325.00
j Hauling Soil and Vegetation	CY	165	\$9.09	\$1,499.85
k Sheet Pile Excavation Support	SF	2520	\$58.01	\$146,185.20
			<b>Total Cost for Task 4</b>	<b>\$171,529.36</b>
5 Mitigation Slope Repair with Riprap				
a One 4-inch Pump (for toe key)	DAY	5	\$1,154.81	\$5,774.05
b Sheet Pile Excavation Support for Riprap Toe Key (Extract)	SF	2320	\$25.50	\$59,160.00
c Toe Key, Slope, and Roadway Excavation	CY	1300	\$6.53	\$8,489.00
d Hauling Soil	CY	1300	\$9.74	\$12,662.00
e Soil Disposal	TON	1800	\$25.00	\$45,000.00
f Geosynthetic Fabric	SY	350	\$2.49	\$871.50
g Crushed Stone	CY	125	\$35.18	\$4,397.50
h Riprap	TON	1300	\$59.46	\$77,298.00
i Roadway Fill	CY	120	\$27.59	\$3,310.80
j Pavement Replacement	SY	100	\$18.89	\$1,889.00
			<b>Total Cost for Task 5</b>	<b>\$218,851.85</b>
6 Materials Testing During Construction (Soil)	Per Day	10	\$800.00	\$8,000.00
			<b>Total Cost for Task 6</b>	<b>\$8,000.00</b>
			Estimated Raw Total	\$418,446.24
			Raw Project Contingency (15%)	\$62,766.94
			<b>ESTIMATED RAW CONSTRUCTION COST TOTAL</b>	<b>\$481,213.17</b>
7 Engineering Assessment, Design, Permitting, and Construction Administration Fee				\$180,000.00
			<b>ESTIMATED RAW CONSTRUCTION AND ENGINEERING COST TOTAL</b>	<b>\$661,213.17</b>

From RSMeans 312323160200 and 31232300016  
From RSMeans 013113200160  
From RSMeans 312319200800

From RSMeans 312514160710  
From RSMeans 312316130050 and 312323156000

From RSMeans 024113300870  
Assumed Cost (will be based on utility company rates)  
From RSMeans 311313100020  
From RSMeans 312316130050  
From RSMeans 313713100350  
From RSMeans 311313203050  
From RSMeans 312316130050  
Disposal Fee at Riverside Recycling in Portland = \$25/TON  
Disposal Fee at Riverside Recycling in Portland = \$65/TON  
From RSMeans 312323204282  
From RSMeans 314116101800

From RSMeans 312319201000 and 312319201020  
From RSMeans 314116101900  
From RSMeans 312316131300  
From RSMeans 312323204282  
Disposal Fee at Riverside Recycling in Portland = \$25/TON  
From RSMeans 334123190110  
From RSMeans 312323160100  
From RSMeans 313713100370  
From RSMeans 312323160050 and 312323237040  
From RSMeans 321216130160 and 321216130340

Assume 10 day soil placement period

Estimated Engineering Fee

Updated August 15, 2024

<b>Harrison Avenue Slope Mitigation with Soil Nails - December 18, 2023 Failure</b> <b>Gardiner, Maine</b> <b>Engineer's Opinion of Probable Construction Costs</b> <b>Weston &amp; Sampson Project No.: ENG23-0628</b>				
			RAW COSTS	
Description/Task	Unit	Estimated Quantity	Cost/Unit (Raw)	Total Cost (Raw)
1 Contractor Mobilization/Demobilization, Admin.	LS	1	\$10,500.00	\$10,500.00
			<b>Total Cost for Task 1</b>	<b>\$10,500.00</b>
2 Water Control				
a Sand Bags in Stream (5 ft. tall) at slope toe	CY	45	\$25.09	\$1,129.05
b Laborer to Install and Remove Sand Bags (assume 2 laborers)	Week	0.8	\$1,651.10	\$1,320.88
c 2" Pumps	DAY	2	\$819.55	\$1,639.10
			<b>Total Cost for Task 2</b>	<b>\$4,089.03</b>
3 Environmental Protection				
a Straw Wattles	LF	1180	\$4.44	\$5,239.20
b Stabilized Construction Entrance	CY	10	\$23.68	\$236.80
			<b>Total Cost for Task 3</b>	<b>\$5,476.00</b>
4 Site Preparation				
a Remove/Re-Set Guardrail	LF	60	\$43.92	\$2,635.20
b Temporary Relocation of Overhead Utilities	LS	1	\$8,000.00	\$8,000.00
c Brush Removal for Site Access to Lower Section of Slope	ACRE	0.5	\$1,614.38	\$807.19
d Grading to Extend Access to Lower Section of Slope	CY	50	\$8.36	\$418.00
e Stone Placement for Equipment Access to Lower Section of Slope	TON	10.5	\$40.49	\$425.15
f Tree Removal/Chipping at Access Path and Slope	Each	9	\$257.13	\$2,314.17
g Sloughed Soil Removal	CY	110	\$8.36	\$919.60
h Soil Disposal - sloughed soil and grading	TON	320	\$25.00	\$8,000.00
i Tree Chipping Disposal	TON	5	\$65.00	\$325.00
j Hauling Soil and Vegetation	CY	165	\$9.09	\$1,499.85
k Sheet Pile Excavation Support	SF	2520	\$58.01	\$146,185.20
			<b>Total Cost for Task 4</b>	<b>\$171,529.36</b>
5 Mitigation Slope Repair with Soil Nails				
a Minor Slope Grading Prior to Soil Nail Installation	HR	8	\$238.00	\$1,904.00
b Soil Nail Contractor Mob/Demob	LS	1	\$29,750.00	\$29,750.00
c Soil Nail Contractor Design	LS	1	\$12,750.00	\$12,750.00
d Soil Nail Installation (Includes Geobrug finish with loam and seed)	SF	2200	\$72.00	\$158,400.00
e Geotextile Fabric	SY	90	\$2.49	\$224.10
f Crushed Stone	CY	30	\$35.18	\$1,055.40
g Riprap Bottom Section of Slope	TON	85	\$59.46	\$5,054.10
			<b>Total Cost for Task 5</b>	<b>\$209,137.60</b>
6 Materials Testing During Construction (Soil)	Per Day	10	\$800.00	\$8,000.00
			<b>Total Cost for Task 6</b>	<b>\$8,000.00</b>
			Estimated Raw Total	\$408,731.99
			Raw Project Contingency (15%)	\$61,309.80
			<b>ESTIMATED RAW CONSTRUCTION COST TOTAL</b>	<b>\$470,041.78</b>
7 Engineering Assessment, Design, Permitting, and Construction Administration Fee				\$180,000.00
			<b>ESTIMATED RAW CONSTRUCTION AND ENGINEERING COST TOTAL</b>	<b>\$650,041.78</b>
Updated August 15, 2024				

From RSMMeans 312323160200 and 31232300016  
From RSMMeans 013113200160  
From RSMMeans 312319200800

From RSMMeans 312514160710  
From RSMMeans 312316130050 and 312323156000

From RSMMeans 024113300870  
Assumed Cost (will be based on utility company rates)  
From RSMMeans 311313100020  
From RSMMeans 312316130050  
From RSMMeans 313713100350  
From RSMMeans 311313203050  
From RSMMeans 312316130050  
Disposal Fee at Riverside Recycling in Portland = \$25/TON  
Disposal Fee at Riverside Recycling in Portland = \$65/TON  
From RSMMeans 312323204282  
From RSMMeans 314116101800

From On-Going Biddeford Riverwalk Wall Project Without O&P  
Cost from Helical Drilling, Inc. based on similar MEDOT project Without O&P  
Cost from Helical Drilling, Inc. based on similar MEDOT project Without O&P  
Cost from Helical Drilling, Inc. based on similar MEDOT project Without O&P

From RSMMeans 334123190110  
From RSMMeans 312323160100  
From RSMMeans 313713100370

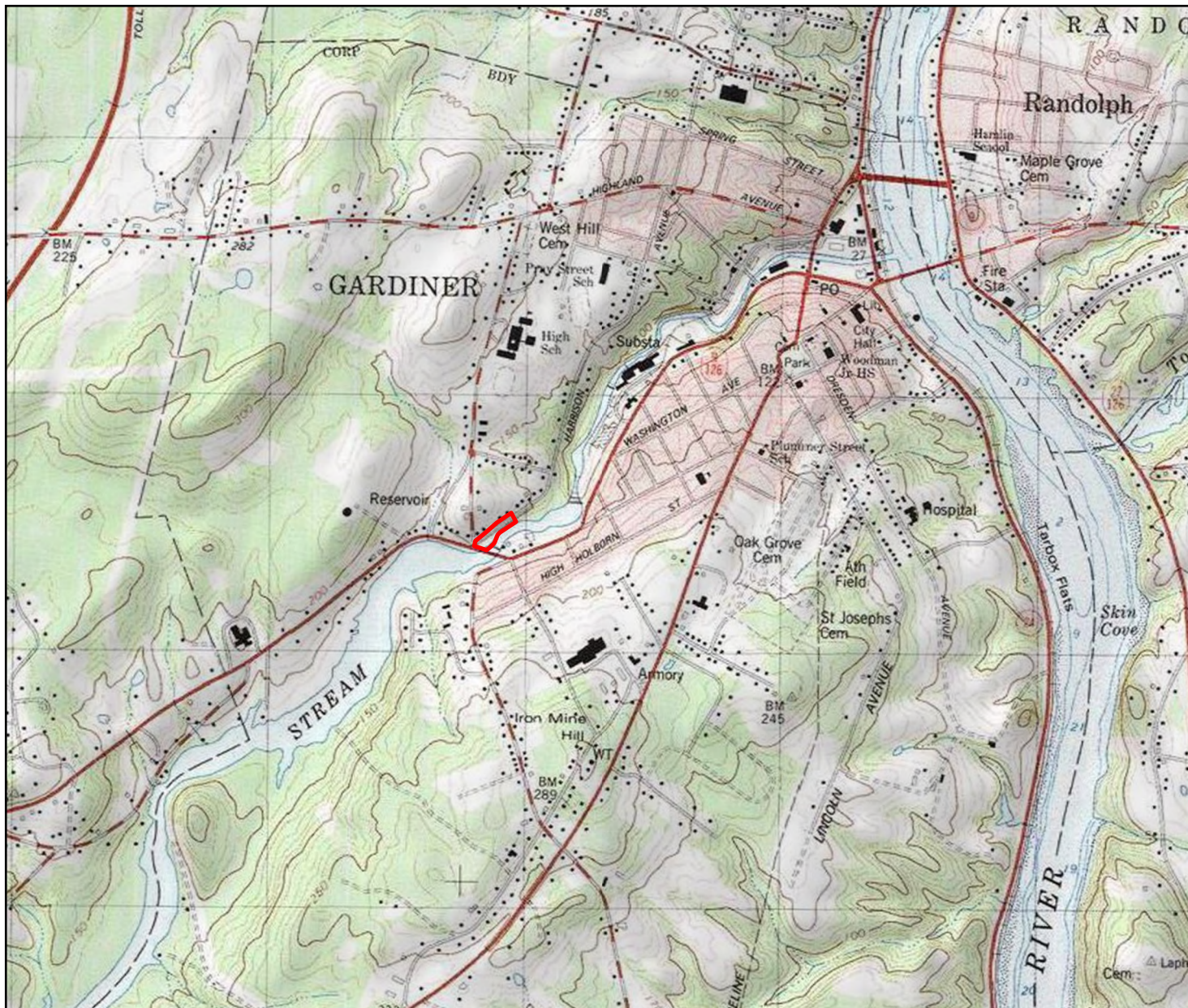
Assume 15 day soil placement period

Estimated Engineering Fee

## APPENDIX C

### Maps





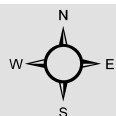
## Legend

Investigation Area

**FIGURE 1**

Harrison Ave  
Gardiner ME

USGS Topographic Map

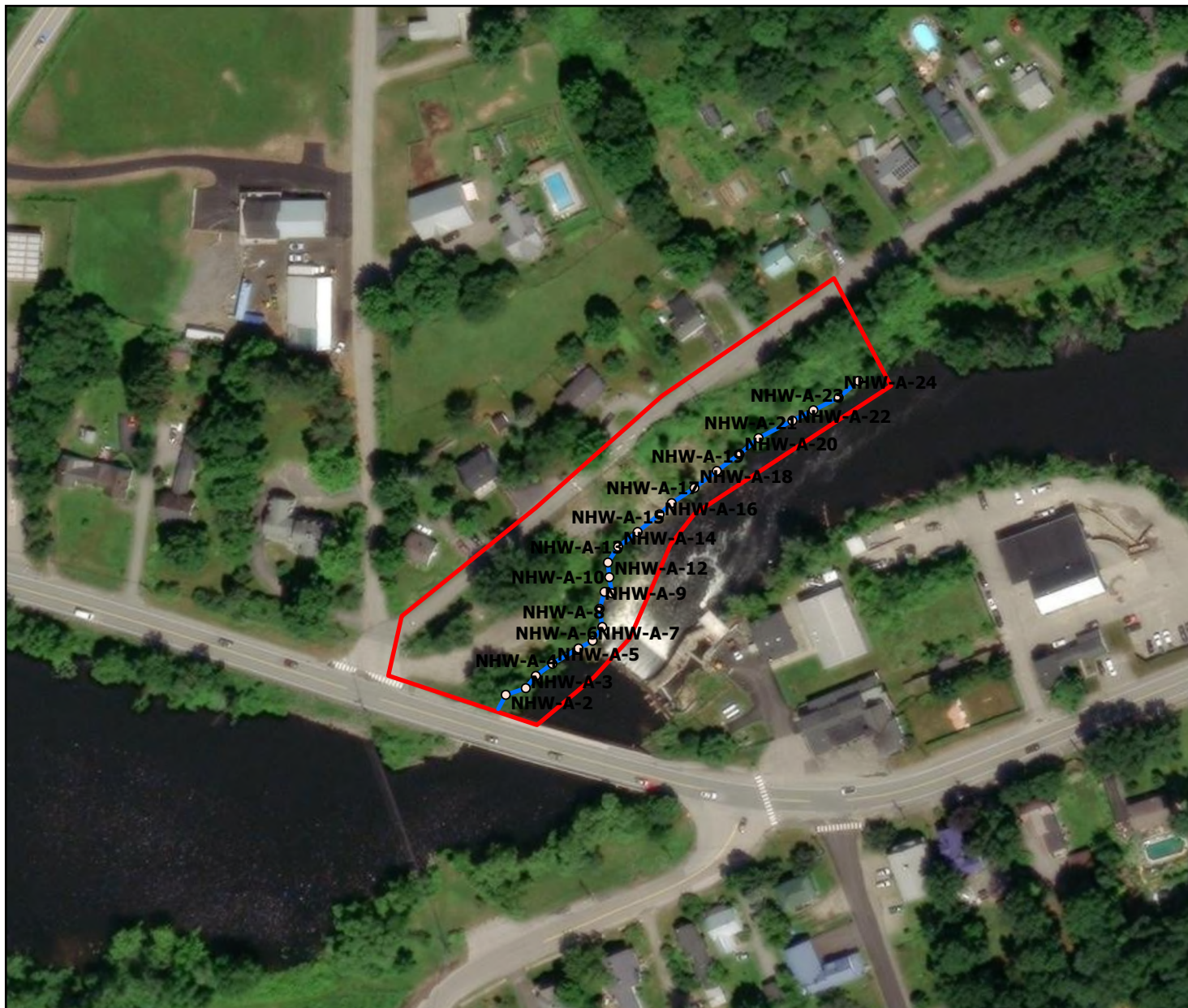


2,000 1,000 0 2,000  
Feet

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Copyright: © 2013 National Geographic Society, i-cubed

Weston & Sampson





- Legend**
- Investigation Area
  - NHD Flowline**
    - Connector (no attributes)
    - Canal Ditch - null
    - Canal Ditch- Aqueduct
    - Canal Ditch - Stormwater
    - Approximate Underground Conduit
    - Adequate Water Pipeline At or Near the Surface
    - Adequate Water Pipeline Underground
    - Penstock Water Pipeline At or Near the Surface
    - Stream/River - No Attributes
    - Intermittent Stream/River
    - Perennial Stream/River
    - Ephemeral Stream/River
    - Drainageway
    - Artificial Path
    - Coastline No Attributes
    - Maine Lakes
  - Maine Sand Dune Boundaries**
    - Frontal Dune
    - Back Dune
    - USFW Maine Wetlands

**FIGURE 2**

Harrison Ave  
Gardiner ME

Wetlands Field Map



Microsoft, Vantor, Maine Geological Survey.

Weston & Sampson





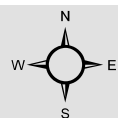
#### Legend

- Investigation Area
- USA\_Flood\_Hazard\_Reduced\_Set
- X: 0.2% Annual Chance Flood Hazard
- 1% Annual Chance Flood Hazard
- Future Conditions 1% Annual Chance Flood Hazard
- Regulatory Floodway
- Area with Reduced Risk Due to Levee
- Special Floodway

**FIGURE 3**

Harrison Ave  
Gardiner ME

FEMA Map



200 100 0 200  
Feet

Sources: FEMA Source: FEMA, Esri, Microsoft, Vantor

## APPENDIX D

### Photos





Photo 1: NHW-A (Cobbosseecontee Stream) above dam looking northeast (downstream).



Photo 2: NHW-A (Cobbosseecontee Stream) below dam looking southwest (upstream).





Photo 3: NHW-A (Cobbosseecontee Stream) below dam looking northeast (downstream) from bottom of slope failure.



Photo 4: View upslope from the bottom of slope failure. Looking northwest.





Photo 5: View upslope from the bottom of slope failure. Looking west.



Photo 6: View upslope from the bottom of slope failure. Looking northwest.





Photo 7: NHW-A (Cobbosseecontee Stream) below dam looking east (downstream) from top of slope failure.



Photo 8: Guardrail and road edge at top of slope failure. Looking east.

## APPENDIX E

### Deeds



# Property Card: 1 COBBOSSEE AV

City of Gardiner, ME



Parcel Information	
<b>Parcel ID:</b> 028004 <b>Vision ID:</b> 2322 <b>Owner:</b> GARDINER WATER DISTRICT <b>Co-Owner:</b> <b>Mailing Address:</b> P O BOX 536  GARDINER, ME 04345	<b>Map:</b> 028 <b>Lot:</b> 004 <b>Use Description:</b> WATER DIST <b>Zone:</b> 22 <b>Land Area in Acres:</b> 0.46
Sale History	Assessed Value
<b>Book/Page:</b> 1773/0281 <b>Sale Date:</b> <b>Sale Price:</b> \$0	<b>Land:</b> \$34,800 <b>Buildings:</b> \$0 <b>Extra Bldg Features:</b> \$0 <b>Outbuildings:</b> \$3,200 <b>Total:</b> \$38,000

Building Details: Building # 1		
NO PHOTO AVAILABLE	<b>Model:</b>	<b>Int Wall Desc 1:</b>
	<b>Living Area:</b> 0	<b>Int Wall Desc 2:</b>
	<b>Year Built:</b> 0	<b>Ext Wall Desc 1:</b>
	<b>Style:</b>	<b>Ext Wall Desc 2:</b>
	<b>Stories:</b>	<b>Roof Cover:</b>
	<b>Occupancy:</b>	<b>Roof Structure:</b>
	<b>No. Total Rooms:</b>	<b>Heat Type:</b>
	<b>No. Bedrooms:</b>	<b>Heat Fuel:</b>
	<b>No. Baths:</b>	<b>A/C Type:</b>
	<b>No. Half Baths:</b>	



[www.cai-tech.com](http://www.cai-tech.com)

This information is believed to be correct but is subject to change and is not warranted.

# Property Card: 605 WATER ST

City of Gardiner, ME



Parcel Information	
<b>Parcel ID:</b> 028006 <b>Vision ID:</b> 2242 <b>Owner:</b> GARDINER WATER DISTRICT <b>Co-Owner:</b> <b>Mailing Address:</b> P O BOX 536  GARDINER, ME 04345-536	<b>Map:</b> 028 <b>Lot:</b> 006 <b>Use Description:</b> WATER DIST <b>Zone:</b> 22 <b>Land Area in Acres:</b> 0.9
Sale History	Assessed Value
<b>Book/Page:</b> 0453/0330 <b>Sale Date:</b> <b>Sale Price:</b> \$0	<b>Land:</b> \$57,900 <b>Buildings:</b> \$198,300 <b>Extra Bldg Features:</b> \$7,600 <b>Outbuildings:</b> \$0 <b>Total:</b> \$263,800

Building Details: Building # 1		
	<b>Model:</b> Commercial <b>Living Area:</b> 1552 <b>Year Built:</b> 1885 <b>Style:</b> Light Indust <b>Stories:</b> 1 <b>Occupancy:</b> 1 <b>No. Total Rooms:</b> <b>No. Bedrooms:</b> <b>No. Baths:</b> <b>No. Half Baths:</b>	<b>Int Wall Desc 1:</b> Minim/Masonry <b>Int Wall Desc 2:</b> <b>Ext Wall Desc 1:</b> Brick/Masonry <b>Ext Wall Desc 2:</b> <b>Roof Cover:</b> Asph/F GlS/Cmp <b>Roof Structure:</b> Gable/Hip <b>Heat Type:</b> Radiant-Elec. <b>Heat Fuel:</b> Electric <b>A/C Type:</b> None



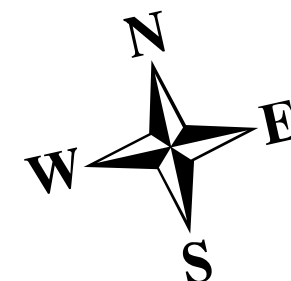
www.cai-tech.com

This information is believed to be correct but is subject to change and is not warranted.





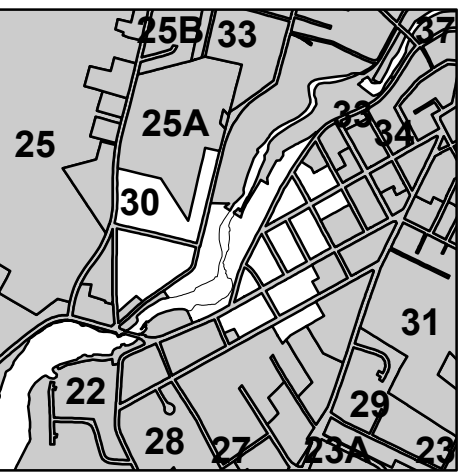
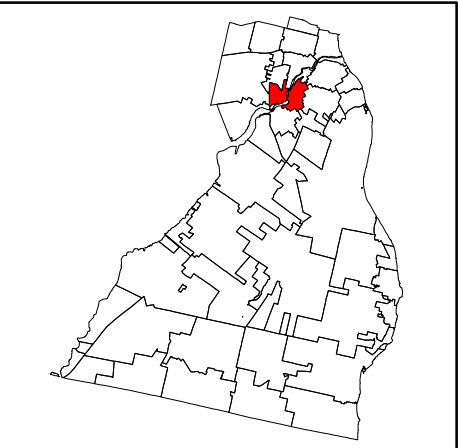
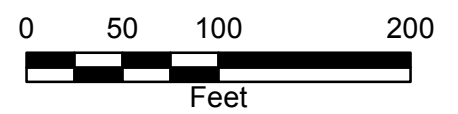
CITY OF  
**GARDINER**  
KENNEBEC CO.  
MAINE



**LEGEND**

- Lot Hook
- Private Right of Way
- Sub-lot Line
- Transmission Line ROW
- River, Stream or Pond
- Railroad
- Road
- Town Line
- Building
- Parcel

For Assessment Purposes. Not to be used for conveyances.



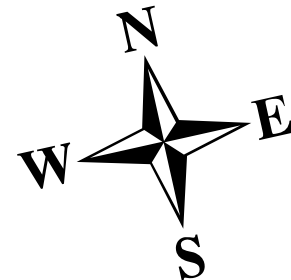
## Map 30

Printed: 9/26/2024  
Effective Date: 4/1/2024





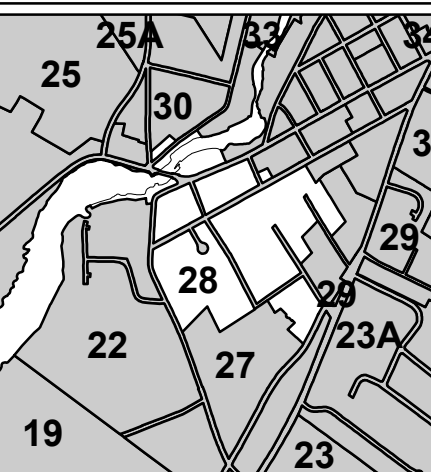
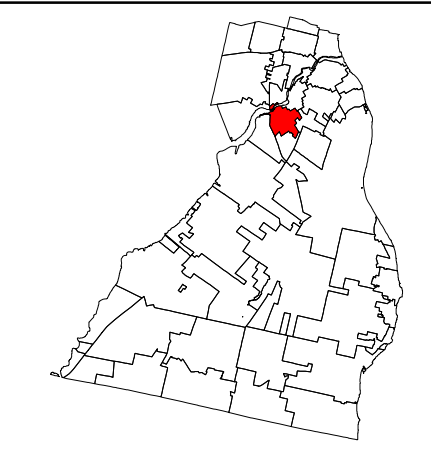
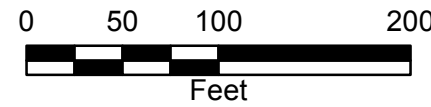
CITY OF  
**GARDINER**  
KENNEBEC CO.  
MAINE



**LEGEND**

- Lot Hook
- Private Right of Way
- Sub-lot Line
- Transmission Line ROW
- River, Stream or Pond
- Railroad
- Road
- Town Line
- Building
- Parcel

For Assessment Purposes. Not  
to be used for conveyances.



**Map 28**

Printed: 9/26/2024  
Effective Date: 4/1/2024



## **APPENDIX F**

Abutters/Public Notice

## **DRAFT ABUTTER NOTICE**

**[INSERT DATE]**

**Subject:** Shoreland Zoning Permit Application  
**Property:** Harrison Avenue in Gardiner, Maine  
**Map/Lot:** Map 26, Lots 4, 6 and 6C

Dear Abutter,

This letter is to notify you that the City of Gardiner (Denise Brown, City Manager) has submitted an application to the City of Gardiner for a Shoreland Zoning Permit for property located at the address above.

**The proposed activity includes:** Repair and stabilization of the failed slope between Harrison Avenue and Cobbosseecontee Stream and the portion of Harrison Avenue adjacent to the slope. Slope stabilization will involve installing slope nails and toe bank protection. Repairs to Harrison Avenue will include storm water drainage improvements.

The application is available for review at the Gardiner Code Enforcement Office, 6 Church Street, Gardiner, Maine.

The project is anticipated to be heard at the May 12, 2026, meeting. Notice of the meeting will also be provided in a local newspaper prior to the meeting.

If you have questions, you may contact:

**Applicant:** Denise Brown (City Manager)  
**Email:** [dbrown@gardinermaine.com](mailto:dbrown@gardinermaine.com)

**Applicant's representative:** Gregory Russo (Weston & Sampson)  
**Email:** [russo.gregory@wseinc.com](mailto:russo.gregory@wseinc.com)

Sincerely,  
Weston & Sampson Engineers, Inc. (Attn: Gregory Russo)



# 200 feet Abutters List Report

Gardiner, ME

April 03, 2026

## Subject Property:

Parcel Number: 030036  
CAMA Number: 030036  
Property Address: WATER ST

Mailing Address: GARDINER CITY OF  
6 CHURCH ST  
GARDINER, ME 04345

---

## Abutters:

Parcel Number: 028006  
CAMA Number: 028006  
Property Address: 605 WATER ST

Mailing Address: GARDINER WATER DISTRICT  
P O BOX 536  
GARDINER, ME 04345-536

Parcel Number: 030006  
CAMA Number: 030006  
Property Address: 283 HARRISON AV

Mailing Address: JENNER CHRISTOPHER  
283 HARRISON AV  
GARDINER, ME 04345

Parcel Number: 030007  
CAMA Number: 030007  
Property Address: 279 HARRISON AV

Mailing Address: MACPHEE-HILLMAN LISA  
279 HARRISON AV  
GARDINER, ME 04345-1924

Parcel Number: 030008  
CAMA Number: 030008  
Property Address: 265 HARRISON AV

Mailing Address: FIRLOTTE MICHAEL J  
265 HARRISON AV  
GARDINER, ME 04345

Parcel Number: 030010  
CAMA Number: 030010  
Property Address: 261 HARRISON AV

Mailing Address: STRATTON BENJAMIN L STRATTON  
KATE L  
261 HARRISON AV  
GARDINER, ME 04345

Parcel Number: 030011  
CAMA Number: 030011  
Property Address: 259 HARRISON AV

Mailing Address: TRUMAN LYNN M YOUNG DOUGLAS J  
259 HARRISON AV  
GARDINER, ME 04345-1924

Parcel Number: 030012  
CAMA Number: 030012  
Property Address: 245 HARRISON AV

Mailing Address: MASON RONALD E MASON TAMMY L  
245 HARRISON AV  
GARDINER, ME 04345-1924

Parcel Number: 030013  
CAMA Number: 030013  
Property Address: 16 ASH ST

Mailing Address: WILLIAMS RICHARD K WILLIAMS  
MARGARET  
16 ASH ST  
GARDINER, ME 04345

Parcel Number: 030021B  
CAMA Number: 030021B  
Property Address: 0 WEST HILL RD

Mailing Address: 158164 WEST HILL ROAD LLC  
110 MARGINAL WAY SUITE 110  
PORTLAND, ME 04101

Parcel Number: 030027  
CAMA Number: 030027  
Property Address: 7 ASH ST

Mailing Address: PALMER RANDALL C PALMER MARY A  
P O BOX 503  
GARDINER, ME 04345-503



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# 200 feet Abutters List Report

Gardiner, ME

April 03, 2026

Parcel Number: 030028  
CAMA Number: 030028  
Property Address: 1 ASH ST

Mailing Address: DEERING ERICKA & TROY  
1 ASH ST  
GARDINER, ME 04345

Parcel Number: 030029  
CAMA Number: 030029  
Property Address: 243 HARRISON AV

Mailing Address: FOOTE MAKAYLA M AGRICOURT  
CARLOS A  
243 HARRISON AV  
GARDINER, ME 04345

Parcel Number: 030030  
CAMA Number: 030030  
Property Address: 241 HARRISON AV

Mailing Address: GRAY JAMES L JR  
241 HARRISON AV  
GARDINER, ME 04345

Parcel Number: 030031  
CAMA Number: 030031  
Property Address: 237 HARRISON AV

Mailing Address: THIBODEAU LOU ANN M (WALLACE)  
237 HARRISON AV  
GARDINER, ME 04345

Parcel Number: 030036A  
CAMA Number: 030036A  
Property Address: WATER ST

Mailing Address: P & M REALTY LLC  
P O BOX 600  
GARDINER, ME 04345-600

Parcel Number: 030036B  
CAMA Number: 030036B  
Property Address: 563 WATER ST

Mailing Address: KEI (MAINE) POWER MANAGEMENT (III)  
LLC  
C/O KEI (USA) POWER MANAGEMENT  
423 BRUNSWICK AV  
GARDINER, ME 04345

Parcel Number: 030037  
CAMA Number: 030037  
Property Address: 244 HARRISON AV

Mailing Address: SERAPH CATHERINE G  
244 HARRISON AV  
GARDINER, ME 04345

Parcel Number: 030038  
CAMA Number: 030038  
Property Address: 521 WATER ST

Mailing Address: HARVEY FAMILY LLC  
28 JEWELL ST  
BRUNSWICK, ME 04011

Parcel Number: 030091  
CAMA Number: 030091  
Property Address: 530 WATER ST

Mailing Address: CHADWICK KATHERINE H  
530 WATER ST  
GARDINER, ME 04345

Parcel Number: 030093  
CAMA Number: 030093  
Property Address: 143 WASHINGTON AV

Mailing Address: SLACK ALEXANDER P PALMER  
KRISINDA E  
143 WASHINGTON AV  
GARDINER, ME 04345

Parcel Number: 030097  
CAMA Number: 030097  
Property Address: 2 SPRUCE ST

Mailing Address: WOODBURY KYLE R  
2 SPRUCE ST  
GARDINER, ME 04345

Parcel Number: 030098  
CAMA Number: 030098  
Property Address: 10 SPRUCE ST

Mailing Address: RUSSO ANGELA L  
10 SPRUCE ST  
GARDINER, ME 04345



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4/3/2026

Page 2 of 4





# 200 feet Abutters List Report

Gardiner, ME

April 03, 2026

Parcel Number: 030109  
CAMA Number: 030109  
Property Address: 144 WASHINGTON AV

Mailing Address: BRODEUR EDMOND D BRODEUR  
SHIRLEY A  
144 WASHINGTON AV  
GARDINER, ME 04345-2037

Parcel Number: 030110  
CAMA Number: 030110  
Property Address: 546 WATER ST

Mailing Address: BISHOP SCOTT E  
546 WATER ST  
GARDINER, ME 04345

Parcel Number: 030111  
CAMA Number: 030111  
Property Address: 548 WATER ST

Mailing Address: AMIDHA REAL ESTATE LLC  
PO BOX 253  
AUGUSTA, ME 04332

Parcel Number: 030112  
CAMA Number: 030112  
Property Address: 552 WATER ST

Mailing Address: HALSEY-HILL CHESTER  
552 WATER ST  
GARDINER, ME 04345

Parcel Number: 030113  
CAMA Number: 030113  
Property Address: 556 WATER ST

Mailing Address: USHER DEREK USHER STACY  
8 WOOD DUCK LANE  
PITTSO, ME 04345

Parcel Number: 030114  
CAMA Number: 030114  
Property Address: 6 WALNUT ST

Mailing Address: FELDER MARK H FELDER DEBORAH K  
6 WALNUT ST  
GARDINER, ME 04345

Parcel Number: 030115  
CAMA Number: 030115  
Property Address: 113 CENTRAL ST

Mailing Address: ALLEN CLARENCE E JR  
113 CENTRAL ST  
GARDINER, ME 04345-2418

Parcel Number: 030119  
CAMA Number: 030119  
Property Address: 21 SPRUCE ST

Mailing Address: TRASK AUDREY M  
21 SPRUCE ST  
GARDINER, ME 04345

Parcel Number: 030119A  
CAMA Number: 030119A  
Property Address: 19 SPRUCE ST

Mailing Address: KNOWLES DAVID KNOWLES NANCY L  
168 OLD LEWISTON RD  
WEST GARDINER, ME 04345

Parcel Number: 030120  
CAMA Number: 030120  
Property Address: 560 WATER ST

Mailing Address: P & M REALTY LLC  
P O BOX 600  
GARDINER, ME 04345

Parcel Number: 030121  
CAMA Number: 030121  
Property Address: 125 CENTRAL ST

Mailing Address: PERKINS MARGARET P  
125 CENTRAL ST  
GARDINER, ME 04345-2419

Parcel Number: 030122  
CAMA Number: 030122  
Property Address: 117 CENTRAL ST

Mailing Address: STEVENSON DAVID K & MARTHA J  
117 CENTRAL ST  
GARDINER, ME 04345



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# 200 feet Abutters List Report

Gardiner, ME

April 03, 2026

Parcel Number: 030122A  
CAMA Number: 030122A  
Property Address: 121 CENTRAL ST

Mailing Address: SOUCIE PATRICIA V (BEAULIEU)  
121 CENTRAL ST  
GARDINER, ME 04345

Parcel Number: 033081  
CAMA Number: 033081  
Property Address: 230 HARRISON AV

Mailing Address: GARDINER CITY OF  
6 CHURCH ST  
GARDINER, ME 04345

Parcel Number: 033103  
CAMA Number: 033103  
Property Address: 649 WATER ST

Mailing Address: MAINE STATE OF DEPARTMENT OF  
TRANSPORTATION  
STATE HOUSE STATION 16  
AUGUSTA, ME 04333

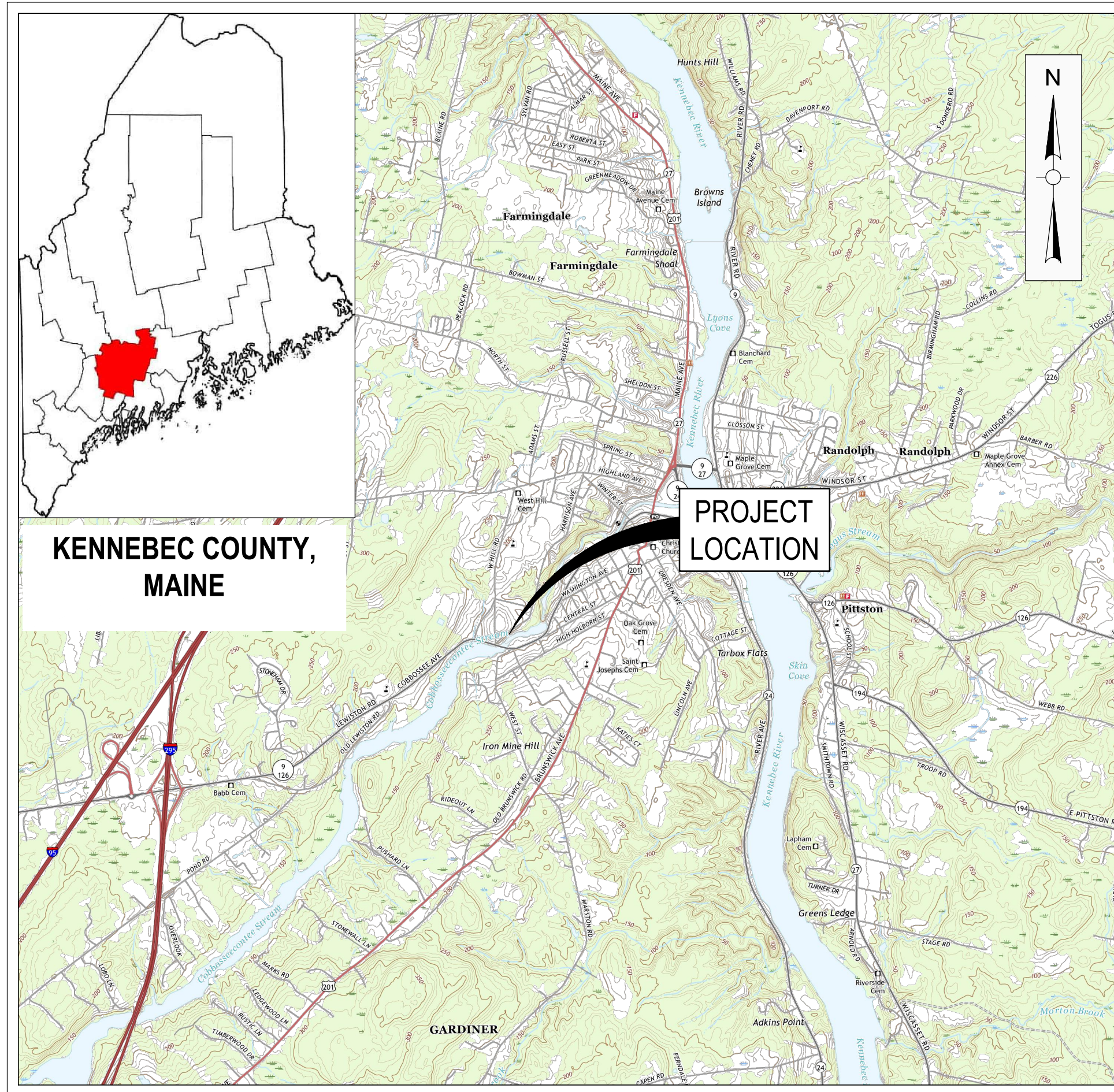


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## APPENDIX G

### Plans





LOCUS MAP  
SCALE: 1" = 3,000'



AERIAL IMAGE  
SCALE: 1" = 200'

# HARRISON AVENUE SLOPE REPAIR AND STORMWATER IMPROVEMENTS

GARDINER, MAINE  
KENNEBEC COUNTY

ISSUED FOR PERMITTING APRIL 2026



## DRAWING INDEX

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- C-2 SITE PREPARATION PLAN
- C-3 SITE IMPROVEMENTS AND MATERIALS PLAN
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- C-9 CONSTRUCTION DETAILS (2 OF 4)
- C-10 CONSTRUCTION DETAILS (3 OF 4)
- C-11 CONSTRUCTION DETAILS (4 OF 4)



Weston & Sampson Engineers, Inc.  
150 Dow Street, Tower 4, Suite 540  
Manchester, NH 03101



Know what's below.  
Call before you dig.



PLAN REFERENCES

1. TOPOGRAPHICAL INFORMATION IS BASED UPON SITE SURVEY AND EXISTING CONDITIONS MAPPING PERFORMED BY DOUCET SURVEY, LLC.
2. SITE ELEVATIONS WERE ESTABLISHED RELATIVE TO A PRE-EXISTING USGS GAGING STATION. ELEVATIONS REFERENCE THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). HORIZONTAL DATUM WAS ESTABLISHED BASED ON REDUNDANT GPS OBSERVATIONS UTILIZING KEYNET GPS VRS NETWORK GEOGRAPHIC COORDINATES ARE EXPRESSED AS NORTHINGS AND EASTINGS RELATIVE TO THE MAINE COORDINATE SYSTEM OF 2011, WEST ZONE, WHICH IS A TRANSVERSE MERCATOR PROJECTION OF THE NORTH AMERICAN DATUM OF 1983 (NAD83).
3. DIMENSIONS INDICATED ARE IN EITHER DECIMAL FEET OR FEET-AND-INCHES.
4. 'OWNER' SHALL MEAN THE CITY OF GARDINER, MAINE.
5. 'ENGINEER' SHALL MEAN WESTON & SAMPSON ENGINEERS, INC.
6. LOCATIONS OF ANY UTILITIES SHOWN ON THESE PLANS ARE APPROXIMATE ONLY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF SUCH UTILITIES, PROTECTING ALL EXISTING UTILITIES, AND REPAIRING ANY DAMAGE DONE DURING CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ON-SITE COORDINATION WITH UTILITY COMPANIES AND PUBLIC AGENCIES AND FOR OBTAINING ALL REQUIRED PERMITS AND PAYING ALL REQUIRED FEES.

NOTES TO BIDDERS

1. ALL BIDDERS ARE REQUIRED TO INSPECT THE PROJECT SITE IN ITS ENTIRETY PRIOR TO SUBMITTING THEIR BID, AND BECOME FAMILIAR WITH ALL CONDITIONS AS THEY MAY AFFECT THEIR BID. CONTRACTOR AND SUB-CONTRACTOR SHALL BE FAMILIAR WITH ALL DRAWINGS AND SPECIFICATIONS PRIOR TO COMMENCING THE CONSTRUCTION.
2. SCANNED COPIES OF AVAILABLE DRAWINGS ASSOCIATED WITH PRIOR SITE CONSTRUCTION WORK ARE ACCESSIBLE TO PROSPECTIVE BIDDERS UPON REQUEST. THE OWNER AND ENGINEER ARE NOT RESPONSIBLE FOR THE ACCURACY AND VALIDITY OF SUCH INFORMATION OR FOR THE CONTRACTOR'S INTERPRETATIONS OF SUCH INFORMATION.

STREAM LEVEL FOR PROJECT SITE

RIVER LEVEL DESCRIPTION	REFENCE DATUM	ELEVATION
NORMAL STREAM LEVEL RANGE*	NAVD88	123 - 124
FEMA 100-YEAR STORM STREAM LEVEL**	NAVD88	129

\* BASED ON THE STREAM LEVELS SURVEYED NOVEMBER 2023 AND DECEMBER 2024. LEVELS ARE EXPECTED TO FLUCTUATE BASED ON TIME OF YEAR, PRECIPITATION, AND OPERATIONS AT NEW MILLS DAM.

\*\* BASED ON THE FEMA 100-YEAR FLOOD LEVEL ACCORDING TO THE KENNEBEC COUNTY, MAINE FLOOD INSURANCE STUDY DOCUMENT PREPARED BY FEMA AND FEMA'S NATIONAL FLOOD HAZARD LAYER.

GENERAL REQUIREMENTS OF THE CONTRACTOR

1. COORDINATE ALL WORK WITH THE OWNER AND THE OWNER'S ENGINEER.
2. DELINEATE THE LIMIT OF WORK IN THE FIELD PRIOR TO THE START OF CONSTRUCTION ACTIVITY.
3. PROVIDE ALL EQUIPMENT, MATERIALS, AND LABOR NECESSARY TO CONSTRUCT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
4. NOTIFY DIG-SAFE AT LEAST 72-HOURS PRIOR TO EXCAVATING AT ANY LOCATION. PROVIDE A COPY OF THE DIG-SAFE PROJECT REFERENCE NUMBER(S) TO THE OWNER AND ENGINEER PRIOR TO EXCAVATION.
5. SUPPLY THE OWNER WITH THE NAME OF THE OSHA "COMPETENT PERSON" PRIOR TO CONSTRUCTION.
6. CHECK AND VERIFY ALL EXISTING CONDITIONS AND RELEVANT DIMENSIONS AT THE SITE PRIOR TO THE START OF CONSTRUCTION AND PRIOR TO ORDERING MATERIALS.
7. REVIEW ALL DRAWINGS AND SPECIFICATIONS TO DETERMINE THE EXTENT OF EXCAVATION AND DEMOLITION REQUIRED TO RECEIVE SITE IMPROVEMENTS.
8. VERIFY THE LOCATION, SIZE, SERVICE, AND INVERT ELEVATION OF ALL UNDERGROUND UTILITIES AND STRUCTURES AS IT MAY PERTAIN TO THE WORK PRIOR TO CONSTRUCTION. COORDINATE ACTIVITY WITH RESPECTIVE UTILITY COMPANIES, EMERGENCY SERVICES, AND THE OWNER.
9. ESTABLISH AND MAINTAIN SURVEY CONTROL DURING PERFORMANCE OF THE WORK AND TO VERIFY EXISTING ELEVATIONS.
10. THOROUGHLY REVIEW AND UNDERSTAND THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL NOTIFY THE OWNER AND ENGINEER OF ERRORS, OMISSIONS, AND / OR DISCREPANCIES PRIOR TO THE START OF CONSTRUCTION AND PRIOR TO ORDERING MATERIALS.
11. UNLESS INDICATED IN THE CONTRACT DOCUMENTS OR INSTRUCTED OTHERWISE, MATCH EXISTING GRADES AT ALL LOCATIONS WHERE NEW WORK MEETS EXISTING CONDITIONS.
12. RESTORE ALL DISTURBED AREAS TO THE ORIGINAL CONDITIONS OR AS SHOWN ON THE CONTRACT DRAWINGS. ALL CONSTRUCTION WASTE MATERIAL AND BARRICADES SHALL BE REMOVED FROM ALL AREAS WHEN CONSTRUCTION IS COMPLETED.
13. RAISE OR LOWER ALL EXISTING UTILITY VALVES, COVERS, GRATES, ETC. AS NEEDED TO BE FLUSH WITH THE FINAL GRADE UNLESS STATED OTHERWISE.
14. PROTECT FROM DAMAGE ALL TREES AND EXISTING SITE FEATURES WITHIN THE WORK AREA THAT ARE TO REMAIN.
15. PROPERLY MAINTAIN AND INSPECT ALL TEMPORARY EROSION CONTROL MEASURES UNTIL THE SITE IS PERMANENTLY STABILIZED.
16. HAULING OF MATERIALS TO AND FROM THE SITE SHALL BE RESTRICTED TO THE HOURS OF 7:00 AM TO 5:00 PM MONDAY THROUGH FRIDAY. HAULING SHALL ALSO BE PROHIBITED ON STATE AND FEDERAL HOLIDAYS.
17. KEEP ALL STREETS, PARKING LOTS, AND WALKS THAT ARE NOT RESTRICTED FROM PUBLIC USE DURING CONSTRUCTION BROOM CLEAN AT ALL TIMES. THE CONTRACTOR SHALL USE ACCEPTABLE METHODS AND MATERIALS TO MAINTAIN ADEQUATE DUST CONTROL THROUGHOUT CONSTRUCTION.
18. THE CONTRACTOR SHALL MAINTAIN ACCESS TO HARRISON AVENUE RESIDENCES AT ALL TIMES.
19. TAKE ALL NECESSARY PRECAUTIONS TO PROTECT CONTRACTOR EMPLOYEES, AS WELL AS PUBLIC USERS FROM INJURY DURING THE ENTIRE CONSTRUCTION PERIOD USING ALL NECESSARY SAFEGUARDS, INCLUDING BUT NOT LIMITED TO, THE ERECTION OF TEMPORARY WALKS, STRUCTURES, PROTECTIVE BARRIERS, COVERINGS, OR FENCES AS NEEDED.
20. MAKE ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE, AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY OWNER AT NO ADDITIONAL COST TO THE OWNER.
21. RECORD ANY ALTERATIONS TO THESE DRAWINGS ON "AS-BUILT" DRAWINGS.

CONFLICTS AND DISCREPANCIES

1. 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.
2. ANY DISCREPANCIES OR CONFLICTS BETWEEN THE DRAWINGS AND EXISTING CONDITIONS, EXISTING CONDITIONS TO REMAIN, TEMPORARY CONSTRUCTION, PERMANENT CONSTRUCTION, AND WORK OF ADJACENT CONTRACTS SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER BEFORE PROCEEDING. ITEMS ENCOUNTERED IN AREAS OF EXCAVATION THAT ARE NOT INDICATED ON THE DRAWINGS, BUT ARE VISIBLE ON SURFACE, SHALL BE THE CONTRACTOR'S RESPONSIBILITY AND SHALL BE REMOVED AT NO ADDITIONAL COST TO THE OWNER.

SITE SAFETY / SECURITY, UTILIZATION, AND LIMIT OF WORK

1. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR CONSTRUCTION SITE SECURITY AND SAFETY AND SHALL PREVENT ACCESS BY THE PUBLIC TO THE SITE AT ALL TIMES DURING THE WORK, INCLUDING DURING NON-WORKING HOURS. THESE DRAWINGS DO NOT INDICATE ALL COMPONENTS WHICH MAY BE NECESSARY FOR CONSTRUCTION SAFETY.
2. THE CONTRACTOR SHALL CONFINE THE OPERATIONS AND ACTIVITIES FOR CONSTRUCTION PURPOSES WITHIN THE LIMIT OF WORK INDICATED IN THESE DRAWINGS.
3. SPECIFIC AREAS WITHIN THE LIMIT OF WORK ARE INDICATED IN THESE DRAWINGS AS AREAS AVAILABLE FOR CONTRACTOR USE DURING THE WORK. HOWEVER, NO ADDITIONAL CONSIDERATION OR PAYMENT WILL BE MADE FOR TEMPORARY SIGNAGE, FENCING, EROSION / SEDIMENTATION CONTROLS, EARTHWORK, GROUND STABILIZATION, ETC. IN THESE AREAS THAT MAY BE REQUIRED OR NECESSARY TO FULFILL THE CONTRACTOR'S NEEDS.
4. IF THE CONTRACTOR IDENTIFIES ADDITIONAL STAGING AREAS ON THE OWNER'S PROPERTY, THE CONTRACTOR SHALL MAKE A WRITTEN REQUEST TO THE OWNER AND ENGINEER DESCRIBING THE NEED, LOCATION, AND EXTENTS OF THE PROPOSED AREA. NO GUARANTEE IS MADE THAT ADDITIONAL STAGING AREAS WILL BE MADE AVAILABLE.

SITE PROTECTION AND RESTORATION

1. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN EROSION AND SEDIMENTATION CONTROLS AS SHOWN AND AS REQUIRED BY THE PROJECT PERMITS. SUCH CONTROLS SHALL REMAIN IN-PLACE UNTIL ALL DISTURBED AREAS HAVE BEEN RESTORED TO THEIR ORIGINAL CONDITION AND AS REQUIRED BY THE PROJECT PERMITS. THE CONTRACTOR IS RESPONSIBLE FOR REMOVING ALL EROSION AND SEDIMENT CONTROLS UPON COMPLETION OF THE WORK AND APPROVAL BY APPLICABLE PERMITTING AUTHORITIES.
2. ALL SEDIMENT AND EROSION CONTROL DEVICES SHALL BE PUT INTO PLACE PRIOR TO BEGINNING ANY CONSTRUCTION OR DEMOLITION AND SHALL BE MAINTAINED THROUGHOUT THE DURATION OF THE PROJECT.
3. THE CONTRACTOR SHALL MEET ALL STATE OF MAINE DEP AND CITY OF GARDINER WETLAND ORDINANCE REGULATIONS FOR SEDIMENT AND EROSION CONTROL.
4. ALL STAGING AND STOCKPILE AREAS SHALL BE PROTECTED FROM EROSION AND CONTAMINATION INTO ANY RESOURCE AREA BY EROSION AND SEDIMENT CONTROLS. EXCAVATED MATERIAL STOCKPILED ON THE SITE SHALL BE SURROUNDED BY A RING OF UNBROKEN SEDIMENT AND EROSION CONTROL FENCE.
5. ALL EXISTING DRAINAGE FACILITIES TO REMAIN SHALL BE MAINTAINED FREE OF DEBRIS, SOIL, SEDIMENT, AND FOREIGN MATERIAL AND OPERATIONAL THROUGHOUT THE LIFE OF THE CONTRACT. THE CONTRACTOR SHALL REMOVE ALL SOIL, SEDIMENT, DEBRIS, AND FOREIGN MATERIAL FROM ALL DRAINAGE STRUCTURES, INCLUDING BUT NOT LIMITED TO, DRAINAGE INLETS, MANHOLES AND CATCH BASINS WITHIN THE LIMIT OF WORK AND DRAINAGE STRUCTURES OUTSIDE THE LIMIT OF WORK THAT ARE IMPACTED BY THE WORK FOR THE ENTIRE DURATION OF CONSTRUCTION.
6. THE CONTRACTOR SHALL PROVIDE DUST CONTROL FOR CONSTRUCTION OPERATIONS AS APPROVED BY THE OWNER.
7. ALL POINTS OF CONSTRUCTION EGRESS OR INGRESS SHALL BE MAINTAINED TO PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC / PRIVATE ROADS.
8. ALL AREAS DISTURBED BY THE CONTRACTOR BEYOND THE LIMIT OF WORK SHALL BE RESTORED TO MATCH PRE-CONSTRUCTION CONDITIONS AT NO ADDITIONAL COST TO THE OWNER.
9. ALL PAVEMENT DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPLACED IN ACCORDANCE WITH THE SPECIFICATIONS AND AS SHOWN IN THESE DRAWINGS.
10. THE CONTRACTOR SHALL MAINTAIN SIDE SLOPES AND DRAINAGE SWALES DURING CONSTRUCTION TO PREVENT PONDING AND EROSION.
11. EXISTING TREES TO REMAIN SHALL BE PROTECTED FROM CONSTRUCTION ACTIVITIES. NO STOCKPILING OF MATERIAL, EQUIPMENT OR VEHICULAR TRAFFIC SHALL BE ALLOWED WITHIN THE DRIP LINE OF TREES TO REMAIN. NO GUYS SHALL BE ATTACHED TO ANY TREE TO REMAIN.

SITE CLEARING AND DEMOLITION

1. THE CONTRACTOR SHALL INCLUDE IN THE BID THE COST OF REMOVING ANY EXISTING SITE FEATURES AND APPURTENANCES NECESSARY TO ACCOMPLISH THE CONSTRUCTION OF THE PROPOSED SITE IMPROVEMENTS. THE CONTRACTOR SHALL ALSO INCLUDE IN THE BID THE COST NECESSARY TO RESTORE SUCH ITEMS IF THEY ARE SCHEDULED TO REMAIN AS PART OF THE FINAL SITE IMPROVEMENTS.
2. THE OWNER RESERVES THE RIGHT TO REVIEW ALL MATERIALS DESIGNATED FOR REMOVAL AND TO RETAIN OWNERSHIP OF SUCH MATERIALS. IF THE OWNER RETAINS ANY MATERIAL, THE CONTRACTOR SHALL ALLOW ARRANGEMENTS WITH THE OWNER TO HAVE THOSE MATERIALS REMOVED FROM THE SITE AT NO ADDITIONAL COST.
3. UNLESS SPECIFICALLY NOTED TO BE SALVAGED OR REUSED, ALL SITE FEATURES CALLED FOR REMOVAL SHALL BE REMOVED WITH THEIR FOOTINGS, ATTACHMENTS, BASE MATERIAL, ETC. AND TRANSPORTED FROM THE SITE TO BE DISPOSED OF IN A LAWFUL MANNER AT AN ACCEPTABLE DISPOSAL SITE AND AT NO ADDITIONAL COST TO THE OWNER.
4. DURING EARTHWORK OPERATIONS, THE CONTRACTOR SHALL TAKE CARE TO NOT DISTURB EXISTING MATERIALS TO REMAIN, OUTSIDE THE LIMITS OF EXCAVATION AND BACKFILL AND SHALL TAKE WHATEVER MEASURES NECESSARY. AT THE CONTRACTOR'S EXPENSE, TO PREVENT ANY EXCAVATED MATERIAL FROM COLLAPSING. ALL BACKFILL MATERIALS SHALL BE PLACED AND COMPACTED AS SPECIFIED TO THE SUBGRADE REQUIRED FOR THE INSTALLATION OF THE REMAINDER OF THE CONTRACT WORK.

LAYOUT AND MATERIALS

1. THE CONTRACTOR SHALL COORDINATE ALL LAYOUT ACTIVITIES WITH THE SCOPE OF WORK CALLED FOR BY THIS CONTRACT. THE CONTRACTOR SHALL SET, PROTECT, AND REPLACE REFERENCE STAKES AS NECESSARY OR AS REQUIRED TO ENSURE THE THE REQUIRED LINES, GRADES, AND LOCATIONS ARE HELD THROUGHOUT THE ENTIRE PROJECT DURATION.
2. ALL WORK SHALL BE PERFORMED BY THE CONTRACTOR UNLESS SPECIFICALLY INDICATED THAT THE WORK WILL BE PERFORMED "BY OTHERS".
3. ALL PROPOSED SITE FEATURES SHALL BE LAID OUT AND STAKED FOR REVIEW AND APPROVAL BY THE OWNER AND ENGINEER PRIOR TO COMMENCEMENT OF INSTALLATION. ANY REQUIRED ADJUSTMENTS TO THE LAYOUT SHALL BE UNDERTAKEN AS REQUIRED, AT NO ADDITIONAL COST TO THE OWNER.
4. ALL PROPOSED PAVEMENTS SHALL MEET THE LINE AND GRADE OF EXISTING ADJACENT PAVEMENT SURFACES AND SHALL BE TREATED WITH AN RS-1 TACK COAT AT POINT OF CONNECTION.
5. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND GRADES ON THE GROUND AND REPORT ANY DISCREPANCIES IMMEDIATELY TO THE OWNER.

EXCAVATION, GRADING, AND DRAINAGE

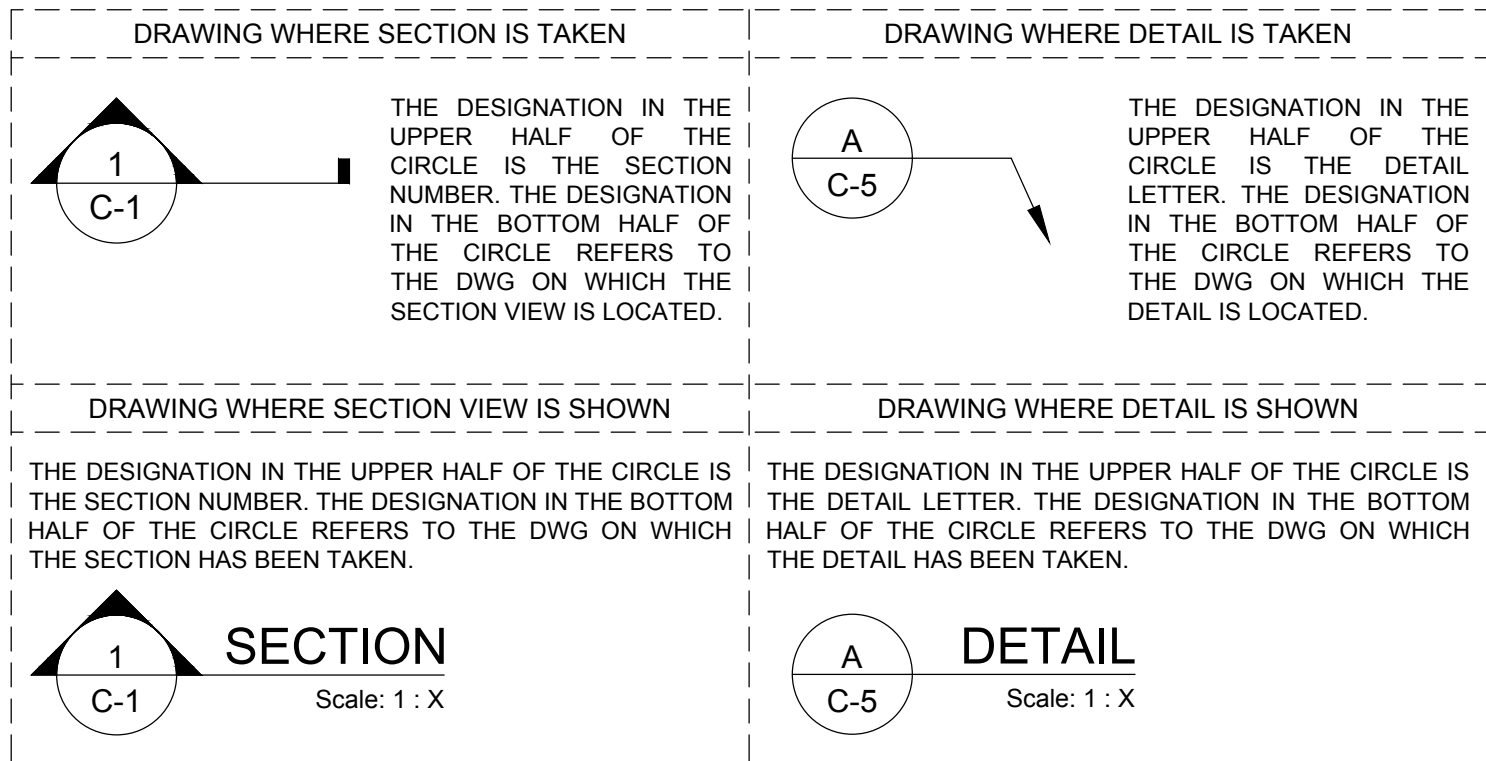
1. ALL WORK RELATING TO INSTALLATION, RENOVATION OR MODIFICATION OF WATER, DRAINAGE AND / OR SEWER SERVICES SHALL BE PERFORMED IN ACCORDANCE WITH THE STANDARDS OF THE CITY OF GARDINER. THE CONTRACTOR SHALL NOTIFY THE GARDINER DEPARTMENT OF PUBLIC WORKS PRIOR TO PERFORMING ANY PAVEMENT CUTS OR MAKING CONNECTIONS TO ANY CITY UTILITIES.
2. THE CONTRACTOR SHALL OBTAIN A STREET OPENING PERMIT FROM THE GARDINER DEPARTMENT OF PUBLIC WORKS PRIOR TO PERFORMING ANY EXCAVATION WITHIN THE PUBLIC RIGHT OF WAY.
3. ALL GRADING IS TO BE SMOOTH AND CONTINUOUS. WHERE PROPOSED GRAVEL SURFACE MEETS EXISTING SURFACE, BLEND THE TWO PAVEMENTS. ELIMINATE ROUGH SPOTS AND ABRUPT GRADE CHANGES, AND MEET LINE AND GRADE OF EXISTING CONDITIONS WITH NEW IMPROVEMENTS.
4. THE CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE (1.5% MINIMUM) AWAY FROM ALL BUILDING FOUNDATIONS AND STRUCTURES.
5. THE CONTRACTOR SHALL ENSURE ALL AREAS ARE PROPERLY PITCHED TO DRAIN, WITH NO SURFACE WATER PONDING OR PUDDLING.
6. ALL UTILITY GRATES, COVERS, OR OTHER SURFACE ELEMENTS INTENDED TO BE EXPOSED AT GRADE SHALL BE FLUSH WITH THE ADJACENT FINISHED GRADE AND ADJUSTED TO PROVIDE A SMOOTH TRANSITION AT ALL EDGES.
7. THE CONTRACTOR SHALL SET SUBGRADE ELEVATIONS TO ALLOW FOR POSITIVE DRAINAGE AND PROVIDE EROSION CONTROL DEVICES, STRUCTURES, MATERIALS AND CONSTRUCTION METHODS TO DIRECT SILT MIGRATION AWAY FROM DRAINAGE AND OTHER UTILITY SYSTEMS, PUBLIC / PRIVATE STREETS AND WORK AREAS. THE CONTRACTOR SHALL CLEAN OUT BASINS REGULARLY AND AT THE END OF THE PROJECT.
8. EXCAVATION REQUIRED WITHIN PROXIMITY OF KNOWN EXISTING UTILITY LINES SHALL BE DONE BY HAND. THE CONTRACTOR SHALL REPAIR ANY DAMAGE TO EXISTING UTILITY LINES OR STRUCTURES INCURRED DURING CONSTRUCTION OPERATIONS AT NO COST TO THE OWNER.
9. WHERE NEW EARTHWORK MEETS EXISTING EARTHWORK, THE CONTRACTOR SHALL BLEND NEW EARTHWORK SMOOTHLY INTO EXISTING, PROVIDING VERTICAL CURVES OR ROUNDS AT ALL TOP AND BOTTOM OF SLOPES.
10. NO FILL SHALL CONTAIN HAZARDOUS MATERIAL.
11. FILLING OF EXCAVATED AREAS SHALL NOT TAKE PLACE WITHOUT THE PRESENCE OR PERMISSION OF THE OWNER AND WITHOUT GIVING PRIOR NOTIFICATION TO THE ENGINEER.
12. WHERE A SPECIFIC LIMIT OF WORK LINE IS NOT OBVIOUS OR IMPLIED, BLEND PROPOSED GRADES TO EXISTING CONDITIONS.
13. RESTORE ALL DISTURBED AREAS AND LIMITS OF ALL REMOVALS TO LOAM AND SEED UNLESS OTHERWISE NOTED.

CONSTRUCTION MEANS, METHODS, AND SEQUENCE

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE MEANS AND METHODS OF CONSTRUCTION, EXCEPT WHERE SPECIFIED IN THE CONTRACT DOCUMENTS.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SEQUENCE OF THE WORK, EXCEPT WHERE SPECIFIED IN THE CONTRACT DOCUMENTS.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SURFACE WATER AND GROUNDWATER CONTROL DURING THE WORK. TEMPORARY WATER CONTROL MEASURES SHALL BE, AT A MINIMUM, AS REQUIRED BY THE CONTRACT DOCUMENTS AND APPLICABLE PERMIT CONDITIONS.
4. WHERE NO INDICATION IS MADE IN THESE DRAWINGS, THE SLOPE OF AN EXCAVATION SHALL BE DETERMINED BASED ON THE CONTRACTOR'S MEANS AND METHODS. IN ALL CASES, EXCAVATIONS MUST BE IN COMPLIANCE WITH APPLICABLE LOCAL, STATE, AND FEDERAL REGULATIONS, REGARDLESS OF DEPICTIONS SHOWN IN THESE DRAWINGS.

METHOD OF SECTIONING AND DETAILING

SECTION VIEWS AND DETAILS ARE CROSS-REFERENCED BETWEEN DRAWINGS AS FOLLOWS:



Project:

CITY OF GARDINER,  
MAINE



HARRISON AVENUE SLOPE  
REPAIR AND STORMWATER  
IMPROVEMENTS

Weston & Sampson

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978.532.1900  
800.SAMPSON  
www.westonandsampson.com

Consultants:

Revisions:

No.	Date	Description

Seal:

Issued For:

PERMITTING

Scale:

Date: APRIL 2026

Drawn By: TJB

Reviewed By: MJZ

Approved By: TJS

W&S Project No.: ENG23-0628

W&S File No.: ---

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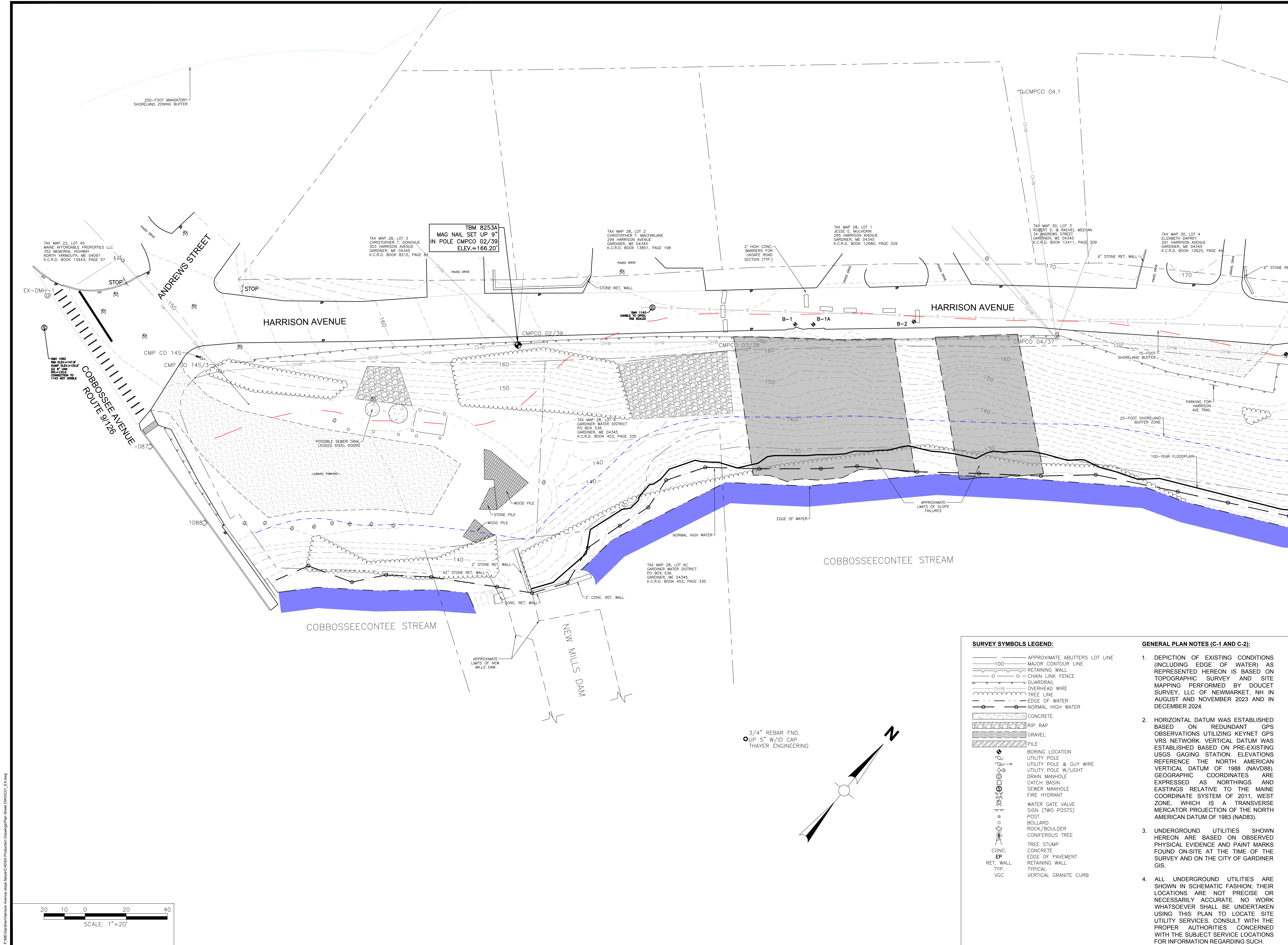
GENERAL  
NOTES

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G-1




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HARRISON AVENUE SLOPE  
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APRIL 2026

Drawn By:

TJB

Reviewed By:

MJZ

Approved By:

TJS

W&S Project No.:

ENG23-0628

W&S File No.:

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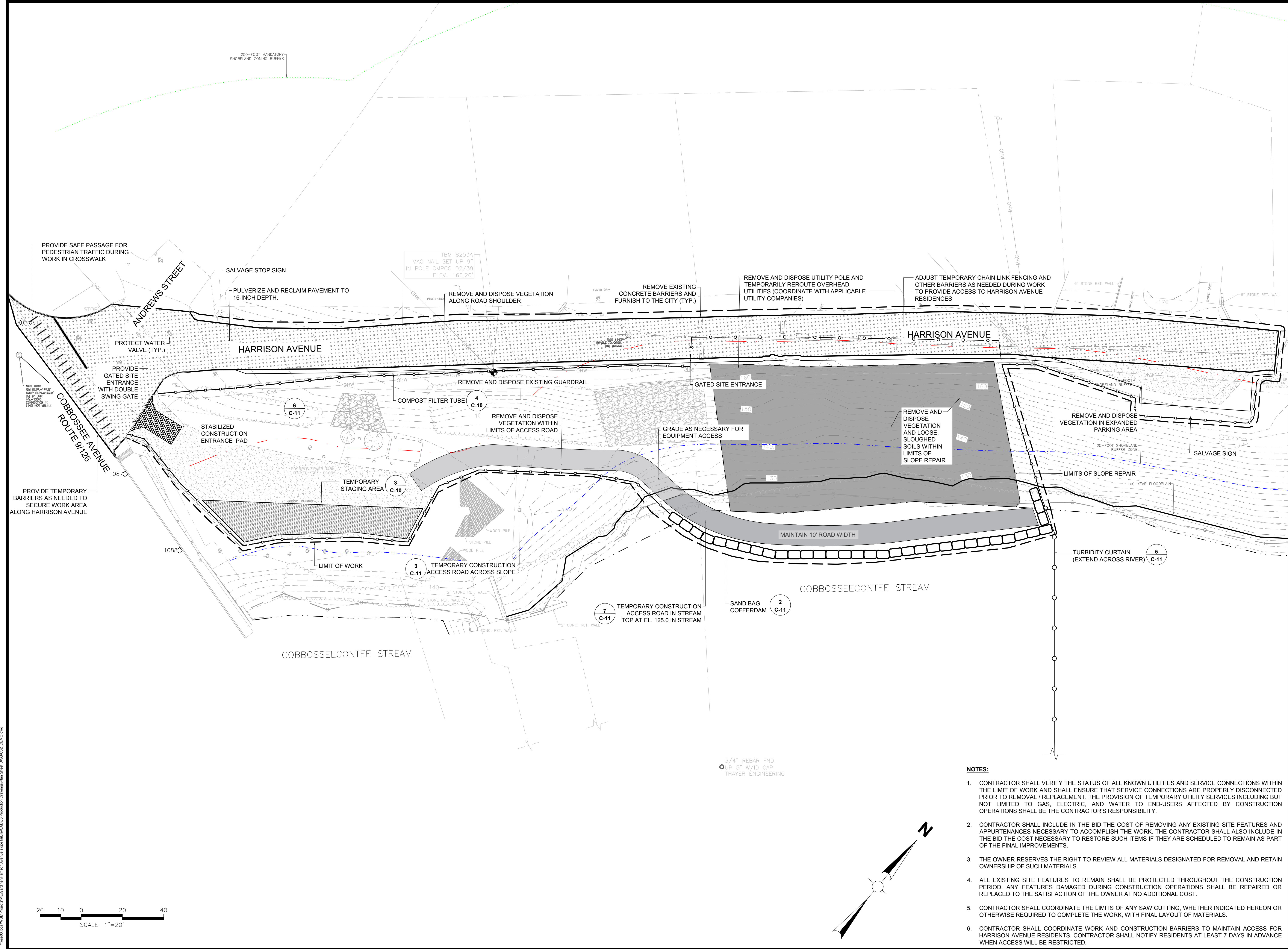
EXISTING  
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PLAN

Sheet Number:

C-1

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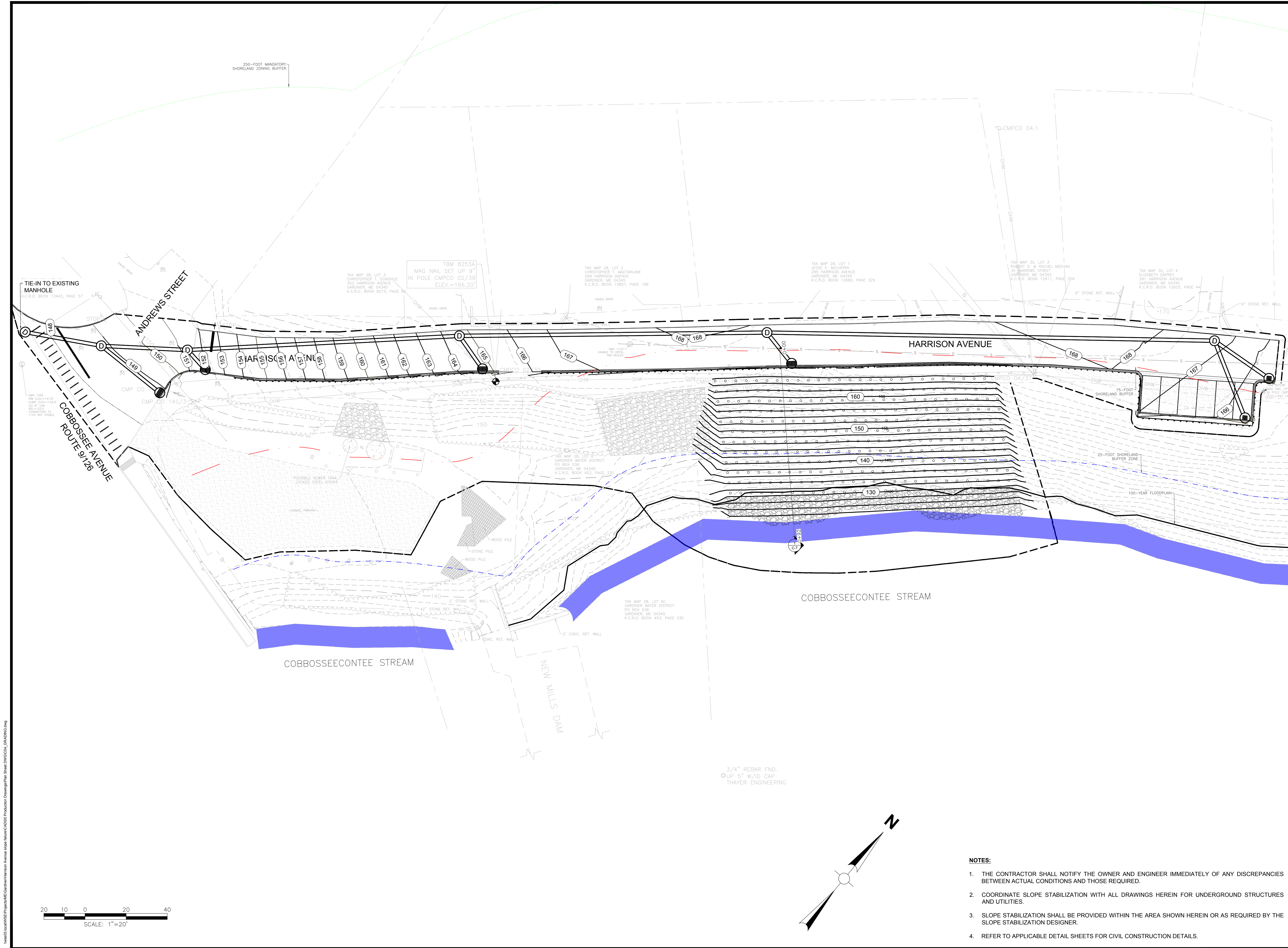













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Drawn By: TJB  
Reviewed By: MJZ  
Approved By: TJS

W&S Project No.: ENG23-0628  
W&S File No.:

Drawing Title:

GRADING AND  
DRAINAGE  
PLAN

Sheet Number:

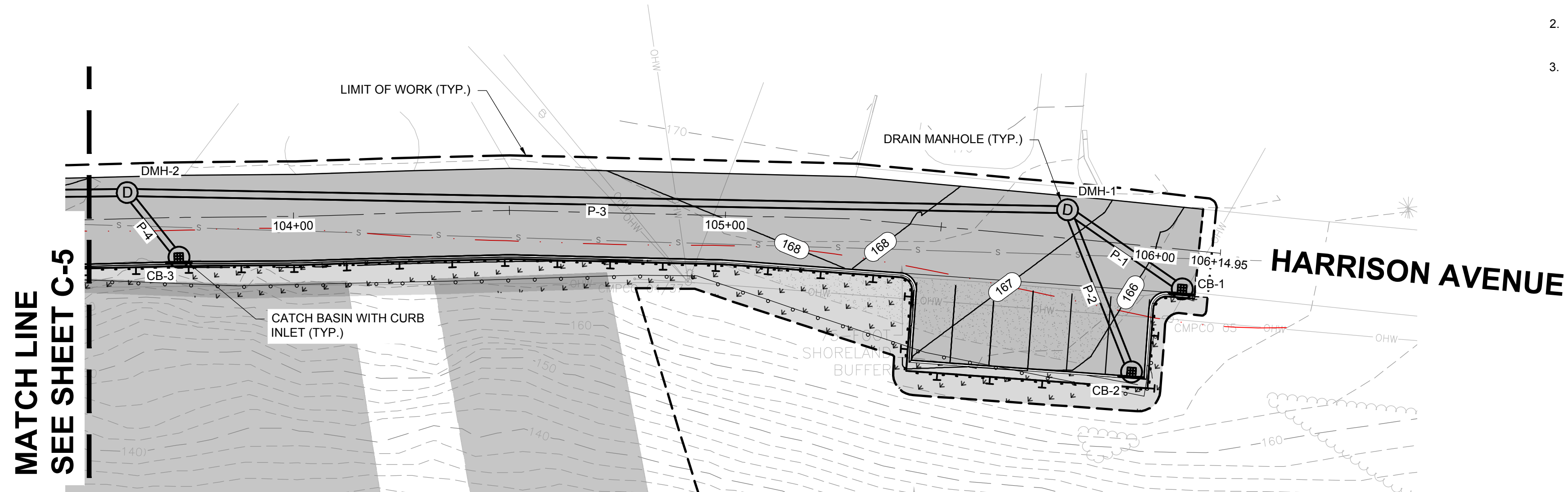
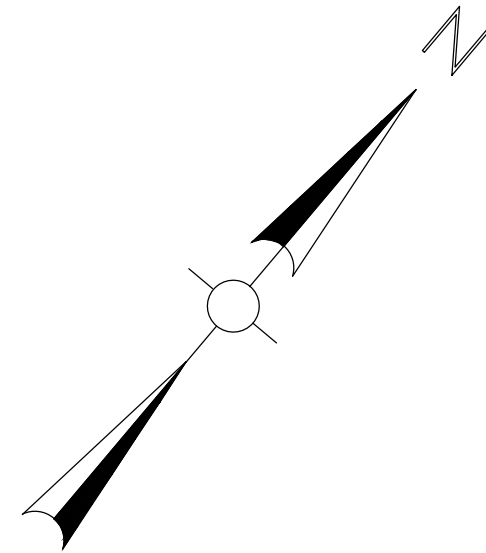
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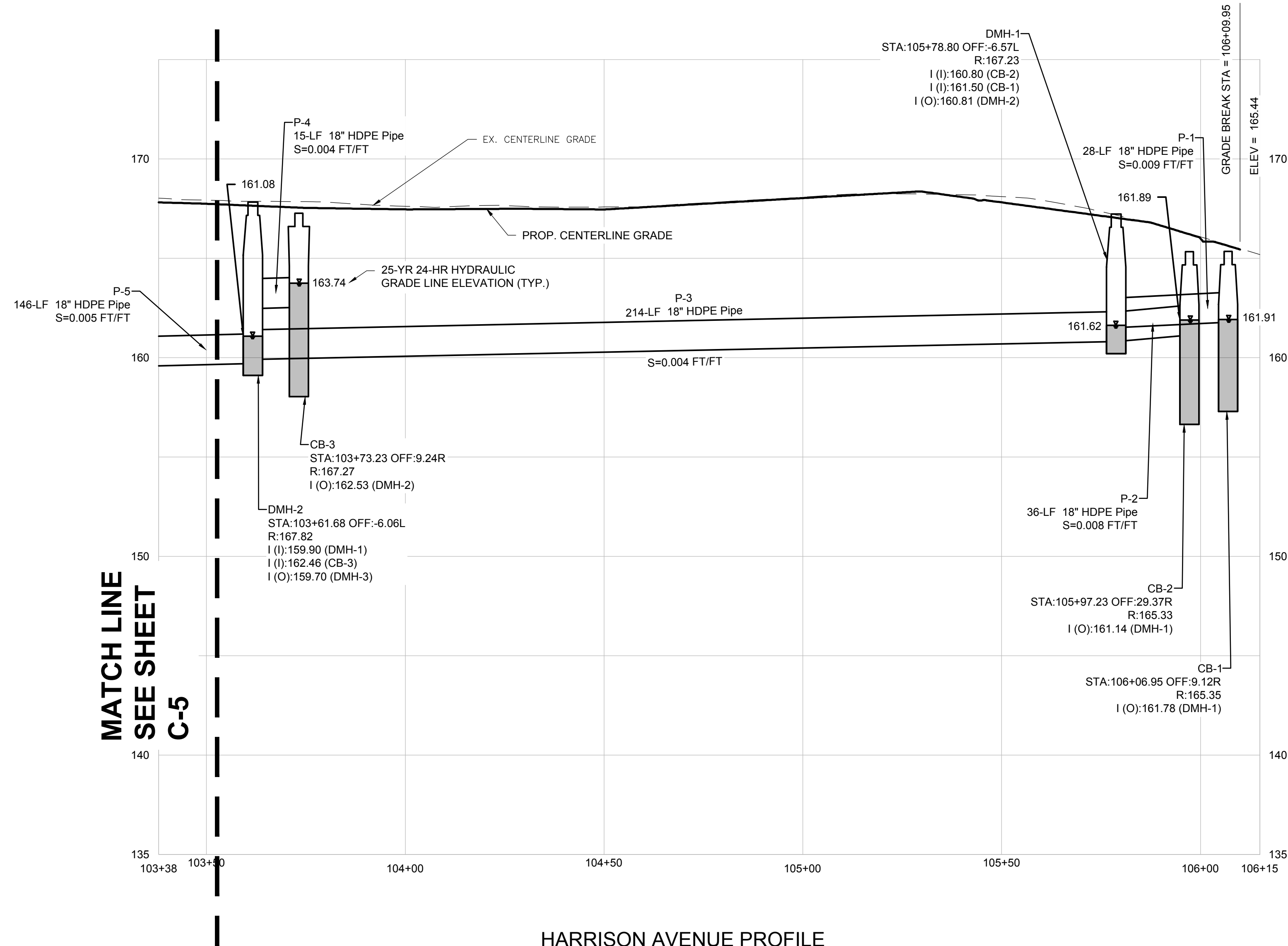
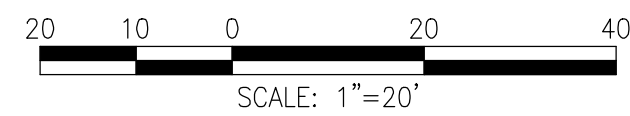




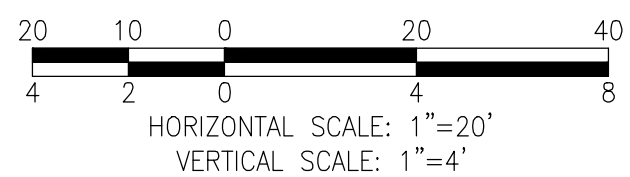




HARRISON AVENUE PLAN  
(STA 103+53 TO 106+15)



HARRISON AVENUE PROFILE  
(STA 103+53 TO 106+15)

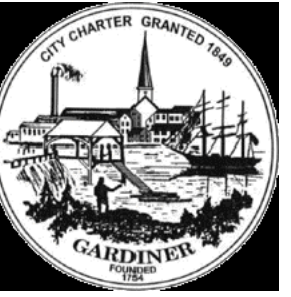


NOTES:

1. PROFILE ONLY SHOWS PROPOSED DRAINAGE PIPES AND STRUCTURES. THIS PLAN INDICATES THE LIMITS OF PROPOSED HARRISON AVENUE WORK ONLY.
2. HORIZONTAL LOCATIONS OF OTHER UTILITIES ARE APPROXIMATE ONLY AND ARE NOT THE RESULT OF AN ACTUAL FIELD SURVEY.
3. CONTRACTOR TO VERIFY LOCATIONS, ELEVATIONS, AND INVERTS OF EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION.

Project:

CITY OF GARDINER,  
MAINE



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Revisions:

No.	Date	Description

Seal:

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Date: APRIL 2026

Drawn By: TJB

Reviewed By: MJZ

Approved By: TJS

W&S Project No.: ENG23-0628

W&S File No.:

Drawing Title:

GRADING AND  
DRAINAGE  
PLAN AND  
PROFILE  
STA 103+53 TO  
STA 106+15

Sheet Number:

C-6

Revisions:		
No.	Date	Description

Seal:

Issued For:

PERMITTING

Scale:

Date: APRIL 2026  
Drawn By: TJB  
Reviewed By: MJZ  
Approved By: TJS

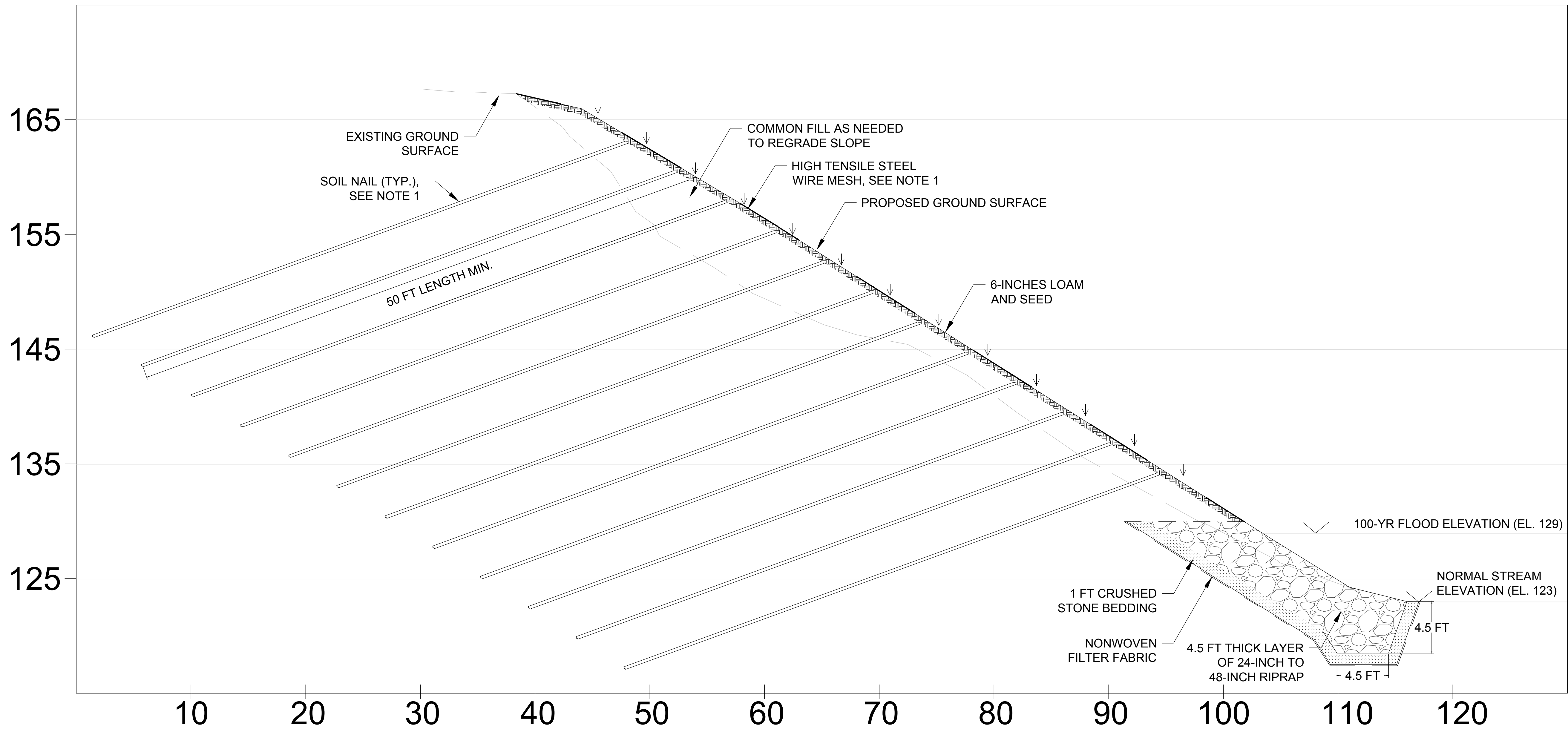
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W&S File No.: ---

Drawing Title:

**SITE  
SECTIONS**

Sheet Number:

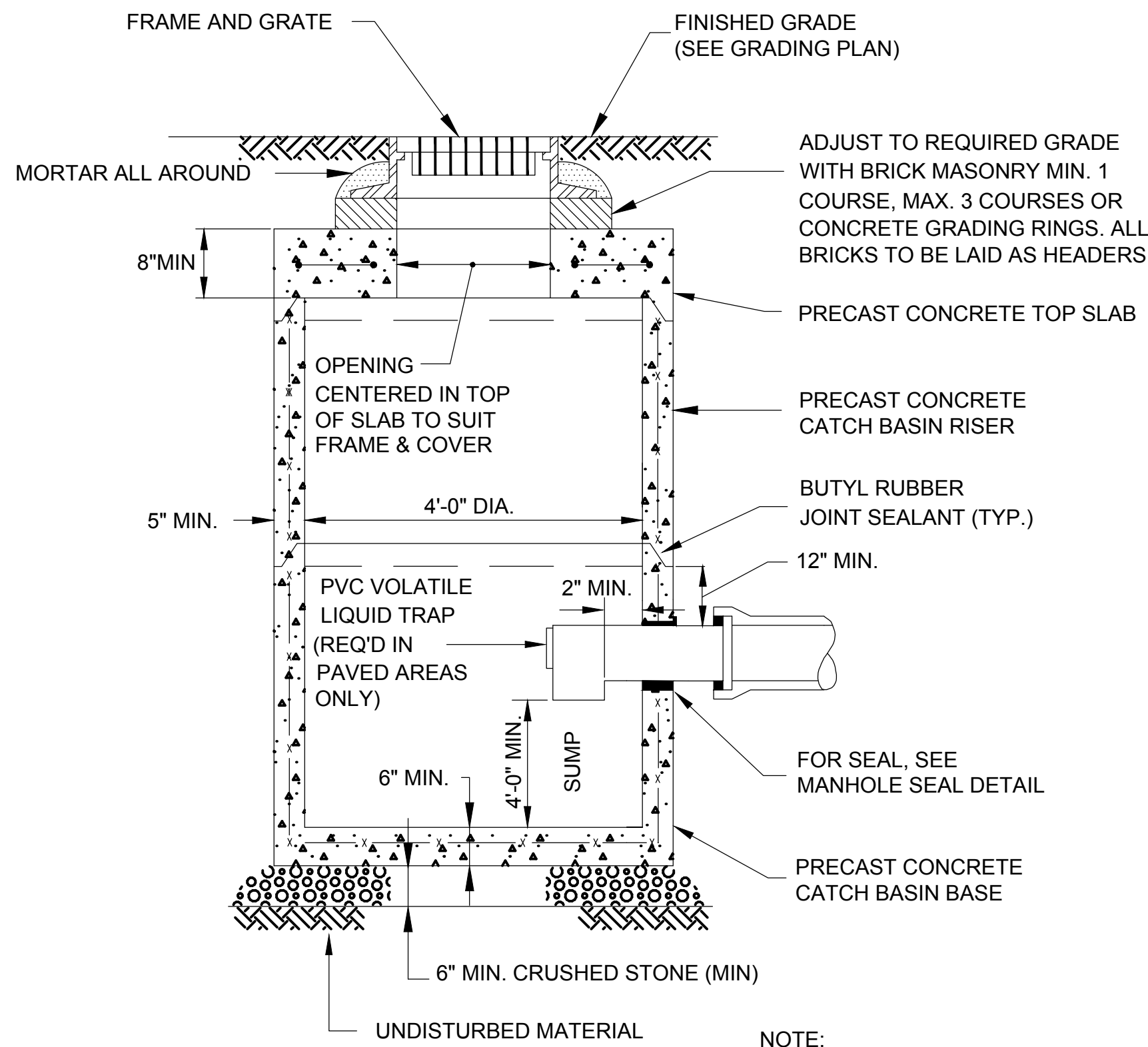
**C-7**



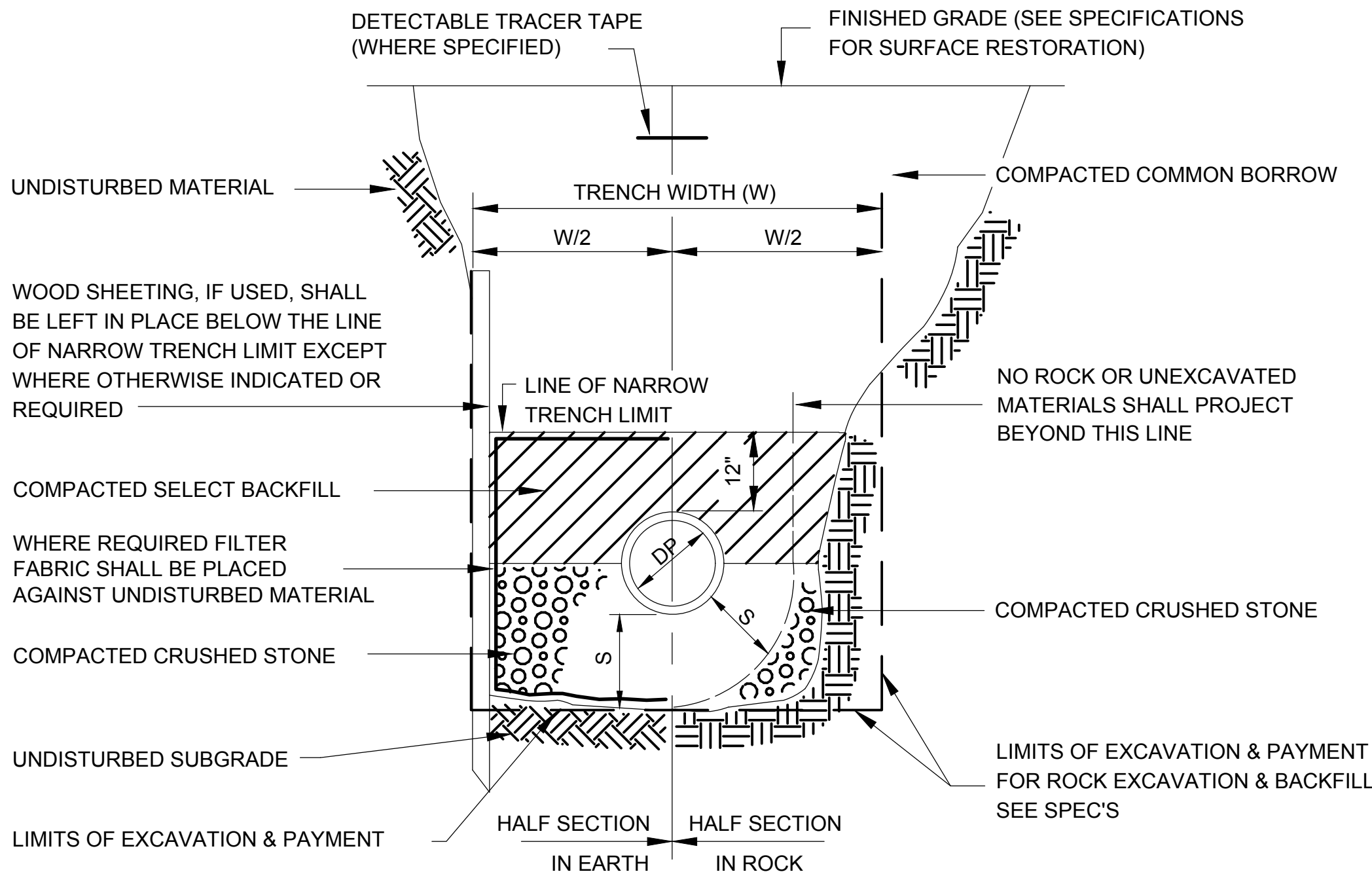
**1**  
**C-3**  
**SECTION**  
Scale: 1" = 5'

- NOTES:**
- SLOPE STABILIZATION SOIL NAILS AND WIRE MESH ARE DEPICTED IN SECTION AS SCHEMATIC ONLY. SOIL STABILIZATION DESIGNER RESPONSIBLE FOR EXTENT, LOCATION, LAYOUT DIMENSIONS, TYPE, AND ORIENTATION OF SLOPE STABILIZATION SOIL NAIL SYSTEM AND DESIGN OF WIRE MESH. REFER TO SPECIFICATION SECTION XX XX XX - SOIL NAILS.
  - SLOPE FILLING, COMPACTION AND FINAL GRADING SHALL OCCUR PRIOR TO INSTALLATION OF SOIL NAILS SUCH THAT ALL SOIL NAILS EXTEND TO FINAL GRADE AND SURFICIAL SOILS ARE RETAINED BY WIRE MESH REINFORCEMENT.

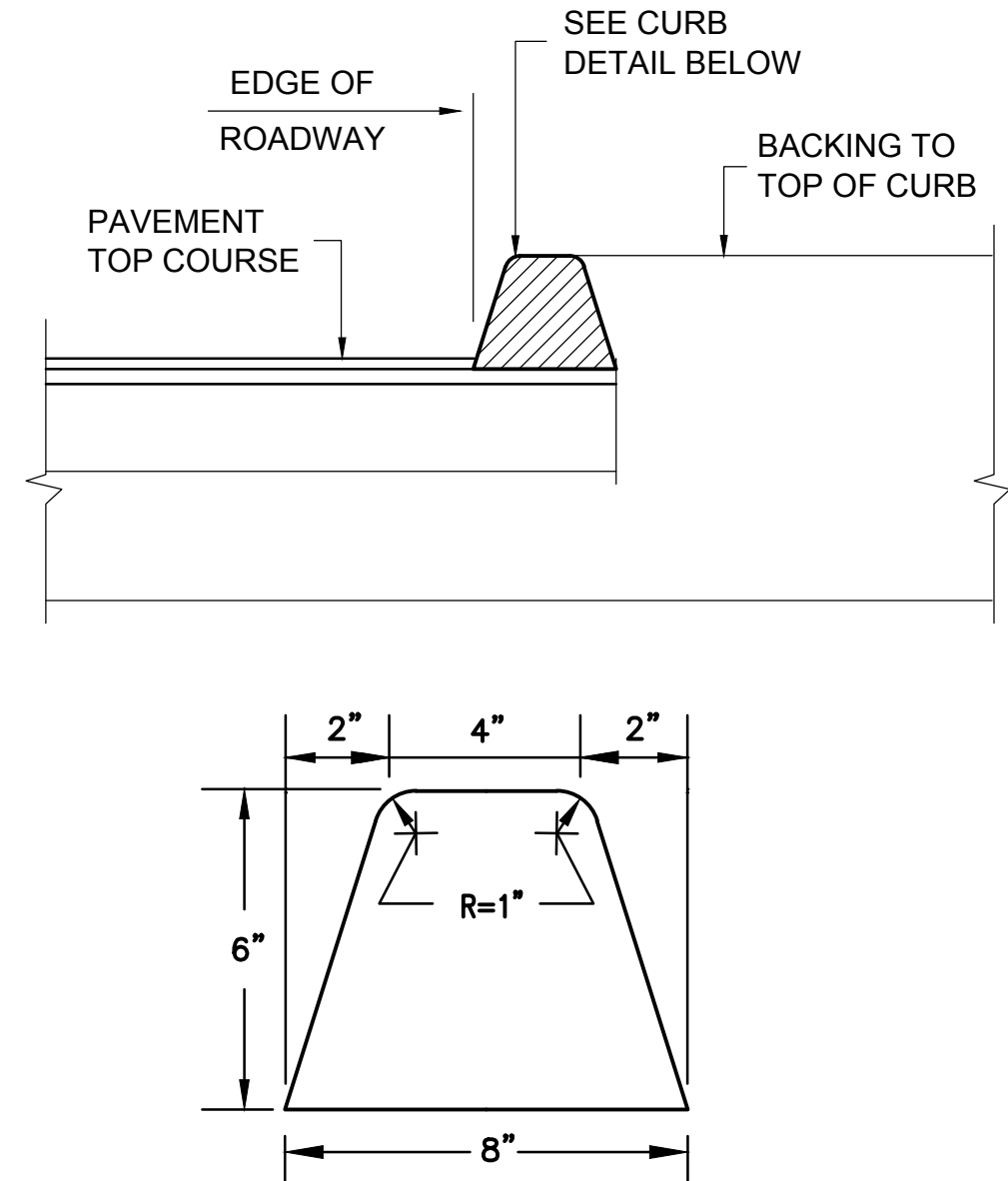




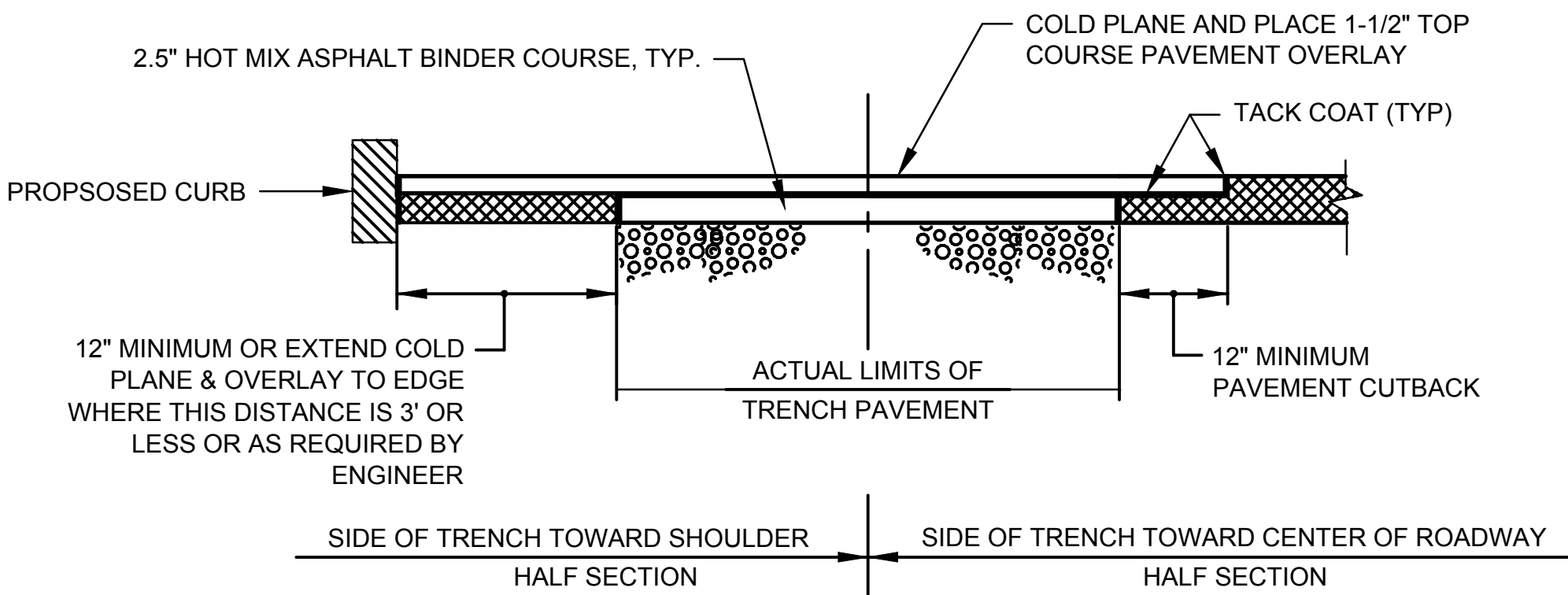
1 PRECAST CATCH BASIN DETAIL  
SCALE: N.T.S.



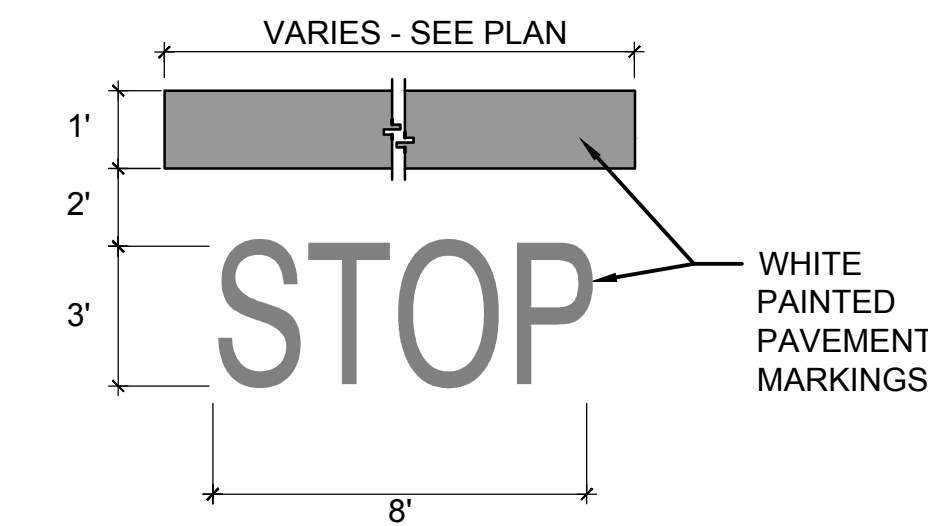
2 DRAINAGE TRENCH DETAIL  
SCALE: N.T.S.



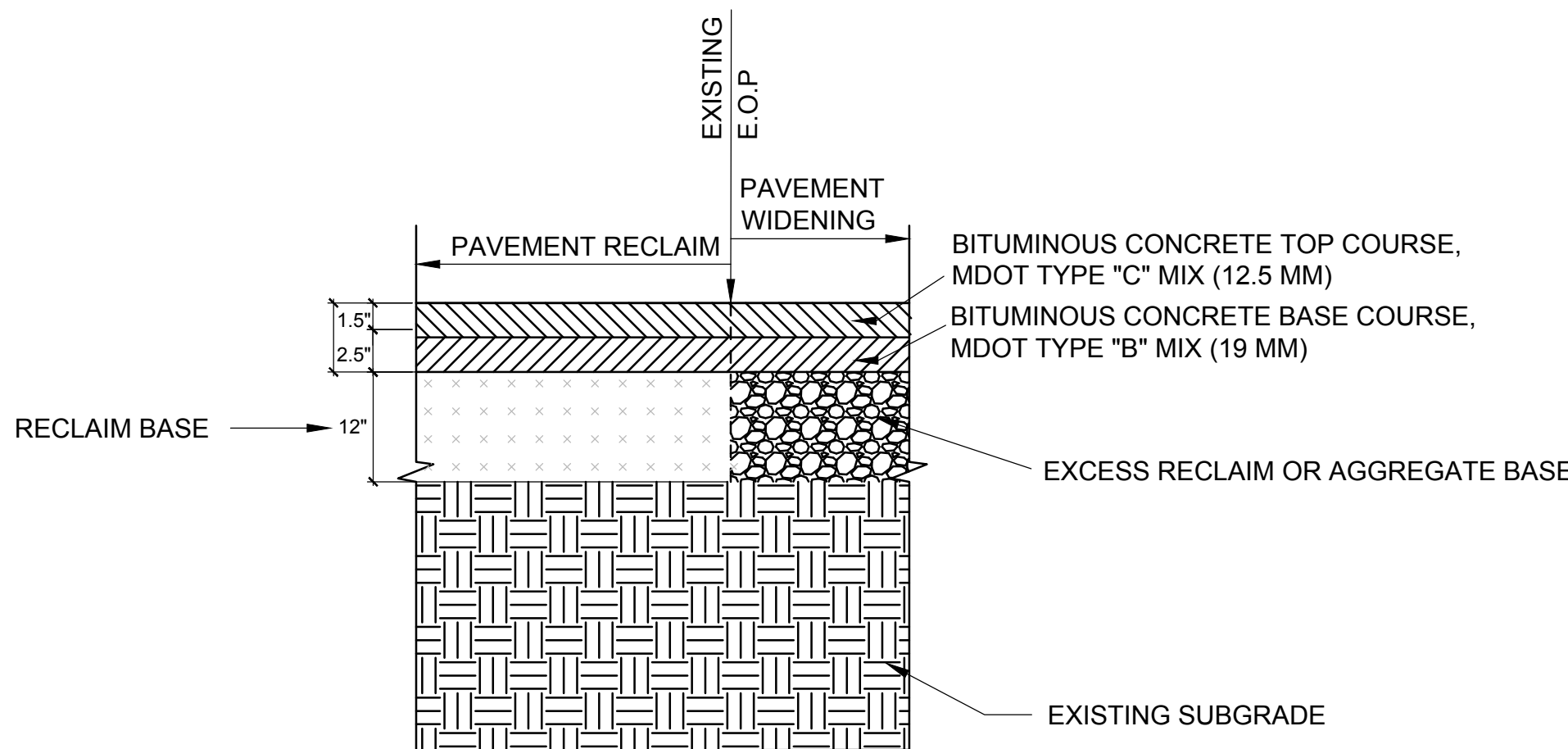
3 ASPHALT CURB  
SCALE: N.T.S.



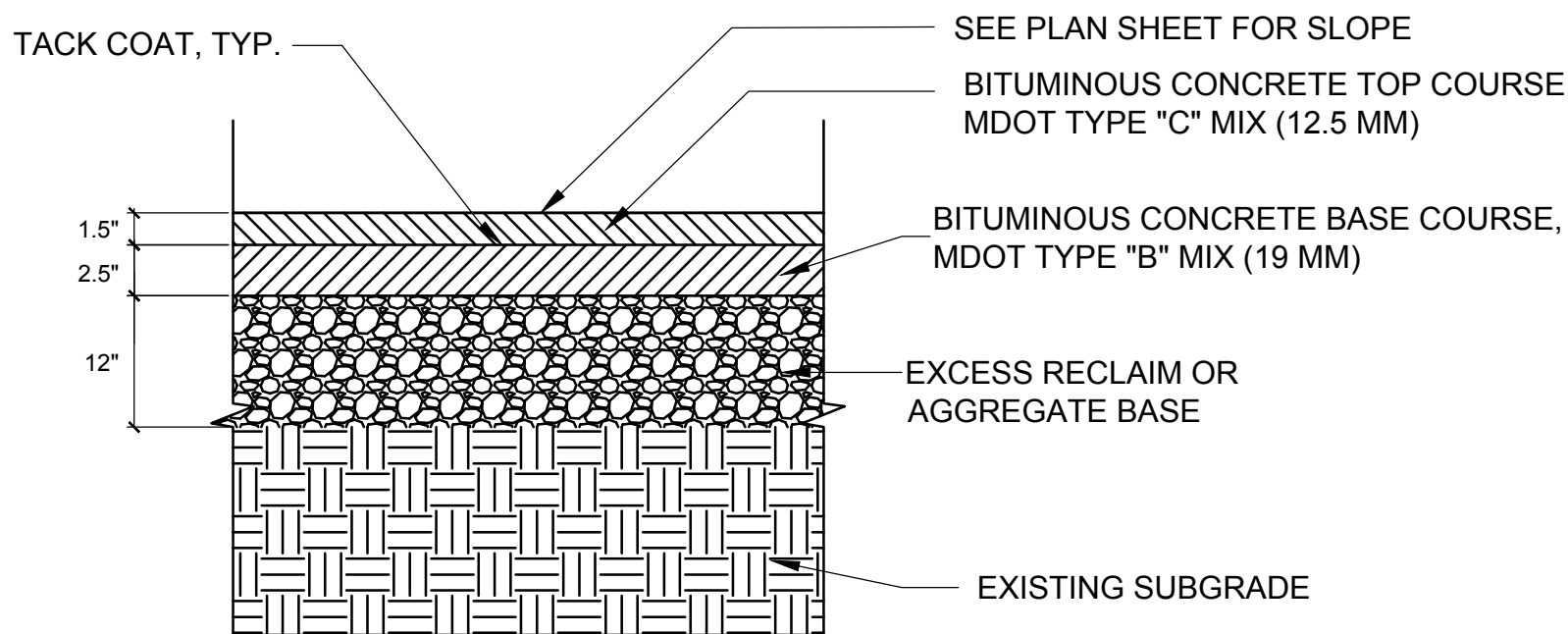
4 PERMANENT TRENCH PAVEMENT DETAIL  
SCALE: N.T.S.



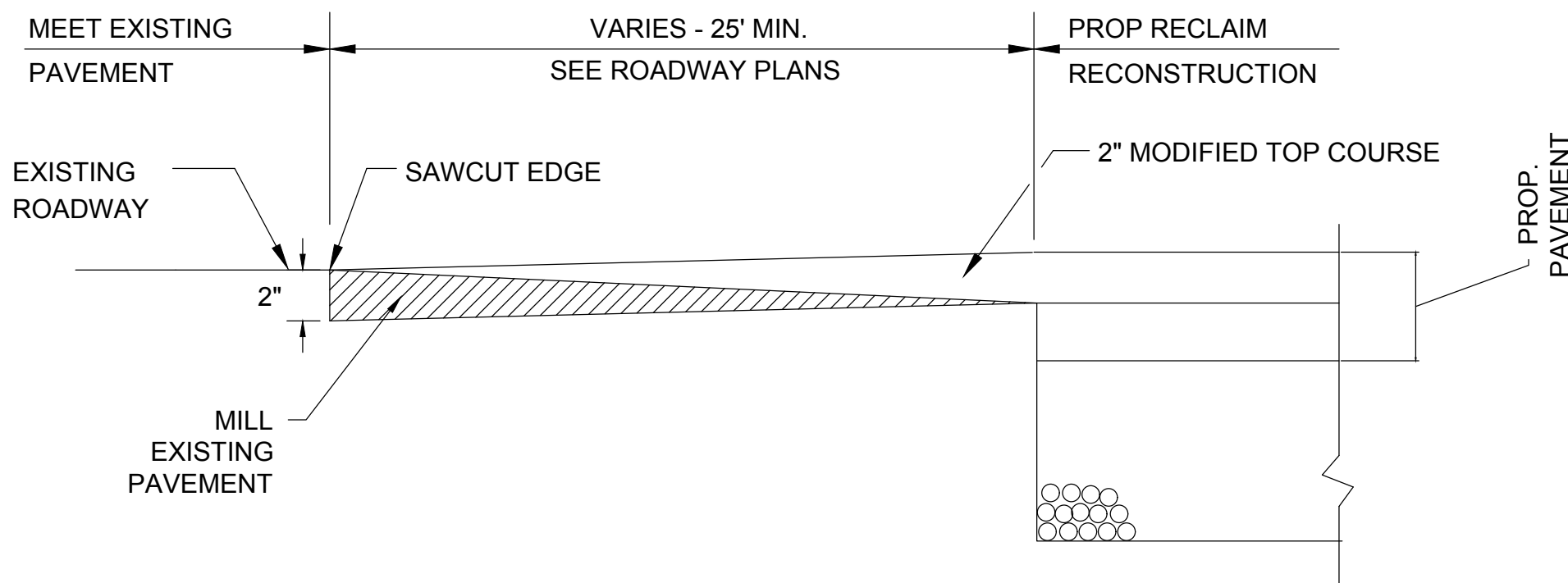
5 PAVEMENT MARKINGS DETAIL  
SCALE: N.T.S.



6 PAVEMENT RECLAIM AND WIDENING  
SCALE: N.T.S.



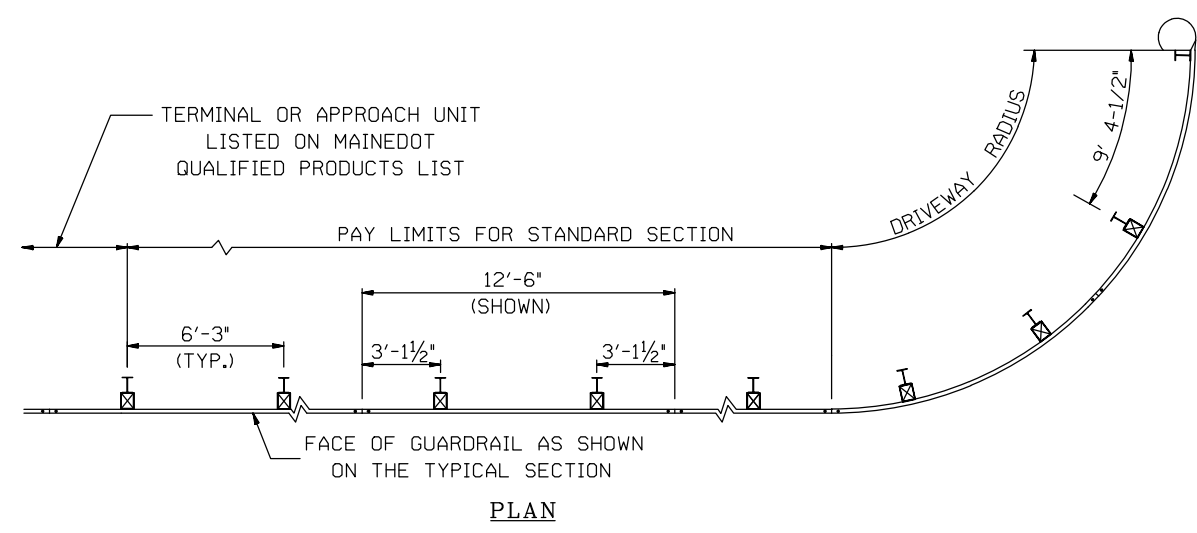
7 PARKING LOT PAVEMENT CROSS SECTION  
SCALE: N.T.S.



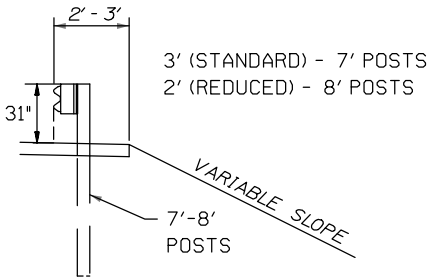
8 PROPOSED PAVEMENT TRANSITION (LONGITUDINAL SECTION)  
SCALE: N.T.S.

Revisions:		
No.	Date	Description



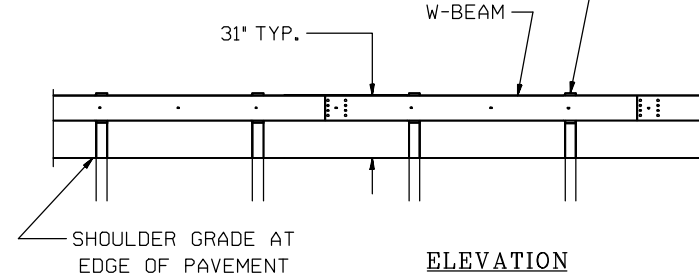


PLAN



CROSS SECTION

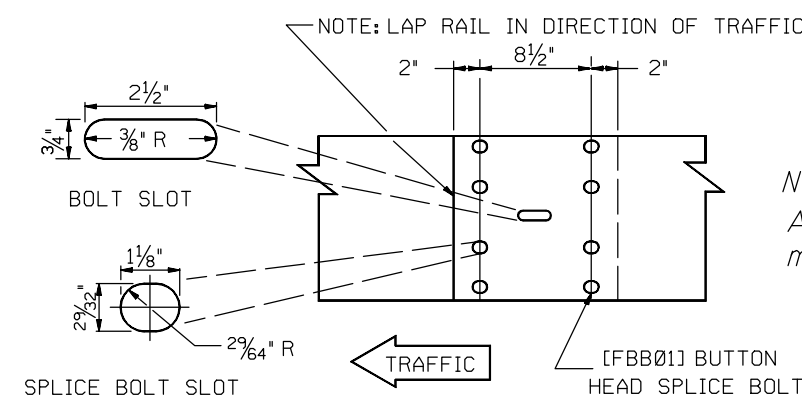
W 6x9.0 OR W 6x8.5 STEEL POST WITH 6" x 8" WOOD OFFSET BLOCK OR OTHER 8" BLOCK LISTED ON MAINEDOT QUALIFIED PRODUCTS LIST (TYP.)



ELEVATION

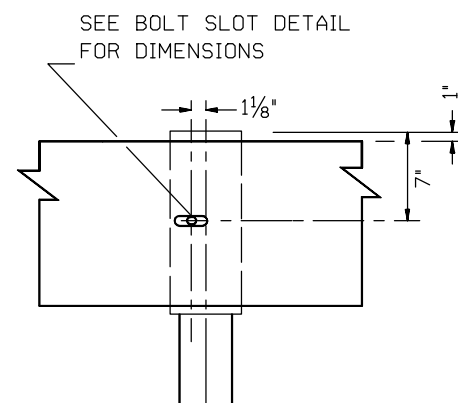
### 31" W-BEAM GUARDRAIL - MID-WAY SPLICE

Identification letters and numbers on drawings refer to the standard detail drawings shown in "A guide to Standardized Highway Barrier Hardware" by AASHTO-AGC-ARTBA Joint Committee.

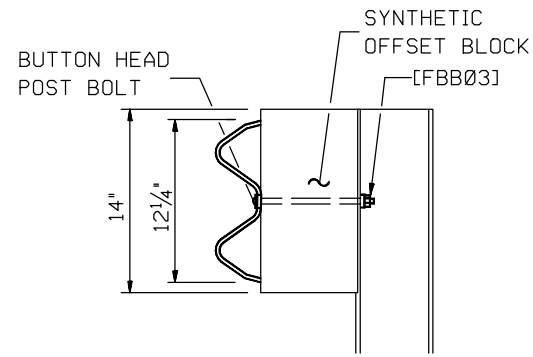


ELEVATION VIEW AT BEAM SPLICE

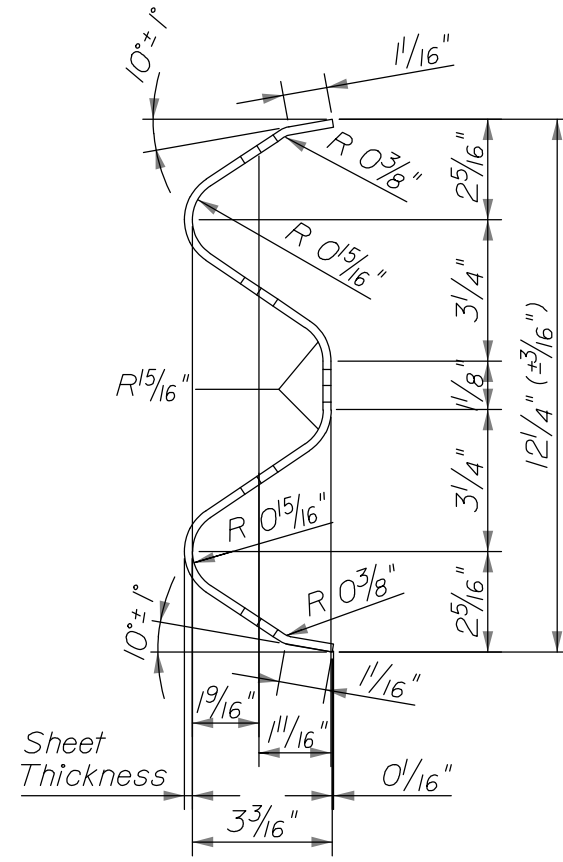
NOTE: All dimensions subject to manufacturing tolerances



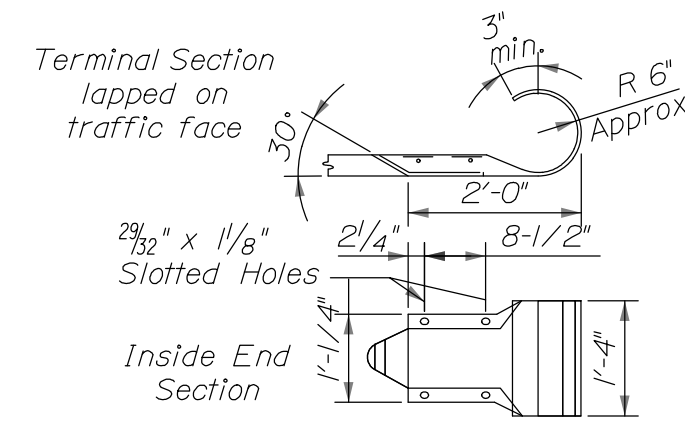
ELEVATION AT POST VIEW



TYPICAL SIDE VIEW

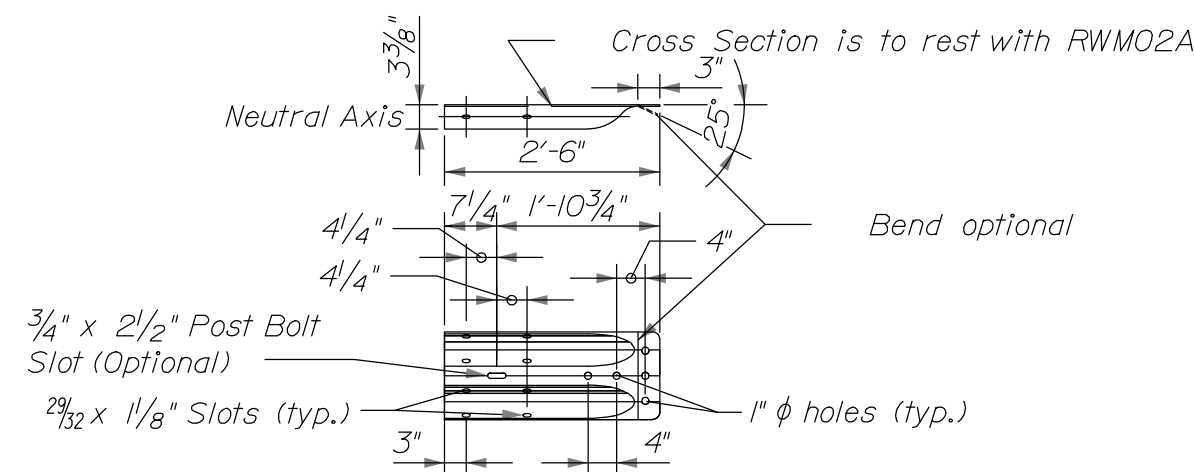


~ GUARDRAIL BEAM DETAIL RWM02A ~



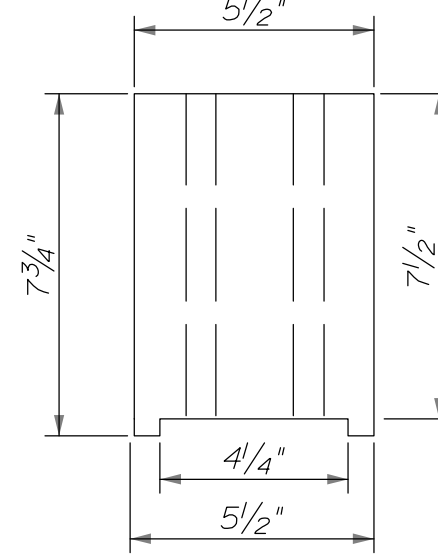
### ~ GUARDRAIL TERMINAL END - RWE03A ~

1. Use only on the end of circular guardrail at driveways.
2. Use only on the trailing end of guardrail on divided highways with washers (fwr03) installed on the last 9 posts.

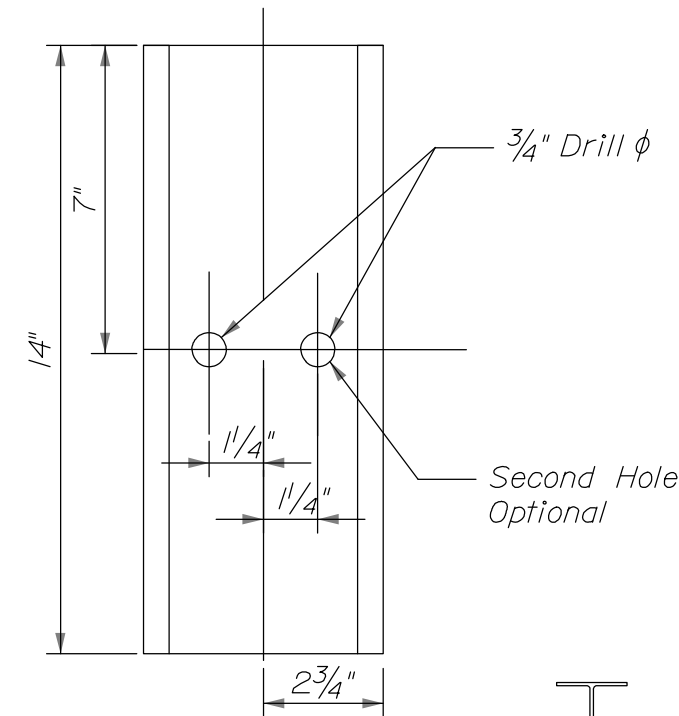


### ~ W-BEAM TERMINAL CONNECTOR RWE02A ~

### ~ OFFSET BLOCK DETAIL FOR STEEL POST ~



~ TOP VIEW ~

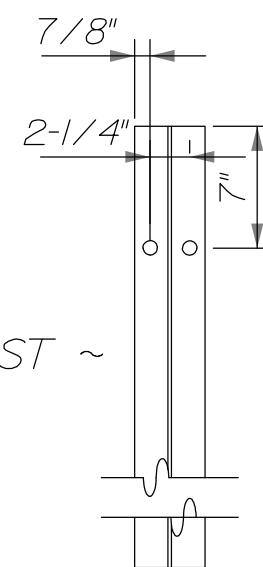


~ SIDE VIEW ~

Offset Block and Post shall be bolted with one FBB03 Post Bolt. Holes to be 3/4" phi.

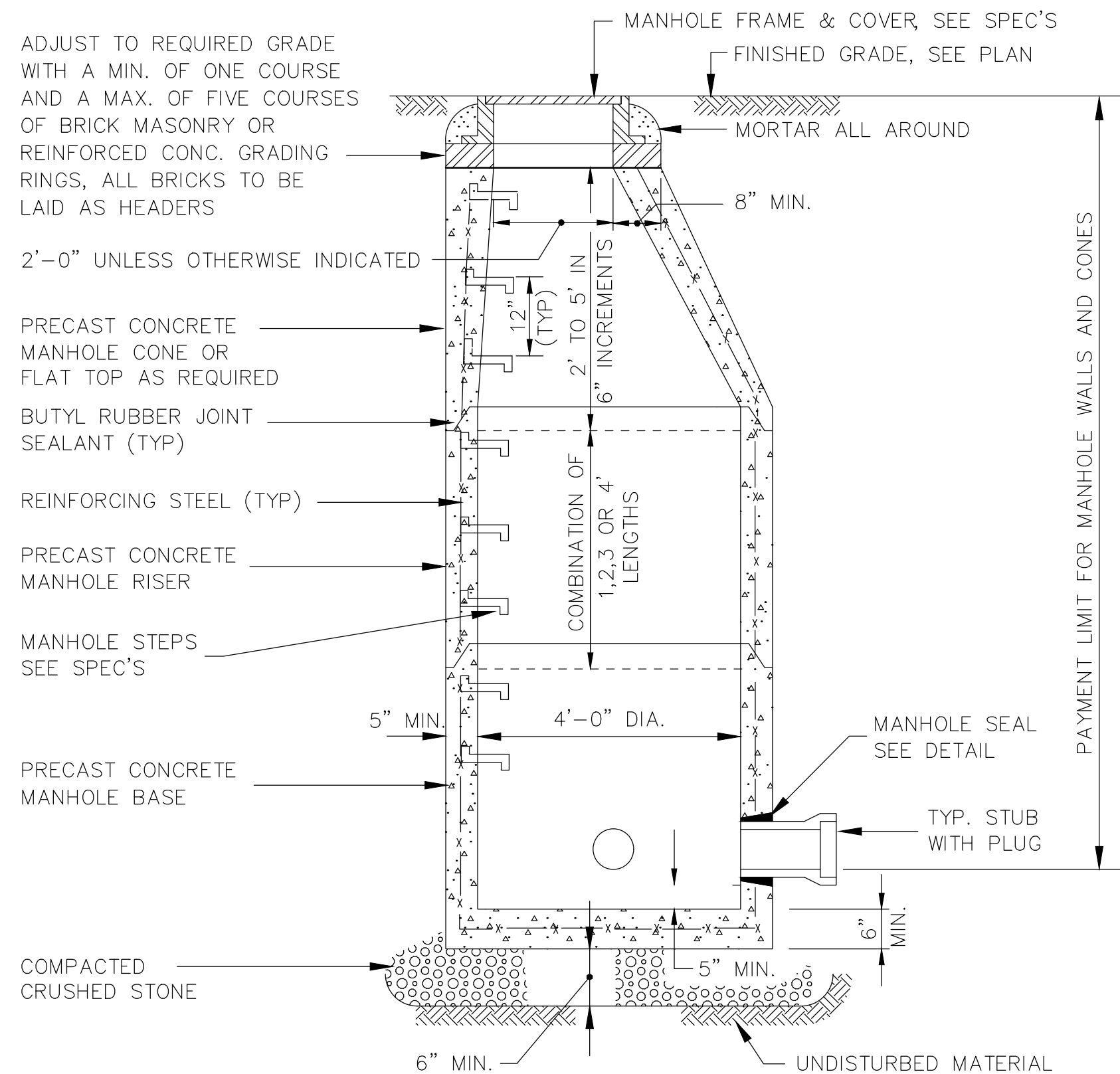
Location of holes for attaching Offset Block to Steel Post (second Hole is Optional)

### ~ STEEL POST ~ (PWE01)



## 1 MAINE DOT GUARDRAIL DETAIL

SCALE: N.T.S.



## 2 DRAIN MANHOLE

SCALE: N.T.S.

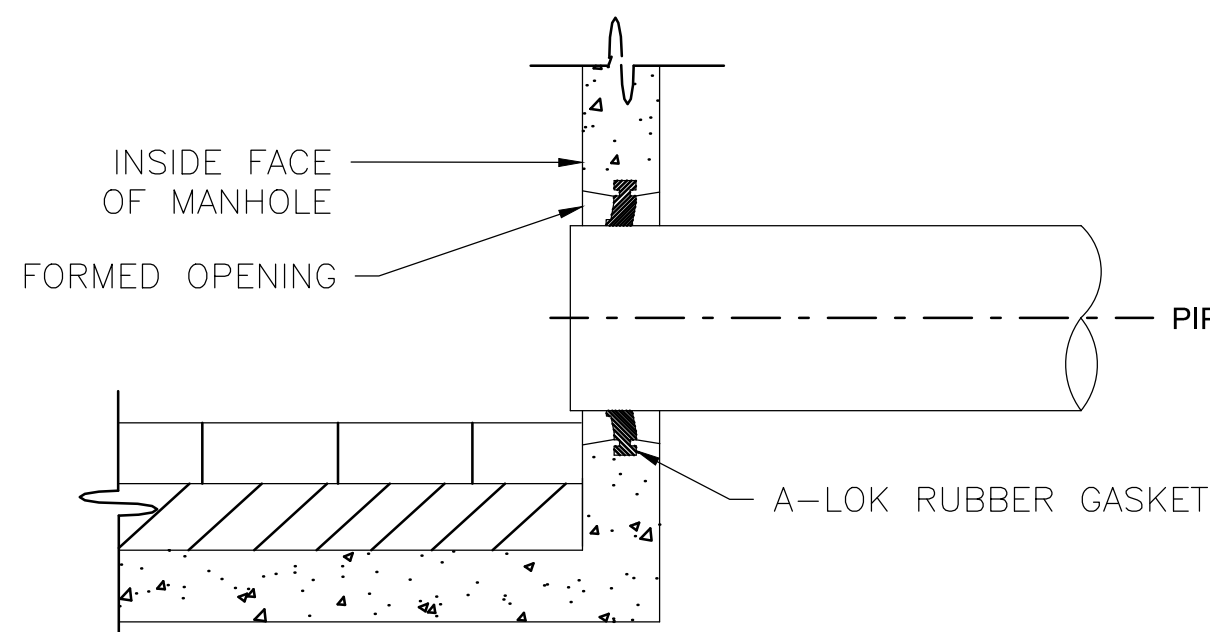


FIGURE NO. 1

### A-LOK SYSTEM TYPE A

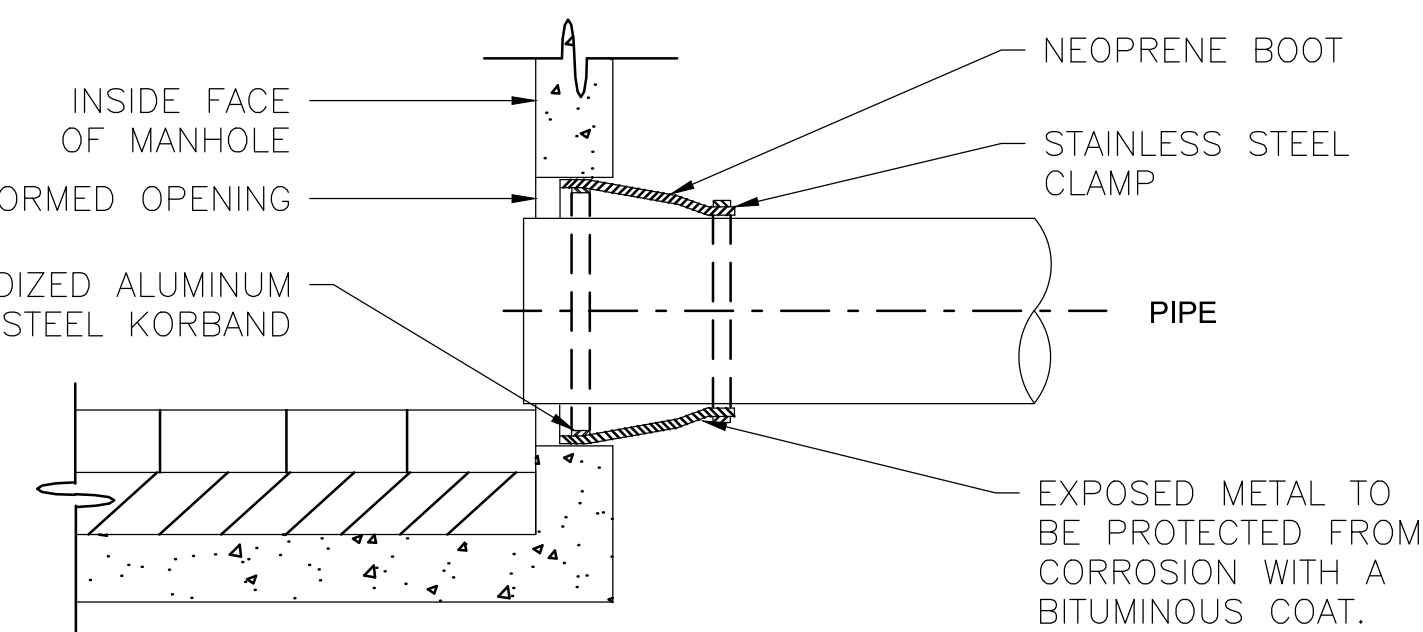


FIGURE NO. 2

### KOR-N-SEAL BOOT

NOTES:

1. ALTERNATE MANHOLE PIPE CONNECTIONS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.

## 4 PIPE CONNECTION AT PRECAST CONCRETE DRAINAGE STRUCTURE

SCALE: N.T.S.

Project:

CITY OF GARDINER,  
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HARRISON AVENUE SLOPE  
REPAIR AND STORMWATER  
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Approved By: TJS

W&S Project No.: ENG23-0628

W&S File No.:

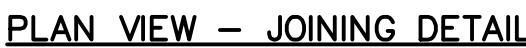
Drawing Title:

CONSTRUCTION  
DETAILS  
(2 OF 4)

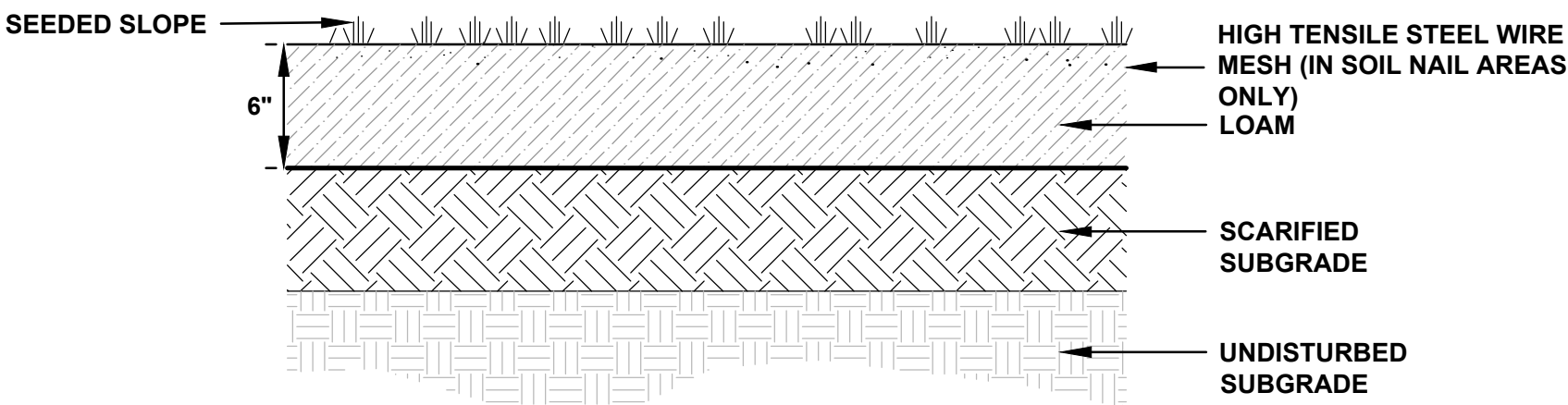
Sheet Number:

C-9









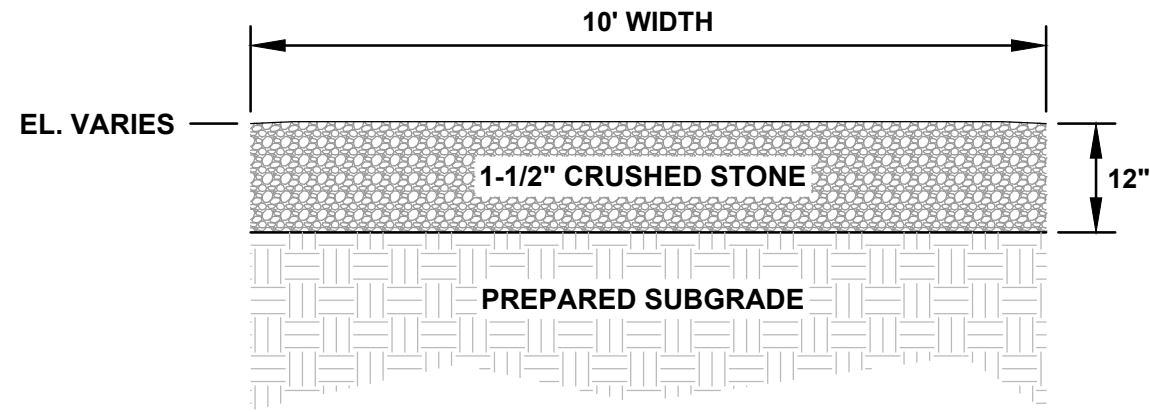
NOTES:

1. SLOPE STABILIZATION WIRE MESH IS DEPICTED AS SCHEMATIC ONLY. SOIL NAIL STABILIZATION DESIGNER RESPONSIBLE FOR EXTENT, LOCATION, LAYOUT DIMENSIONS, TYPE, AND ORIENTATION OF SLOPE STABILIZATION WIRE MESH. REFER TO SPECIFICATION SECTION XX XX XX - SOIL NAILS.

SEED MIX			
	PROPORTION BY WEIGHT	GERMINATION MINIMUM	PURITY MINIMUM
CREEPING RED FESCUE	50%	85%	95%
KENTUCKY 31	30%	85%	95%
DOMESTIC RYE	10%	90%	98%
RED TOP	5%	85%	92%
LADINO CLOVER	5%	85%	96%

1 LOAM AND SEED

SCALE: N.T.S.

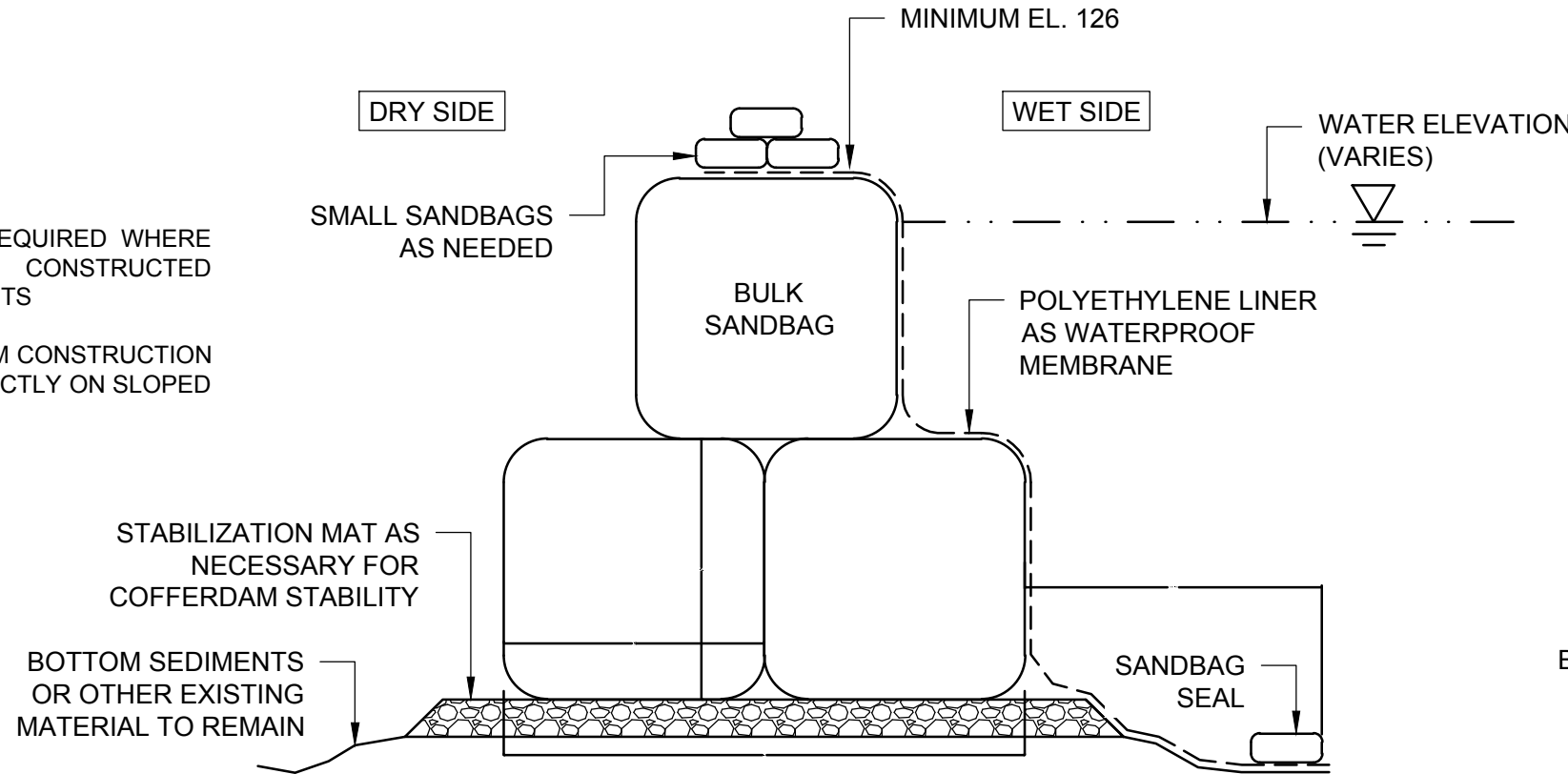


3 TEMPORARY ACCESS ROAD SECTION - ACROSS EXISTING SLOPE

SCALE: N.T.S.

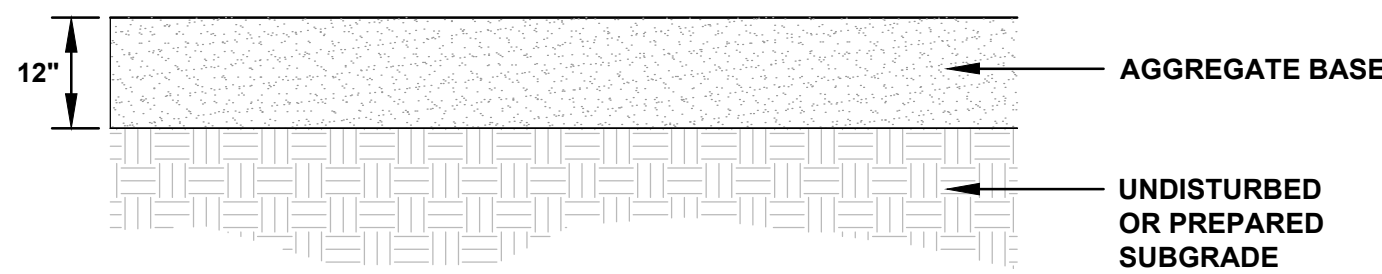
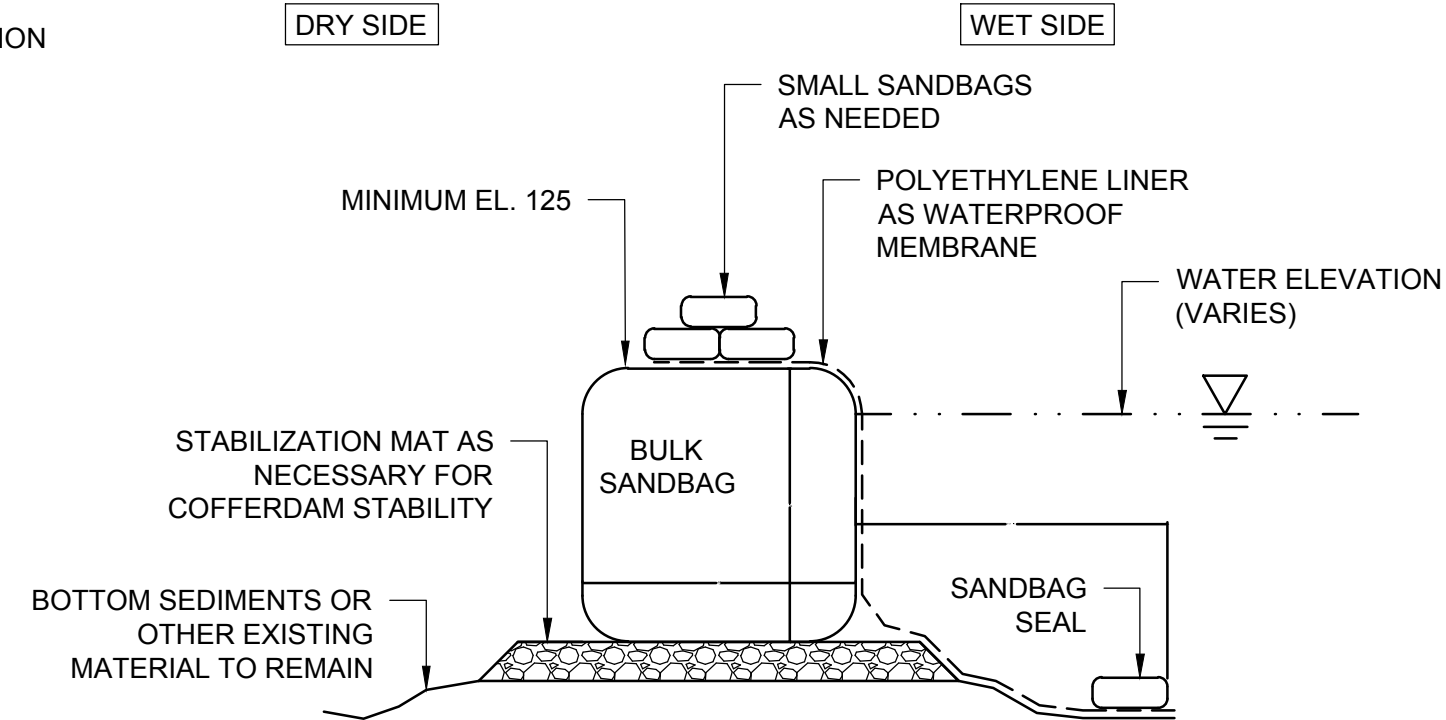
NOTES:

1. STABILIZATION MAT NOT REQUIRED WHERE SANDBAG COFFERDAM IS CONSTRUCTED DIRECTLY ON FIRM SEDIMENTS
2. SANDBAGS FOR COFFERDAM CONSTRUCTION SHALL NOT BE PLACED DIRECTLY ON SLOPED SURFACES



2 TEMPORARY SINGLE AND DOUBLE SANDBAG COFFERDAM

SCALE: N.T.S.

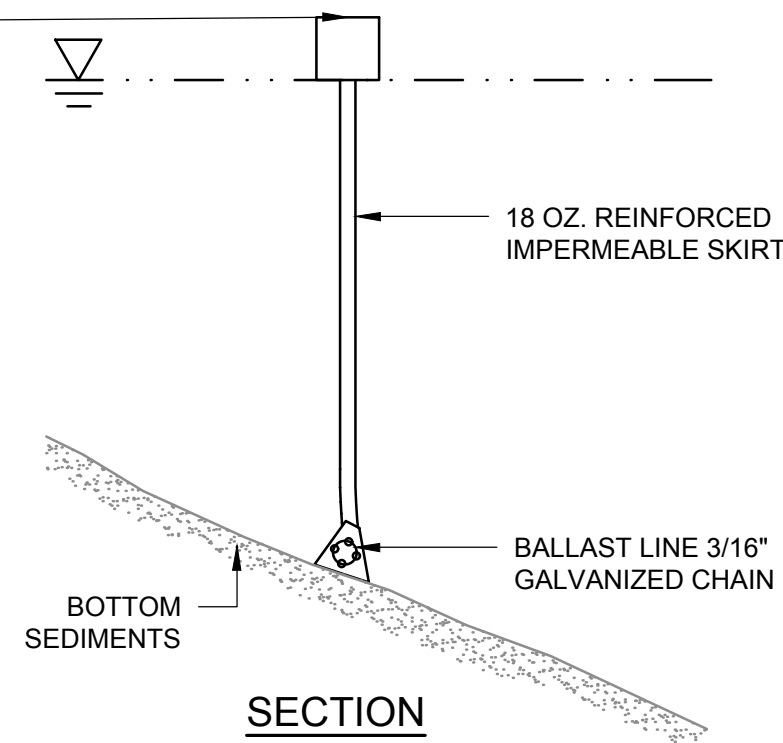


4 ROADWAY SHOULDER REPAIR

SCALE: N.T.S.

NOTES:

1. INSTALL THE TURBIDITY CURTAIN PRIOR TO STARTING WORK.
2. SECURELY FASTEN THE RIGHT AND LEFT ENDS OF THE TURBIDITY CURTAIN ALONG THE SHORE LINE AND PROVIDE INTERMEDIATE ANCHORING DEVICES IF NECESSARY TO KEEP THE TURBIDITY CURTAIN IN POSITION.
3. IF NECESSARY, JOIN ADJACENT ENDS OF TURBIDITY CURTAIN BY CONNECTING REINFORCING GROMMETS AND SHACKLING BALLAST LINES.

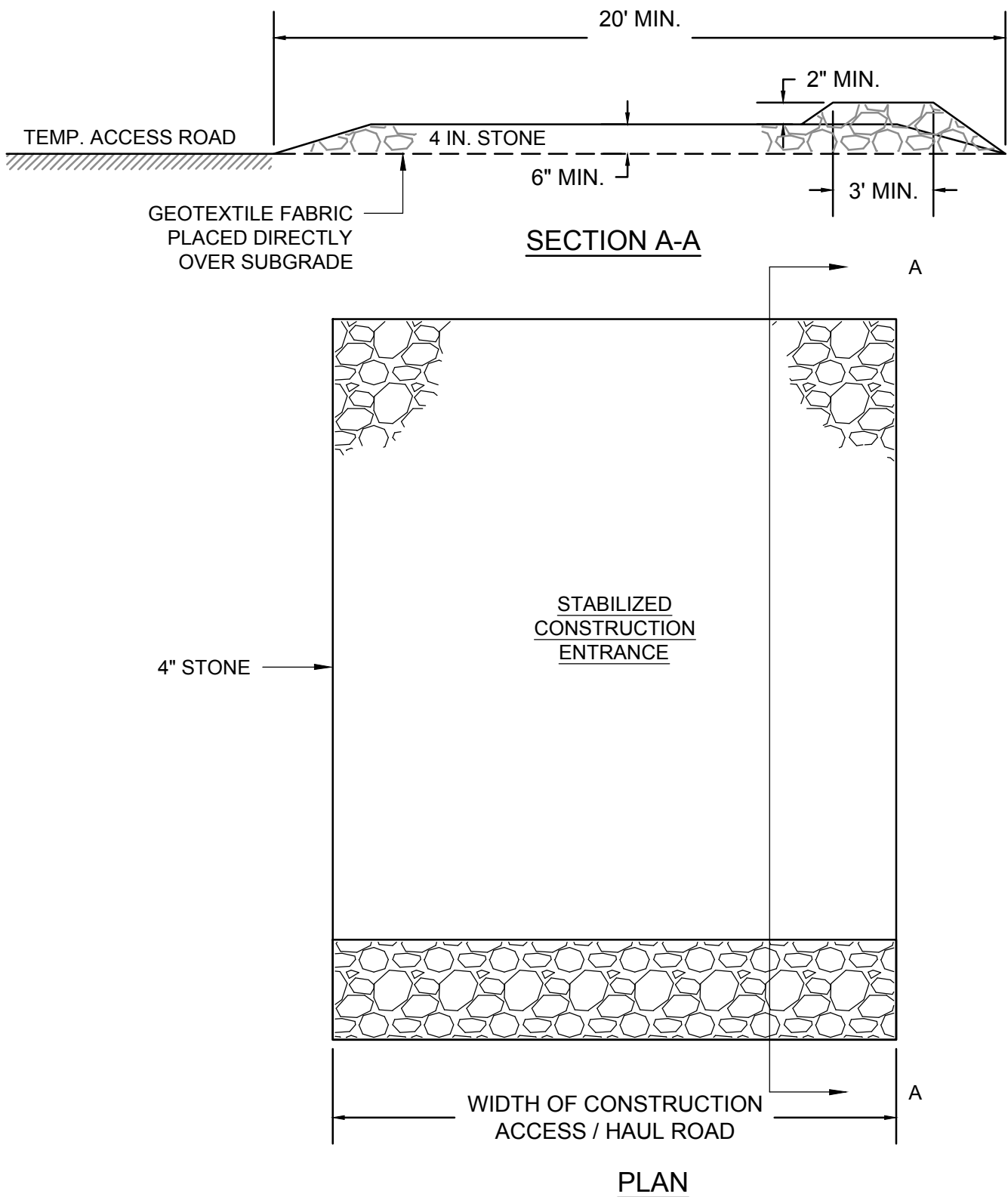


5 TURBIDITY CURTAIN

SCALE: N.T.S.

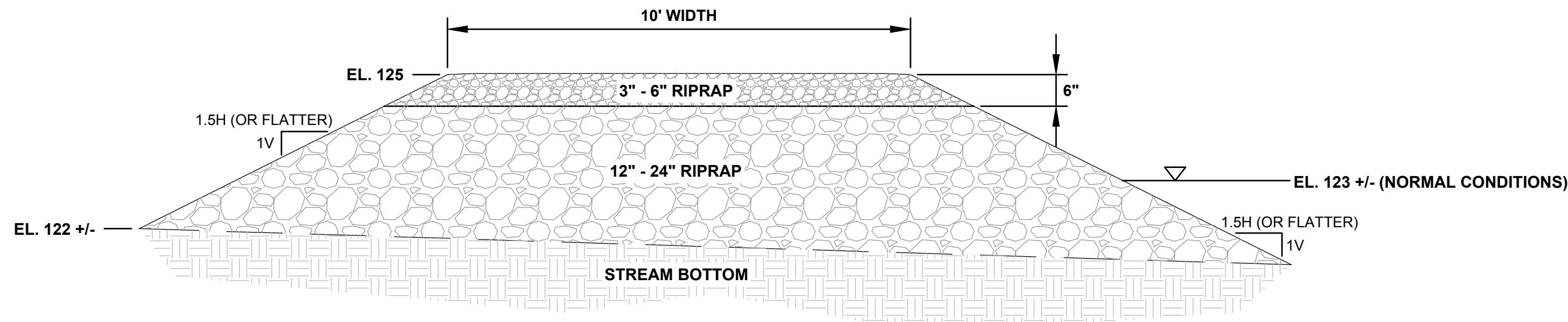
NOTES:

1. FILTER FABRIC - SHALL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING STONE.
2. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
3. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PAVED ROADS. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS NECESSARY AND REPAIR AND / OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED, OR TRACKED ONTO PAVED ROADS MUST BE REMOVED IMMEDIATELY.
4. WASHING - TRUCK WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PAVED ROADS. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
5. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.
6. STONE SHALL BE REMOVED AT THE CONCLUSION OF PROJECT AND ACCUMULATED SEDIMENT DISPOSED OF IN ACCORDANCE WITH THE SPECIFICATIONS. REMOVAL OF STONE SHALL BE AT NO ADDITIONAL COST TO THE OWNER. FOLLOWING REMOVAL, RESTORE THE AREA.



6 STABILIZED CONSTRUCTION ENTRANCE PAD

SCALE: N.T.S.



7 TEMPORARY ACCESS ROAD SECTION - IN STREAM

SCALE: N.T.S.

Project:

CITY OF GARDINER,  
MAINE



HARRISON AVENUE SLOPE  
REPAIR AND STORMWATER  
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Approved By: TJS

W&S Project No.: ENG23-0628  
W&S File No.:

Drawing Title:

CONSTRUCTION  
DETAILS  
(4 OF 4)

Sheet Number:

C-11



## APPENDIX H

### Wetland Delineation Report



westonandsampson.com

55 Walkers Brook Drive, Suite 100  
Reading, MA 01867  
tel: 978.532.1900

## Wetland Delineation Report



November 2024

Gardiner, Maine

Project # ENG23-0628

Harrison Ave. Slope Failure

Gardiner, ME

Wetland Delineation Conducted By:  
Gregory Russo, CWS on 11/19/2024

Delineation Report Reviewed By:  
Devin Herrick, CWS



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2.4 Significant Wildlife Habitat .....	2-4
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4.0 REFERENCES .....	4-1

FIGURES

Figure 1.....	USGS Topographic Map
Figure 2.....	Wetlands Field Map
Figure 3.....	FEMA FIRM Map
Figure 4.....	Environmental Resources Map

APPENDICES

Appendix A .....	Site Photographs
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## 1.0 SITE DESCRIPTION

On November 19<sup>th</sup> 2024, the presence of wetland resources was investigated near Harrison Avenue in Gardiner Maine. This investigation area is a river bank and adjacent slopes and is located adjacent to an existing dam, residential roads, and residential properties. Please see Figure 1 (Wetlands Field Map) and Figure 2 (USGS Topographic Map) of this report for the investigation area.

One resource area, a River (Cobbosseecontee Stream), was identified and flagged in the field using pink flagging by a Weston & Sampson employee who is trained in the wetland delineation process using US Army Corps of Engineers methodology. A further description of this resource area is presented in the following sections.

## 2.0 DELINEATION OF WETLAND RESOURCES

### 2.1 Site Observations

A Weston & Sampson wetland scientist, trained in the Army Corps of Engineers Wetland Delineation Manual (1987), observed the following protected wetland resources at the site:

- River, Stream or Brook

No wetlands were identified therefore no US Army Corps of Engineers (ACOE) Wetland Determination Data Forms were recorded. See Appendix A for site photographs.

### 2.2 Wetland Delineation Methodology

A wetland delineation assessment was conducted in accordance with the Maine Natural Resources Protection Act (NRPA) (Title 38, Chapter 3, §§ 480) utilizing the Army Corps of Engineers (ACOE) Wetland Delineation Manual (1987). The 1987 ACOE Manual is the current Federal delineation manual used in the Clean Water Act Section 404 regulatory program for the identification and delineation of wetlands.

The wetland delineation methodology included the characterization of vegetation, soil and hydrologic conditions in both wetland and upland areas to identify the transitional area, which was used as the wetland limit. Pink flags with distinct flag numbers are left in the field to show wetland resource area limits.

Vegetation, hydrology and soils are assessed in both wetland and upland areas to accurately place the wetland limits at each site. The percentage of vegetative species was estimated by creating sample plots. Sample plot radius for trees, saplings, shrubs, groundcover and woody vine strata was 30', 15', 15', 5' and 30', respectively. After creating the sample plot areas, the percent basal area coverage of each species within the monitoring plot was recorded. Using these field observations, the percent dominance of each species within its stratum was calculated. The 50/20 Rule was then used to determine dominance. Dominant species were considered the most abundant plant species (when ranked in descending order of abundance and cumulatively totaled) that immediately exceeds 50% of the total dominance measure (basal area) for the stratum, plus any additional species comprising 20% or more of the total dominance measure for the stratum. Once the dominant species were determined,

.....

they were treated equally to determine the presence of hydrophytic vegetation. If the number of dominant species with a Wetland Indicator Status of FAC (excluding FAC-), FACW or OBL is greater than, or equal to, the number of remaining dominant species, the area was considered a jurisdictional wetland resource area based on vegetation.

A soil sample from each wetland sample plot is also taken. Each soil sample goes to a depth of at least 12-24 inches. The soil is characterized to determine if the soil sample is considered a hydric (wetland) soil. Soil samples, including mottles, are characterized based on color using Munsell Soil-Color charts as a color reference.

The general area is then assessed for hydrologic conditions, including, but not limited to, site inundation, depth to free water, depth of soil saturation, water marks, drift lines, sediment deposits, water stained leaves.

No Wetlands were identified on site. Resources areas identified in the field were limited to one River (Cobbosseecontee Stream), described below.

### 2.3 River, Stream or Brook

"River, stream or brook" are defined under 38 M.R.S. Sec. 480-B of the Natural Resources Protection Act (NRPA) as: *"a channel between defined banks. A channel is created by the action of surface water and has 2 or more of the following characteristics.*

- A. It is depicted as a solid or broken blue line on the most recent edition of the U.S. Geological Survey 7.5-minute series topographic map or, if that is not available, a 15-minute series topographic map.*
- B. It contains or is known to contain flowing water continuously for a period of at least 6 months of the year in most years.*
- C. The channel bed is primarily composed of mineral material such as sand and gravel, parent material or bedrock that has been deposited or scoured by water.*
- D. The channel contains aquatic animals such as fish, aquatic insects or mollusks in the water or, if no surface water is present, within the stream bed.*
- E. The channel contains aquatic vegetation and is essentially devoid of upland vegetation.*

.....



*"River, stream or brook" does not mean a ditch or other drainage way constructed, or constructed and maintained, solely for the purpose of draining storm water or a grassy swale."*

### **Perennial River, Stream or Brook Channels**

One River, Stream or Brook Channel ("Channel") was identified within the investigation area. The following characteristics were observed within the Channel making it jurisdictional under NRPA:

1. It is depicted as a solid or broken blue line on the most recent edition of the U.S. Geological Survey 7.5-minute series topographic map or, if that is not available, a 15-minute series topographic map.
2. It contains or is known to contain flowing water continuously for a period of at least 6 months of the year in most years.
3. The channel bed is primarily composed of mineral material such as sand and gravel, parent material or bedrock that has been deposited or scoured by water.

Stream channel materials are composed of boulders, cobble and gravel as well as coarse sand with evidence of water scouring.

The Channel exhibited flowing water at the time of the investigation and appears to have water flowing continuously for a period of at least 6 months of the year in most years. Additionally, this Channel is depicted as a solid blue line on the most recent edition of the U.S. Geological topographic maps. As such, this Channel is being considered a Perennial Channel.

The boundary of the north Perennial Channel bank was identified in the field utilizing Normal High Water (NHW). Wetland flags left in the field included:

- NHW-A-1 through NHW-A-25 (Perennial Channel Bank "A" Series)

Rivers, Streams and/or Brooks (including Intermittent Streams) are subject to a 75-foot buffer zone which is defined as *"Adjacent to a Protected Natural Resource. The area within 75 feet, measured horizontally, of the normal high water line of a great pond, river, stream or brook or the upland edge of a coastal wetland or freshwater wetland"* per Chapter 310(3)(A). Additionally, under the Maine Mandatory

Shoreland Zoning Law, municipalities are required to protect the shoreland zone, which is defined as "all land within 250 feet of the normal high water line of any natural pond over 10 acres, any river that drains at least 25 square miles, and all tidal waters and saltwater marshes."

## 2.4 Significant Wildlife Habitat

"Significant Wildlife Habitat" is defined under 38 M.R.S. Sec. 480-B of the Natural Resources Protection Act (NRPA) as:

- A. *The following areas to the extent that they have been mapped by the Department of Inland Fisheries and Wildlife or are within any other protected natural resource: high and moderate value deer wintering areas and travel corridors as defined by the Department of Inland Fisheries and Wildlife; seabird nesting islands as defined by the Department of Inland Fisheries and Wildlife; and critical spawning and nursery areas for Atlantic salmon as defined by the Department of Marine Resources; and [PL 2023, c. 156, §1 (AMD).]*
- B. *Except for solely forest management activities, for which "significant wildlife habitat" is as defined and mapped in accordance with section 480-I by the Department of Inland Fisheries and Wildlife, the following areas that are defined by the Department of Inland Fisheries and Wildlife and are in conformance with criteria adopted by the Department of Environmental Protection or are within any other protected natural resource:*
  - (1) *Significant vernal pool habitat;*
  - (2) *High and moderate value waterfowl and wading bird habitat, including nesting and feeding areas;*
  - (3) *Shorebird nesting, feeding and staging areas; and*
  - (4) *Habitat for state endangered and state threatened species listed under Title 12, section 12803, subsection 3 that is within another protected natural resource area or that is located wholly or partly within the boundaries of a proposed project site that requires approval from:*
    - (a) *The department pursuant to this article or article 6, 7 or 8-A, except for activity or development on a residential lot that is not part of a proposed multi lot housing development; or*
    - (b) *The Maine Land Use Planning Commission pursuant to this article as provided in section 480-E-1 or, for subdivisions and nonresidential uses only, pursuant to Title 12, chapter 206-A.*

Weston & Sampson created environmental resources maps (see Figure 4) of the site to determine the presence of other protected areas. The data source of these map layers was the Maine Geolibrary. These areas included:

- Tidal Waterfowl and Wading Bird Habitat
- Inland Waterfowl and Wading Bird Habitat
- Maine Shorebird Areas
- Maine Seabird Nesting Islands
- Deer Wintering Areas
- Significant Vernal Pools
- Endangered Species Critical Habitat Areas
- Critical Habitat Areas
- Endangered Threatened and Special Concern Wildlife

Based on review of the mapping, the investigation area is located within a Critical Habitat Area for Atlantic Sturgeon.

## 2.5 FEMA Floodplain

Weston & Sampson created a FEMA Map (see Figure 3) of the site to determine the presence of 100 year floodplain on site.

FEMA Flood Insurance Rate Maps (FIRM) were created online from the FEMA website to determine if there is a 100-year flood zone at the site. See Figure 3 for FIRM map. Based on FEMA flood maps the investigation area is located within the 100-year flood zone, Zone AE, base flood elevation 129 feet NAD88.

.....



## 3.0 SUMMARY

On November 19<sup>th</sup> 2024, the presence of wetland resources was investigated near Harrison Avenue in Gardiner Maine. A single Perennial Stream bank was identified and flagged at the site.

Additional environmental mapping was conducted using Maine Geolibrary GIS data layers and FEMA FIRM mapping. This additional mapping indicates that the site is located within the 100-year floodplain and is located within a Critical Habitat Area for Atlantic Sturgeon.

This Wetlands Delineation Report has been reviewed and approved by a Certified Wetland Scientist CWS.

## 4.0 REFERENCES

Newcomb, Lawrence. 1977. Newcomb's Wildflower Guide. Little, Brown and Company.

United States Department of Agriculture, Natural Resources Conservation Service. 2018. *Field Indicators of Hydric Soils in the United States, Version 8.2*. L. M. Vasilas, G. W. Hurt, and J.F. Berkowitz (eds.). USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils.

USACOE, January 1987, Corps of Engineers Wetlands Delineation Manual, Wetlands Research Program Technical Report Y-87-1.

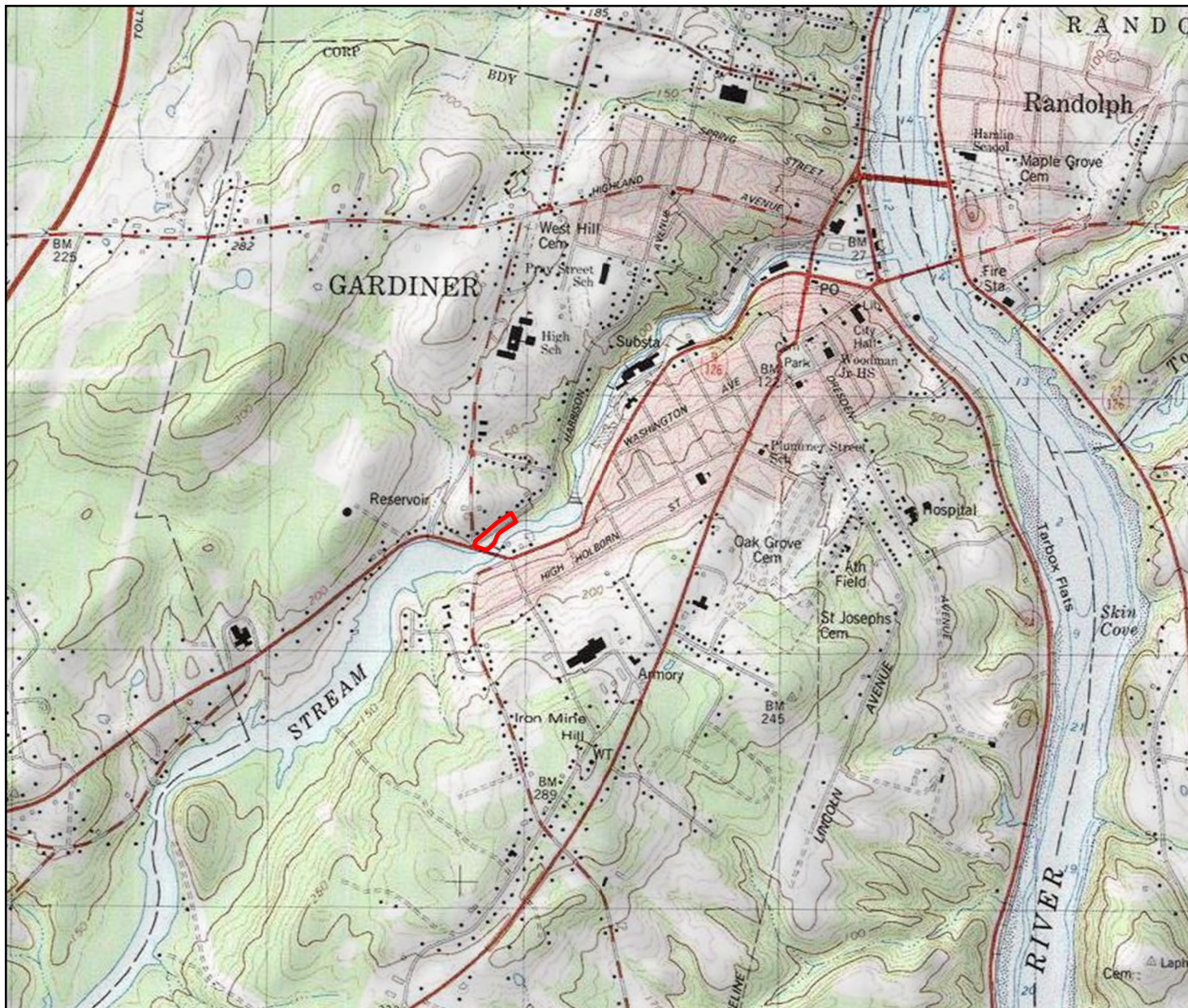
FEMA Flood Map Service Center, online at [msc.fema.gov/portal](https://msc.fema.gov/portal) Assessed on 01/07/2025.

Tiner, Jr., Ralph W., 2005, Field Guide to Nontidal Wetland Identification

Tiner, Jr., Ralph W, 2009, Field Guide to Tidal Wetland Plants of the Northeastern United States and Neighboring Canada.

Wojtec, Michael, Bard – A field Guide to Trees of the Northeast.

New England Hydric Soils Technical Committee, 2019, Version 4, *Field Indicator of Identifying Hydric Soils in New England*. New England Interstate Water Pollution Control Commission, Lowell, MA.



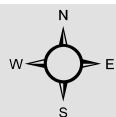
## Legend

Investigation Area

**FIGURE 1**

Harrison Ave  
Gardiner ME

USGS Topographic Map

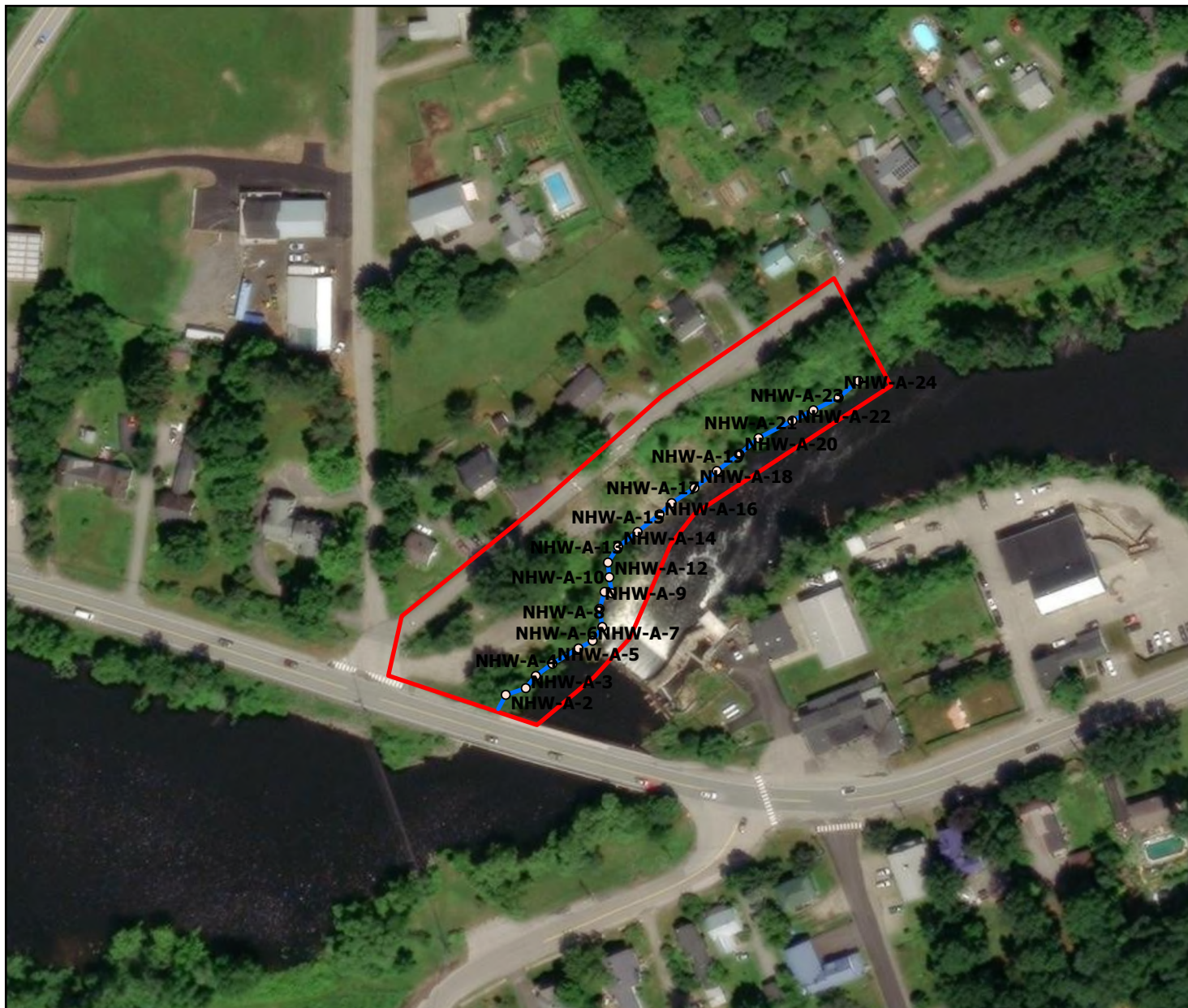


2,000 1,000 0 2,000  
Feet

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Copyright: © 2013 National Geographic Society, i-cubed

Weston & Sampson



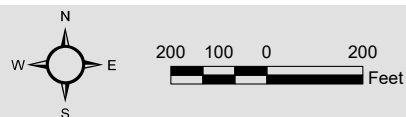


- Legend**
- Investigation Area
  - NHD Flowline**
    - Connector (no attributes)
    - Canal Ditch - null
    - Canal Ditch- Aqueduct
    - Canal Ditch - Stormwater
    - Approximate Underground Conduit
    - Adequate Water Pipeline At or Near the Surface
    - Adequate Water Pipeline Underground
    - Penstock Water Pipeline At or Near the Surface
    - Stream/River - No Attributes
    - Intermittent Stream/River
    - Perennial Stream/River
    - Ephemeral Stream/River
    - Drainageway
    - Artificial Path
    - Coastline No Attributes
    - Maine Lakes
  - Maine Sand Dune Boundaries**
    - Frontal Dune
    - Back Dune
    - USFW Maine Wetlands

**FIGURE 2**

Harrison Ave  
Gardiner ME

Wetlands Field Map



Microsoft, Vantor, Maine Geological Survey.

Weston & Sampson





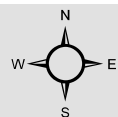
#### Legend

- Investigation Area
- USA\_Flood\_Hazard\_Reduced\_Set
- X: 0.2% Annual Chance Flood Hazard
- 1% Annual Chance Flood Hazard
- Future Conditions 1% Annual Chance Flood Hazard
- Regulatory Floodway
- Area with Reduced Risk Due to Levee
- Special Floodway

**FIGURE 3**

Harrison Ave  
Gardiner ME

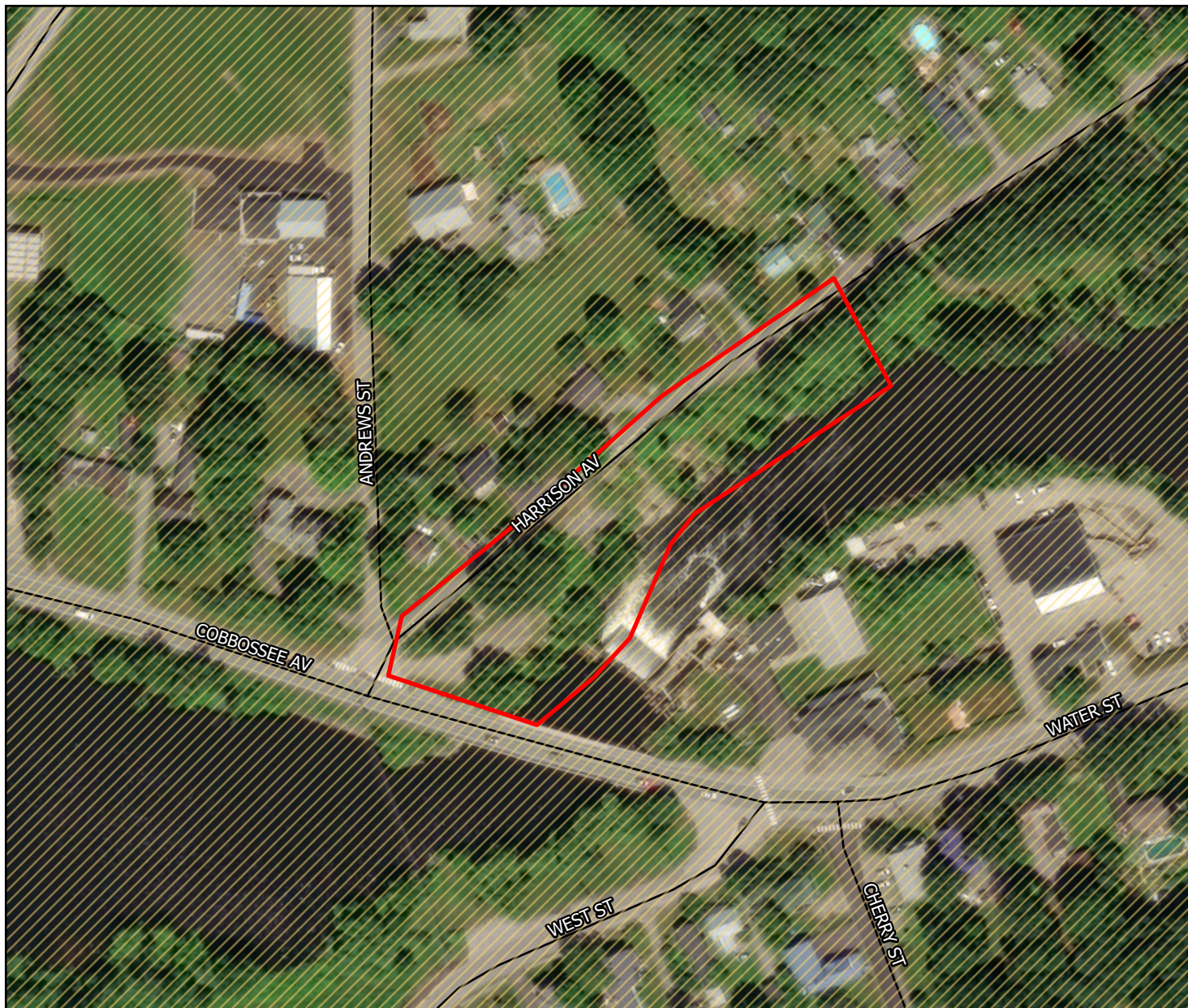
FEMA Map



200 100 0 200  
Feet

Sources: FEMA Source: FEMA, Esri, Microsoft, Vantor





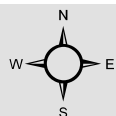
#### Legend

-  Tidal Waterfowl and Wading Bird Habitat
-  Inland Waterfowl and Wading Bird Habitat
-  Maine Shorebird Areas
-  Maine Seabird Nesting Islands
-  Deer Wintering Areas
-  Significant Vernal Pools
-  Endangered Species Critical Habitat Areas
-  Critical Habitat Areas Static Snapshot
-  Endangered Threatened and Special Concern Wildlife - Summarized
-  Investigation Area

#### FIGURE 4

Harrison Ave  
Gardiner ME

Significant Wildlife  
Habitat Map



200 100 0 200  
Feet

Maine Department of Inland Fisheries and Wildlife, Maine Inland Fisheries and Wildlife, Feature Service: U.S. Environmental Protection Agency, Office of Chemical Safety & Pollution Prevention, Office of Pesticide Programs; Data Steward: U.S. Fish & Wildlife Service, Ecological Services; National Oceanic & Atmospheric Administration, National Marine Fisheries Service, Microsoft, Vantor, Maine Geological Survey.

Weston & Sampson



## APPENDIX A

### Site Photographs



Photo 1: NHW-A (Cobbosseecontee Stream) above dam looking northeast (downstream).



Photo 2: NHW-A (Cobbosseecontee Stream) below dam looking southwest (upstream).





Photo 3: NHW-A (Cobbosseecontee Stream) below dam looking northeast (downstream) from bottom of slope failure.



Photo 4: View upslope from the bottom of slope failure. Looking northwest.





Photo 5: View upslope from the bottom of slope failure. Looking west.



Photo 6: View upslope from the bottom of slope failure. Looking northwest.





Photo 7: NHW-A (Cobbosseecontee Stream) below dam looking east (downstream) from top of slope failure.



Photo 8: Guardrail and road edge at top of slope failure. Looking east.

## APPENDIX I

### IPaC Information





## United States Department of the Interior

### FISH AND WILDLIFE SERVICE

Maine Ecological Services Field Office

P. O. Box A

East Orland, ME 4431

Phone: (207) 469-7300 Fax: (207) 902-1588



In Reply Refer To:

03/31/2026 15:16:26 UTC

Project Code: 2026-0069950

Project Name: Harrison Ave. Slope Failure

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2) (c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf>

**Migratory Birds:** In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see <https://www.fws.gov/program/migratory-bird-permit/what-we-do>.

It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see <https://www.fws.gov/library/collections/threats-birds>.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit <https://www.fws.gov/partner/council-conservation-migratory-birds>.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- Migratory Birds
- Wetlands

## OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

**Maine Ecological Services Field Office**

P. O. Box A  
East Orland, ME 4431  
(207) 469-7300



## PROJECT SUMMARY

Project Code: 2026-0069950

Project Name: Harrison Ave. Slope Failure

Project Type: Slide Repair - Land Management/Restoration

Project Description: The project proponent, the City of Gardiner, is proposing to repair a slope failure that occurred along the embankment located immediately east of Harrison Avenue. The failed slope area is situated between the roadway and Cobbosseecontee Stream and has experienced loss of vegetative cover and surficial soils as a result of recent instability. The proposed work is intended to stabilize the affected section of slope, restore lost soil support, and reduce the potential for additional slope movement that could further impact the roadway and surrounding environment.

In addition to the slope stabilization work, the City is proposing a second phase of improvements that will address roadway repairs within the Harrison Avenue corridor. These repairs are expected to include restoration of areas where the roadway edge has been undermined or compromised by slope movement, as well as improvements necessary to maintain safe vehicular access once the slope has been stabilized.

Project Location:

The approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/@44.2206329,-69.7894692803844,14z>



Counties: Kennebec County, Maine

## ENDANGERED SPECIES ACT SPECIES

There is a total of 4 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries<sup>1</sup>, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

- 
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

## MAMMALS

NAME	STATUS
Northern Long-eared Bat <i>Myotis septentrionalis</i> No critical habitat has been designated for this species. Species profile: <a href="https://ecos.fws.gov/ecp/species/9045">https://ecos.fws.gov/ecp/species/9045</a>	Endangered
Tricolored Bat <i>Perimyotis subflavus</i> No critical habitat has been designated for this species. Species profile: <a href="https://ecos.fws.gov/ecp/species/10515">https://ecos.fws.gov/ecp/species/10515</a>	Proposed Endangered

## FISHES

NAME	STATUS
Atlantic Salmon <i>Salmo salar</i> Population: Gulf of Maine DPS There is <b>final</b> critical habitat for this species. Your location does not overlap the critical habitat. Species profile: <a href="https://ecos.fws.gov/ecp/species/2097">https://ecos.fws.gov/ecp/species/2097</a>	Endangered

## INSECTS

NAME	STATUS
Monarch Butterfly <i>Danaus plexippus</i> There is <b>proposed</b> critical habitat for this species. Your location does not overlap the critical habitat. Species profile: <a href="https://ecos.fws.gov/ecp/species/9743">https://ecos.fws.gov/ecp/species/9743</a>	Proposed Threatened

## CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

## USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.



# BALD & GOLDEN EAGLES

Bald and Golden Eagles are protected under the Bald and Golden Eagle Protection Act <sup>2</sup> and the Migratory Bird Treaty Act (MBTA) <sup>1</sup>. Any person or organization who plans or conducts activities that may result in impacts to Bald or Golden Eagles, or their habitats, should follow appropriate regulations and consider implementing appropriate avoidance and minimization measures, as described in the various links on this page.

---

1. The [Bald and Golden Eagle Protection Act](#) of 1940.
2. The [Migratory Birds Treaty Act](#) of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

There are Bald Eagles and/or Golden Eagles in your [project](#) area.

## Measures for Proactively Minimizing Eagle Impacts

For information on how to best avoid and minimize disturbance to nesting bald eagles, please review the [National Bald Eagle Management Guidelines](#). You may employ the timing and activity-specific distance recommendations in this document when designing your project/activity to avoid and minimize eagle impacts. For bald eagle information specific to Alaska, please refer to [Bald Eagle Nesting and Sensitivity to Human Activity](#).

The FWS does not currently have guidelines for avoiding and minimizing disturbance to nesting Golden Eagles. For site-specific recommendations regarding nesting Golden Eagles, please consult with the appropriate Regional [Migratory Bird Office](#) or [Ecological Services Field Office](#).

If disturbance or take of eagles cannot be avoided, an [incidental take permit](#) may be available to authorize any take that results from, but is not the purpose of, an otherwise lawful activity. For assistance making this determination for Bald Eagles, visit the [Do I Need A Permit Tool](#). For assistance making this determination for golden eagles, please consult with the appropriate Regional [Migratory Bird Office](#) or [Ecological Services Field Office](#).

## Ensure Your Eagle List is Accurate and Complete

If your project area is in a poorly surveyed area in IPaC, your list may not be complete and you may need to rely on other resources to determine what species may be present (e.g. your local FWS field office, state surveys, your own surveys). Please review the [Supplemental Information on Migratory Birds and Eagles](#), to help you properly interpret the report for your specified location, including determining if there is sufficient data to ensure your list is accurate.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to bald or golden eagles on your list, see the "Probability of Presence Summary" below to see when these bald or golden eagles are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
<b>Bald Eagle <i>Haliaeetus leucocephalus</i></b> This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. <a href="https://ecos.fws.gov/ecp/species/1626">https://ecos.fws.gov/ecp/species/1626</a>	Breeds Dec 1 to Aug 31

## PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "[Supplemental Information on Migratory Birds and Eagles](#)", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

### Probability of Presence (■)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

### Breeding Season (■)

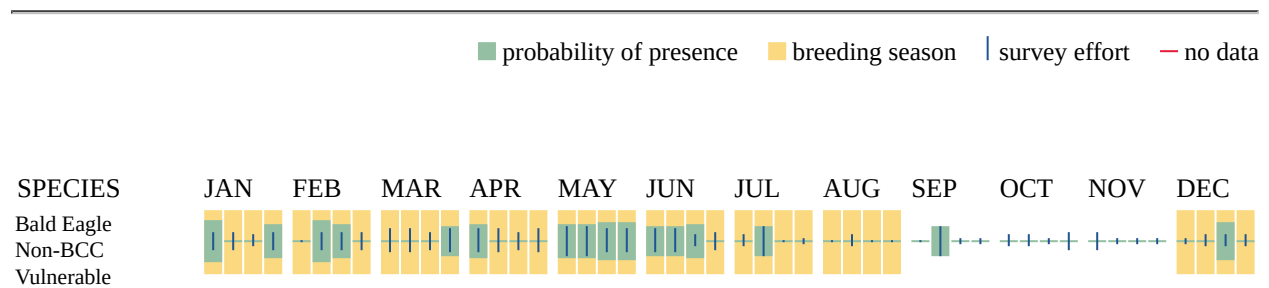
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

### Survey Effort (|)

Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

### No Data (—)

A week is marked as having no data if there were no survey events for that week.



Additional information can be found using the following links:

- Eagle Management <https://www.fws.gov/program/eagle-management>
- Measures for avoiding and minimizing impacts to birds <https://www.fws.gov/library/collections/avoiding-and-minimizing-incident-take-migratory-birds>

- Nationwide avoidance and minimization measures for birds <https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf>
- Supplemental Information for Migratory Birds and Eagles in IPaC <https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action>

## MIGRATORY BIRDS

The Migratory Bird Treaty Act (MBTA) <sup>1</sup> prohibits the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the Department of Interior U.S. Fish and Wildlife Service (Service).

- 
1. The [Migratory Birds Treaty Act](#) of 1918.
  2. The [Bald and Golden Eagle Protection Act](#) of 1940.
  3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the "Probability of Presence Summary" below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
<b>Bald Eagle <i>Haliaeetus leucocephalus</i></b> This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. <a href="https://ecos.fws.gov/ecp/species/1626">https://ecos.fws.gov/ecp/species/1626</a>	Breeds Dec 1 to Aug 31
<b>Bay-breasted Warbler <i>Setophaga castanea</i></b> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA <a href="https://ecos.fws.gov/ecp/species/9583">https://ecos.fws.gov/ecp/species/9583</a>	Breeds May 25 to Aug 1
<b>Black-billed Cuckoo <i>Coccyzus erythrophthalmus</i></b> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. <a href="https://ecos.fws.gov/ecp/species/9399">https://ecos.fws.gov/ecp/species/9399</a>	Breeds May 15 to Oct 10
<b>Bobolink <i>Dolichonyx oryzivorus</i></b> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. <a href="https://ecos.fws.gov/ecp/species/9454">https://ecos.fws.gov/ecp/species/9454</a>	Breeds May 20 to Jul 31



NAME	BREEDING SEASON
Canada Warbler <i>Cardellina canadensis</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. <a href="https://ecos.fws.gov/ecp/species/9643">https://ecos.fws.gov/ecp/species/9643</a>	Breeds May 20 to Aug 10
Cape May Warbler <i>Setophaga tigrina</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA <a href="https://ecos.fws.gov/ecp/species/10571">https://ecos.fws.gov/ecp/species/10571</a>	Breeds Jun 1 to Jul 31
Chimney Swift <i>Chaetura pelagica</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. <a href="https://ecos.fws.gov/ecp/species/9406">https://ecos.fws.gov/ecp/species/9406</a>	Breeds Mar 15 to Aug 25
Evening Grosbeak <i>Coccothraustes vespertinus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. <a href="https://ecos.fws.gov/ecp/species/9465">https://ecos.fws.gov/ecp/species/9465</a>	Breeds May 15 to Aug 10
Lesser Yellowlegs <i>Tringa flavipes</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. <a href="https://ecos.fws.gov/ecp/species/9679">https://ecos.fws.gov/ecp/species/9679</a>	Breeds elsewhere
Olive-sided Flycatcher <i>Contopus cooperi</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. <a href="https://ecos.fws.gov/ecp/species/3914">https://ecos.fws.gov/ecp/species/3914</a>	Breeds May 20 to Aug 31
Prairie Warbler <i>Setophaga discolor</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. <a href="https://ecos.fws.gov/ecp/species/9513">https://ecos.fws.gov/ecp/species/9513</a>	Breeds May 1 to Jul 31
Rose-breasted Grosbeak <i>Pheucticus ludovicianus</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA <a href="https://ecos.fws.gov/ecp/species/11965">https://ecos.fws.gov/ecp/species/11965</a>	Breeds May 15 to Jul 31
Veery <i>Catharus fuscescens fuscescens</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA <a href="https://ecos.fws.gov/ecp/species/11987">https://ecos.fws.gov/ecp/species/11987</a>	Breeds May 15 to Jul 15
Wood Thrush <i>Hylocichla mustelina</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. <a href="https://ecos.fws.gov/ecp/species/9431">https://ecos.fws.gov/ecp/species/9431</a>	Breeds May 10 to Aug 31

## PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read ["Supplemental Information on Migratory Birds and Eagles"](#), specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

### Probability of Presence (■)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

### Breeding Season (■)

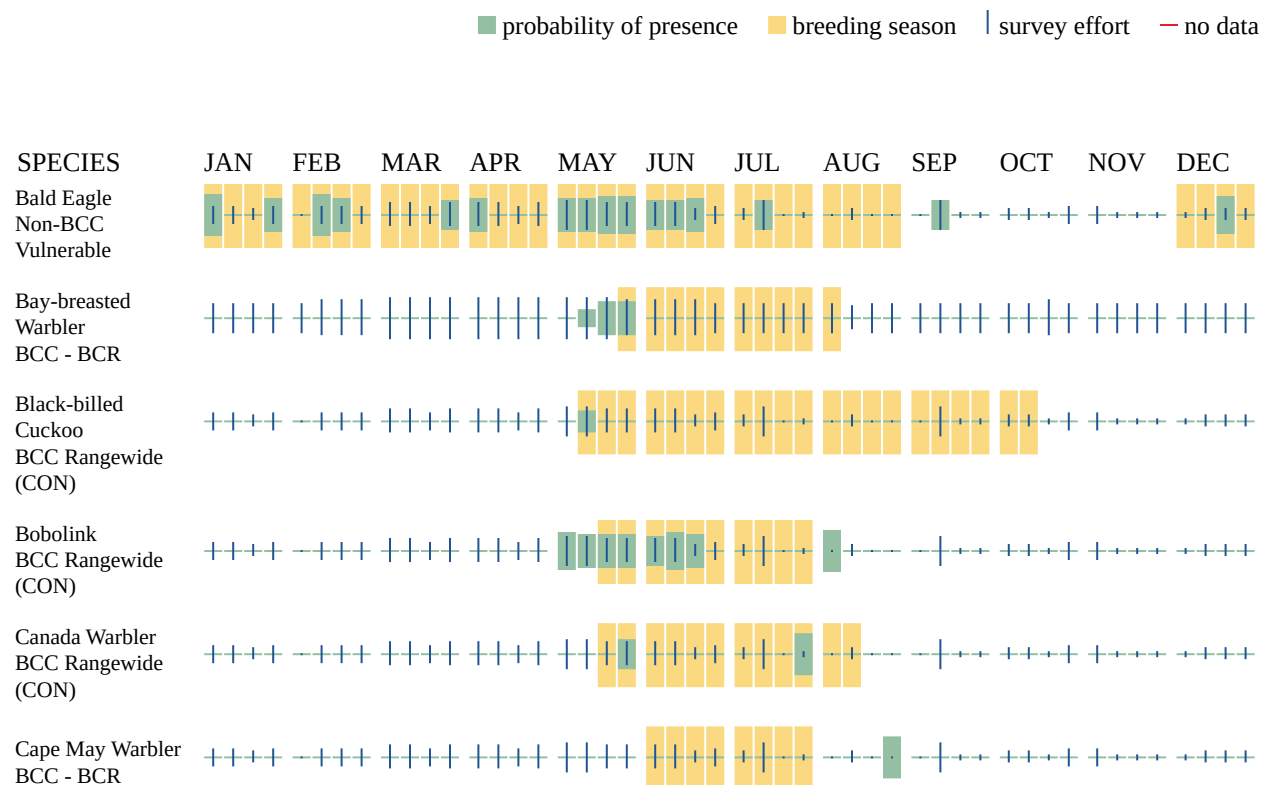
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

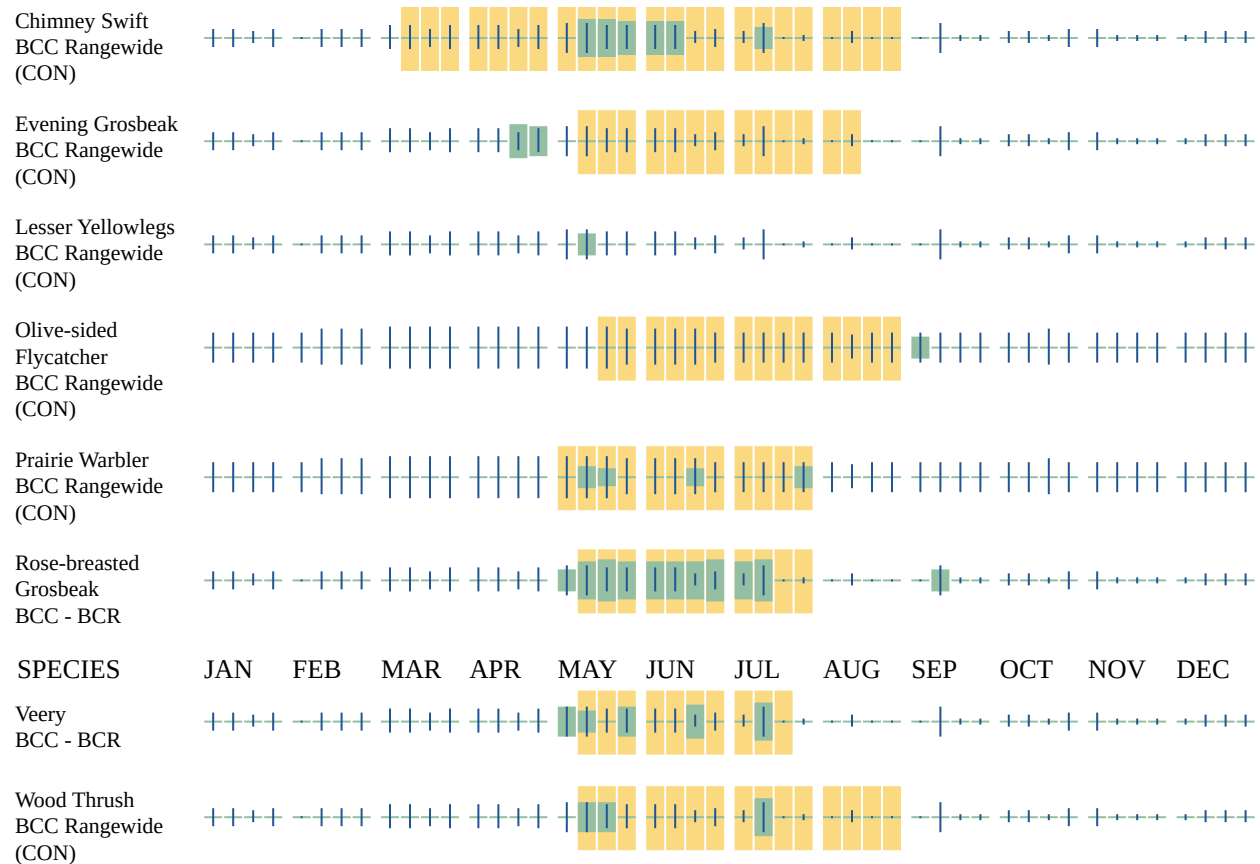
### Survey Effort (|)

Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

### No Data (—)

A week is marked as having no data if there were no survey events for that week.





Additional information can be found using the following links:

- Eagle Management <https://www.fws.gov/program/eagle-management>
- Measures for avoiding and minimizing impacts to birds <https://www.fws.gov/library/collections/avoiding-and-minimizing-incident-take-migratory-birds>
- Nationwide avoidance and minimization measures for birds
- Supplemental Information for Migratory Birds and Eagles in IPaC <https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action>

## WETLANDS

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).



Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

WETLAND INFORMATION WAS NOT AVAILABLE WHEN THIS SPECIES LIST WAS GENERATED. PLEASE VISIT [HTTPS://WWW.FWS.GOV/WETLANDS/DATA/MAPPER.HTML](https://www.fws.gov/wetlands/data/mapper.html) OR CONTACT THE FIELD OFFICE FOR FURTHER INFORMATION.

## IPAC USER CONTACT INFORMATION

Agency: Gardiner city  
Name: Gregory Russo  
Address: 427 Main Street  
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## United States Department of the Interior

FISH AND WILDLIFE SERVICE  
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In Reply Refer To:  
Project code: 2026-0069950  
Project Name: Harrison Ave. Slope Failure

03/31/2026 15:51:07 UTC

Federal Nexus: no  
Federal Action Agency (if applicable): Gardiner city

**Subject:** Technical assistance for 'Harrison Ave. Slope Failure'

Dear Gregory Russo:

This letter records your determination using the Information for Planning and Consultation (IPaC) system provided to the U.S. Fish and Wildlife Service (Service) on March 31, 2026, for 'Harrison Ave. Slope Failure' (here forward, Project). This project has been assigned Project Code 2026-0069950 and all future correspondence should clearly reference this number. **Please carefully review this letter. Your Endangered Species Act (Act) requirements are not complete.**

### Ensuring Accurate Determinations When Using IPaC

The Service developed the IPaC system and associated species' determination keys in accordance with the Endangered Species Act of 1973 (ESA; 87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) and based on a standing analysis. All information submitted by the Project proponent into IPaC must accurately represent the full scope and details of the Project. **Failure to accurately represent or implement the Project as detailed in IPaC or the Northern Long-eared Bat and Tricolored Bat Range-wide Determination Key (Dkey), invalidates this letter.**

### Determination for the Northern Long-Eared Bat and Tricolored Bat

Based on your IPaC submission and a standing analysis completed by the Service, you determined the proposed Project will have the following effect determinations:

Species	Listing Status	Determination
Northern Long-eared Bat ( <i>Myotis septentrionalis</i> )	Endangered	May affect
Tricolored Bat ( <i>Perimyotis subflavus</i> )	Proposed	May affect
	Endangered	



Federal agencies must consult with U.S. Fish and Wildlife Service under section 7(a)(2) of the Endangered Species Act (ESA) when an action *may affect* a listed species. Tricolored bat is proposed for listing as endangered under the ESA, but not yet listed. For actions that may affect a proposed species, agencies cannot consult, but they can *confer* under the authority of section 7(a)(4) of the ESA. Such conferences can follow the procedures for a consultation and be adopted as such if and when the proposed species is listed. Should the tricolored bat be listed, agencies must review projects that are not yet complete, or projects with ongoing effects within the tricolored bat range that previously received a NE or NLAA determination from the key to confirm that the determination is still accurate. Projects that receive a may affect determination for tricolored bat through the key, should contact the appropriate Ecological Services Field Office if they want to conference on this species.

### **Other Species and Critical Habitat that May be Present in the Action Area**

The IPaC-assisted determination key for the northern long-eared bat and tricolored bat does not apply to the following ESA-protected species and/or critical habitat that also may occur in your Action area:

- Atlantic Salmon *Salmo salar* Endangered
- Monarch Butterfly *Danaus plexippus* Proposed Threatened

You may coordinate with our Office to determine whether the Action may cause prohibited take of the species listed above.

### **Conclusion**

Further coordination with the Service is voluntary for those species with a determination of “May Affect.” A “May Affect” determination in this key indicates that the project, as entered, is not consistent with the questions in the key. Not all projects that reach a “May Affect” determination are anticipated to result in adverse impacts to listed species. Through the technical assistance process, the Service might be able to provide information that either indicates incidental take is not reasonably certain to occur, or the Service might be able to provide recommendations that enable the project to be conducted in a way that avoids the likelihood of incidentally taking listed bats. Please contact our Maine Ecological Services Field Office for more information. The Service has developed interim voluntary guidance for non-federal actions involving forest habitat modification that may affect the northern long-eared bat. Review the guidance posted here for more information for NLEB: <https://www.fws.gov/species/northern-long-eared-bat-myotis-septentrionalis> and TCB: <https://www.fws.gov/species/tricolored-bat-perimyotis-subflavus>

**Action Description**

You provided to IPaC the following name and description for the subject Action.

**1. Name**

Harrison Ave. Slope Failure

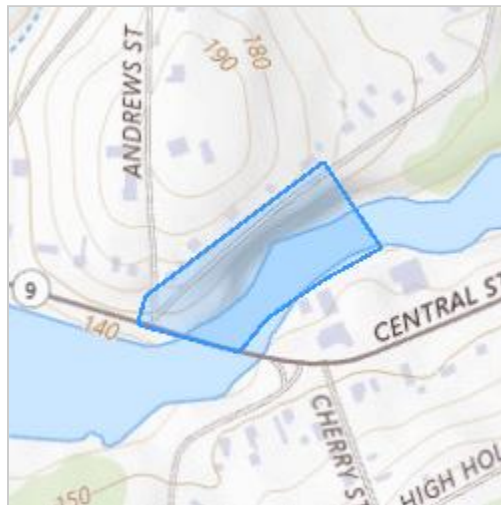
**2. Description**

The following description was provided for the project 'Harrison Ave. Slope Failure':

The project proponent, the City of Gardiner, is proposing to repair a slope failure that occurred along the embankment located immediately east of Harrison Avenue. The failed slope area is situated between the roadway and Cobbosseecontee Stream and has experienced loss of vegetative cover and surficial soils as a result of recent instability. The proposed work is intended to stabilize the affected section of slope, restore lost soil support, and reduce the potential for additional slope movement that could further impact the roadway and surrounding environment.

In addition to the slope stabilization work, the City is proposing a second phase of improvements that will address roadway repairs within the Harrison Avenue corridor. These repairs are expected to include restoration of areas where the roadway edge has been undermined or compromised by slope movement, as well as improvements necessary to maintain safe vehicular access once the slope has been stabilized.

The approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/@44.2206329,-69.7894692803844,14z>



## DETERMINATION KEY RESULT

Based on the answers provided, the proposed Action is consistent with a determination of “may affect” for a least one species covered by this determination key.

## QUALIFICATION INTERVIEW

1. Does the proposed project include, or is it reasonably certain to cause, intentional take of listed bats or any other listed species?

**Note:** Intentional take is defined as take that is the intended result of a project. Intentional take could refer to research, direct species management, surveys, and/or studies that include intentional handling/encountering, harassment, collection, or capturing of any individual of a federally listed threatened, endangered or proposed species?

*No*

2. Is the action area wholly within Zone 2 of the year-round active area for northern long-eared bat and/or tricolored bat?

**Automatically answered**

*No*

3. Does the action area intersect Zone 1 of the year-round active area for northern long-eared bat and/or tricolored bat?

**Automatically answered**

*No*

4. Does any component of the action involve leasing, construction or operation of wind turbines? Answer 'yes' if the activities considered are conducted with the intention of gathering survey information to inform the leasing, construction, or operation of wind turbines.

*No*

5. Does the proposed action involve solar energy?

*No*

6. Is the proposed action authorized, permitted, licensed, funded, or being carried out by a Federal agency in whole or in part?

**Note for projects in Pennsylvania:** Projects requiring authorization under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act would be considered as having a federal nexus. Since the U.S. Army Corps of Engineers (Corps) has issued the Pennsylvania State Programmatic General Permit (PASPGP), which may be verified by the PA Department of Environmental Protection or certain Conservation Districts, the need to receive a Corps authorization to perform the work under the PASPGP serves as a federal nexus. As such, if proposing to use the PASPGP, you would answer ‘yes’ to this question.

*No*



7. [Semantic] Is the action area located within 0.5 miles of a known bat hibernaculum or winter roost? Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your state wildlife agency.

**Automatically answered**

No

8. Does the action area contain any winter roosts or caves (or associated sinkholes, fissures, or other karst features), mines, rocky outcroppings, or tunnels that could provide habitat for hibernating bats?

No

9. Does the action area contain (1) talus or (2) anthropogenic or naturally formed rock shelters or crevices in rocky outcrops, rock faces or cliffs?

No

10. Will the action cause effects to a bridge?

**Note:** Covered bridges should be considered as bridges in this question.

No

11. Will the action result in effects to a culvert or tunnel at any time of year?

No

12. Are trees present within 1000 feet of the action area? **Note:** If there are trees within the action area that are of a sufficient size to be potential roosts for bats answer "Yes". If unsure, additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in the USFWS' [Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines](#).

Yes

13. Does the action include the intentional exclusion of bats from a building or building-like structure? **Note:** Exclusion is conducted to deny bats' entry or reentry into a building. To be effective and to avoid harming bats, it should be done according to established standards. If your action includes bat exclusion and you are unsure whether northern long-eared bats or tricolored bats are present, answer "Yes." Answer "No" if there are no signs of bat use in the building/structure. If unsure, contact your local Ecological Services Field Office to help assess whether northern long-eared bats or tricolored bats may be present. Contact a Nuisance Wildlife Control Operator (NWCO) for help in how to exclude bats from a structure safely without causing harm to the bats (to find a NWCO certified in bat standards, search the Internet using the search term "National Wildlife Control Operators Association bats"). Also see the White-Nose Syndrome Response Team's guide for bat control in structures.

No

14. Does the action involve removal, modification, or maintenance of a human-made building-like structure (barn, house, or other building) **known or suspected to contain roosting bats?**

No

15. Will the action cause construction of one or more new roads open to the public?

For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.).

No

16. Will the action include or cause any construction or other activity that is reasonably certain to increase average night-time traffic permanently or temporarily on one or more existing roads? **Note:** For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.). .

No

17. Will the action include or cause any construction or other activity that is reasonably certain to increase the number of travel lanes on an existing thoroughfare?

For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.).

No

18. Will the proposed Action involve the creation of a new water-borne contaminant source (e.g., leachate pond, pits containing chemicals that are not NSF/ANSI 60 compliant)?

**Note:** For information regarding NSF/ANSI 60 please visit <https://www.nsf.org/knowledge-library/nsf-ansi-standard-60-drinking-water-treatment-chemicals-health-effects>

No

19. Will the proposed action involve the creation of a new point source discharge from a facility other than a water treatment plant or storm water system?

No

20. Will the action include drilling or blasting?

No

21. Will the action involve military training (e.g., smoke operations, obscurant operations, exploding munitions, artillery fire, range use, helicopter or fixed wing aircraft use at night)?

No

22. Will the proposed action involve the use of herbicides or pesticides (e.g., fungicides, insecticides, or rodenticides)?

No

23. Will the action include or cause activities that are reasonably certain to cause chronic or intense nighttime noise (above current levels of ambient noise in the area) in suitable summer habitat for the northern long-eared bat or tricolored bat during the active season? Chronic noise is noise that is continuous or occurs repeatedly again and again for a long time. Sources of chronic or intense noise that could cause adverse effects to bats may include, but are not limited to: road traffic; trains; aircraft; industrial activities; gas compressor stations; loud music; crowds; oil and gas extraction; construction; and mining. **Note:** Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in the USFWS' [Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines](#).

No

24. Does the action include, or is it reasonably certain to cause, the use of permanent or temporary artificial lighting within 1000 feet of suitable forested northern long-eared bat or tricolored bat roosting habitat? **Note:** Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in the USFWS' [Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines](#).

No

25. Will the action include tree cutting or other means of knocking down or bringing down trees, tree topping, or tree trimming?

Yes

26. Is the project related to the production of coal, including projects that support the mining of coal, as well as the production and/or distribution of energy produced from coal?

No

27. Will the proposed action occur exclusively in an already established and currently maintained utility right-of-way?

No

28. Does the action include emergency cutting or trimming of hazard trees in order to remove an imminent threat to human safety or property? See hazard tree note at the bottom of the key for text that will be added to response letters

**Note:** A "hazard tree" is a tree that is an immediate threat to lives, public health and safety, or improved property.

No

29. Does the project intersect with the 0- 9.9% forest density category?

**Automatically answered**

No

30. Does the project intersect with the 10.0- 19.9% forest density category map?

**Automatically answered**

No

31. Does the project intersect with the 20.0- 29.9% forest density category map?

**Automatically answered**

No



32. Does the project intersect with the 30.0- 100% forest density category map?

**Automatically answered**

*Yes*

33. Will the action cause trees to be cut, knocked down, or otherwise brought down across an area greater than 100 acres in total extent?

*No*

34. Will the proposed action result in the use of prescribed fire?

**Note:** If the prescribed fire action includes other activities than application of fire (e.g., tree cutting, fire line preparation) please consider impacts from those activities within the previous representative questions in the key. This set of questions only considers impacts from flame and smoke.

*No*

35. Does the action area intersect the northern long-eared bat species list area?

**Automatically answered**

*Yes*

36. [Semantic] Is the action area located within 0.5 miles of radius of an entrance/opening to any known NLEB hibernacula or winter roost? **Note:** The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

**Automatically answered**

*No*

37. [Semantic] Is the action area located within 0.25 miles of a culvert that is known to be occupied by northern long-eared or tricolored bats? **Note:** The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

**Automatically answered**

*No*

38. [Semantic] Is the action area located within 150 feet of a documented northern long-eared bat roost site?

Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency. Have you contacted the appropriate agency to determine if your action is within 150 feet of any documented northern long-eared bat roosts?

Note: A document with links to Natural Heritage Inventory databases and other state-specific sources of information on the locations of northern long-eared bat roosts is available here. Location information for northern long-eared bat roosts is generally kept in state natural heritage inventory databases – the availability of this data varies by state. Many states provide online access to their data, either directly by providing maps or by providing the opportunity to make a data request. In some cases, to protect those resources, access to the information may be limited.

**Automatically answered**

No

39. Is suitable summer habitat for the northern long-eared bat present within 1000 feet of project activities? If unsure, answer "Yes." **Note:** Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in the USFWS' [Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines](#)

Yes

40. Has a presence/probable absence summer bat survey targeting the northern long-eared bat following the Service's [Range-wide Indiana Bat and Northern Long-Eared Bat Survey Guidelines](#) been conducted within the project area?

No

41. Are any of the trees proposed for cutting or other means of knocking down, bringing down, topping, or trimming suitable for northern long-eared bat roosting (i.e., live trees and/or snags  $\geq 3$  inches dbh that have exfoliating bark, cracks, crevices, and/or cavities)? **Note:** Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in the USFWS' [Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines](#).

Yes

42. Will any tree cutting/trimming or other knocking or bringing down of trees occur during the **Summer Occupancy season** for northern long-eared bats in the action area? **Note:** Bat activity periods for your state can be found in Appendix 2 of the Service's [Northern long-eared Bat and Tricolored Bat Voluntary Environmental Review Process for Development Projects](#).

Yes

43. Does the action area intersect the tricolored bat species list area?

**Automatically answered**

Yes

44. Is the action area located within 0.5-mile of radius of an entrance/opening to any known tricolored bat hibernacula or winter roost?

Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your state wildlife agency.

**Automatically answered**

No

45. [Semantic] Is the action area located within 0.25 miles of a culvert that is known to be occupied by northern long-eared or tricolored bats? **Note:** The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

**Automatically answered**

No

46. Has a presence/probable absence bat survey targeting the [tricolored bat and following the Service's Range-wide Indiana Bat and Northern Long-Eared Bat Survey Guidelines](#) been conducted within the project area?

No

47. Is suitable summer habitat for the tricolored bat present within 1000 feet of project activities? (If unsure, answer ""Yes.""") **Note:** If there are trees within the action area that may provide potential roosts for tricolored bats (e.g., clusters of leaves in live and dead deciduous trees, Spanish moss (*Tillandsia usneoides*), clusters of dead pine needles of large live pines) answer ""Yes."" For a complete definition of suitable summer habitat for the tricolored bat, please see the [Service's Range-wide Indiana Bat and Northern long-eared Bat Survey Guidelines](#).

Yes

48. Do any of the trees proposed for cutting or other means of knocking down, bringing down, topping, or trimming provide potential roosts for tricolored bats (e.g., clusters of leaves in live and dead deciduous trees, Spanish moss (*Tillandsia usneoides*), clusters of dead pine needles of large live pine trees)? **Note:** Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in the USFWS' [Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines](#).

Yes

49. Will any tree cutting/trimming or other knocking or bringing down of trees be conducted during the Pup Season for tricolored bat? **Note:** Bat activity periods for your state can be found in Appendix 2 of the Service's [Northern Long-eared Bat and Tricolored Bat Voluntary Environmental Review Process for Developmental Projects](#).

Yes

50. Do you have any documents that you want to include with this submission?

No



## PROJECT QUESTIONNAIRE

Enter the extent of the action area (in acres) from which trees will be removed - round up to the nearest tenth of an acre. For this question, include the entire area where tree removal will take place, even if some live or dead trees will be left standing.

*0.2*

If tree cutting will be part of the proposed action, at what time of year will tree cutting be conducted?

*Summer*

Can the proposed action be modified to ensure that tree cutting will be conducted outside of the season when bats will be present and roosting in trees?

*No*

**IPAC USER CONTACT INFORMATION**

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