

LAKE RAPONDA, GREEN MOUNTAIN BEACH SHORELINE EROSION CONTROL 30% DESIGN REPORT



Date of Photo: July 30, 2024

Location: Green Mountain Beach, Lake Raponda
Wilmington, VT 05363

Client: Windham County Natural Resources
Conservation District

Town: Wilmington, VT

Consultant: DuBois & King, Inc.

Date of Report: October 9, 2024



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1.0 DESCRIPTION OF PROJECT

1.1 General

1.1.1 Introduction

The Windham County Natural Resources Conservation District (WCNRCD) has contracted DuBois & King, Inc. (D&K) for the preliminary design of erosion control and access improvements (Project) at the Green Mountain Beach located on the eastern shore of Lake Raponda in Wilmington, Vermont. The proposed Project is located on property owned by the City of Wilmington, VT. The following report includes a description of the existing conditions at the site, the proposed landscape improvements, and an opinion of probable construction cost, permit requirements, and operations and maintenance requirements.

1.1.2 Purpose of Work

The Green Mountain Beach is a public beach with recreational swimming and two fishing areas. Stormwater best management practices (BMP's) were installed at the beach in 2017, including a vegetated swale, infiltration steps, and vegetated buffer. An evaluation of these BMPs conducted by the Vermont Department of Environmental Conservation's Lake Wise program in 2023, found that while some components of the BMPs are still intact, other areas of the Beach could benefit from new management practices or repair, including replacing the stone steps with infiltration steps, adding infiltration steps to the fishing areas, connecting the vegetated buffer, and increasing some plantings. The plantings within the vegetated buffers have grown past their original footprint and beach goers have expressed concern that they look messy, are blocking parents' views from the shoreline while their children are swimming, and are taking up valuable space for people to enjoy the beach.

1.2 Existing Conditions

1.2.1 Existing Conditions Plan

The existing conditions of the site are shown on Sheet 2 of the Design Plans. The site is part of a 19.44 acre parcel owned by the Town of Wilmington, the Beach area is 1.94 acres in size. A gravel parking lot for the Beach is also on the parcel, located east of the Beach, across Lake Raponda Road. The Beach is accessed by pedestrians via existing infiltration stairs, a gravel access road, and a steeply sloped gravel area near the north fishing area. The gravel access road also provides vehicular access to a single, unmarked ADA parking space close to the lake front. The access road is also used by maintenance staff to move the floating dock in and out of the water seasonally. Other amenities include a seasonally available portable toilet, picnic table, and single wood bench.

The existing BMP's consist of two vegetated buffers bordered by split rail style wood fences on their upland side and two vegetated swales (or bioswales) up slope from the buffers. The vegetated swales are hydrologically connected via a pipe running under the infiltration stairs. Another pipe is out letting into the swales on the south end of the practice, this pipe appears to be bringing water from the drainage swales along the road down to the bioswales, but it could not be located in the field. The bioswales have an additional pipe that outlets directly into the lake. Sediment was observed entering the lake from this pipe during a site visit in rainy conditions.

Two culverts were observed that direct water under Lake Raponda Road. The northern most culvert outlets into a rock lined swale near the north fishing area. Rocks in the swale were

observed to have been dislodged (likely by people, not water) and a significant sediment plume was observed entering the lake during a site visit in rainy conditions. The second culvert contains a perennial stream. An existing plunge pool is at the outfall on the lake side of the road. It appears that water is overflowing the plunge pool and creating a new secondary channel just to the south of the actual stream course. Where the stream meets the lake, a very wet area has developed, making it difficult to access the north fishing area from the center of the beach. A culvert crossing under the gravel parking lot access road is present on Vermont Natural Resources Atlas but was not observed in the field. Significant standing water was observed where the drainage swale meets the parking area road.

Erosion near both fishing areas at the water's edge was observed as well as adjacent to the existing stone steps between the two vegetated buffers. In the 2023 report from Lake Wise, erosion along the gravel access road had been observed, water bars along the road have since been installed and minimal erosion was evident during site visits made as part of this project.

1..2.2 Site Constraints

Maintaining a balance between the interests of the beach users and providing erosion control practices to protect the health of the Lake is the most critical site constraint. The vegetation within the vegetated buffer is protected and cannot be trimmed back or removed once it has reached full maturity. The tallest vegetation is 4-5' high and blocks views from the turf grass area up slope where beach goers like to sit. It is also encroaching further into the open spaces, taking up more sitting space. The less than positive perception of the natural vegetation means that the additional of more vegetated areas needs to be carefully considered.

2.0 PROPOSED CONDITIONS

2.1 Landscape Interventions

2.1.1 Infiltration Steps

Infiltration steps are proposed between the vegetated buffers where there is currently a single bench. This will provide a safer path down to the beach, a place to sit, and without creating new impervious surface. They are proposed to be cut around existing stones which are an admired feature of beach goers.

2.1.2 Grass Pave

Modular pervious paving system is proposed at the bottom of the access road and up to the lake edge where maintenance crews take vehicles for dock moving. The porous paving systems can help absorb more stormwater directed down the access road and can withstand vehicular traffic without becoming compacted. They can be planted with grass for greater aesthetic value.

2.1.3 Dry Stacked Wall

A natural stone, dry stacked wall is proposed along the lake side edges of the exiting vegetated buffers. This is to help prevent the vegetation from spreading further and create a clear edge for maintenance workers and a neater visual appearance. A dry stacked wall is also permeable to water and does not require a concrete footing which would require further permitting.

2.1.4 Plunge Pool

The stormwater observed in the drainage culvert along Lake Raponda Road that enters the unnamed perennial stream had significant sediment load on both the east side of Lake Raponda

Road upon outletting on the other side, within the existing rock lined swale and where it finally outlets into the Lake. This indicates that the swale is not sufficiently removing sediment as intended. Some soil in the swale was exposed due to rock being moved. A proposed plunge pool at the top of the swale will help reduce stormwater velocity and allow sediment to drop out before moving through the swale.

2.1.5 Dry Swale

The existing rock lined swale had numerous rocks dislodged and has minimal depth. A rebuilding of the swale is proposed to deepen the swale and add additional stone in order to reduce sediment load into the Lake.

2.1.6 Stone Toe

A stone toe is proposed at both the north and south fishing areas. These high traffic areas are both prone to erosion and stone toe provide protection against erosive forces from the lake side.

2.1.7 Site Furnishings

Three new benches are proposed on the site. Two are placed high up the slope near the existing infiltration steps in order to provide a comfortable place to sit that has a clear line of site to the water. A third is placed in the south fishing area which is a popular location for those with mobility issues.

2.1.8 Bioswale Retrofit

The existing bioswale overflows directly into the Lake and sediment was observed entering the Lake during rainy conditions. An overflow riser added to the existing outlet will allow more sediment to settle out prior to entering the outlet.

2.1.9 Vegetated Areas

Vegetated areas were kept to a minimum to not block views or access. A mix of native perennials adapted to shorelines, sandy soils, and wet areas is proposed near the north fishing area. Native shrubs are proposed along the edges of the existing vegetated buffers to create a neater, garden-like appearance.

3.0 OPINION OF PROBABLE CONSTRUCTION COST

3.1 Funding Sources

Through the Vermont Department of Environmental Conservation Clean Water Initiative, project design and implementation may be covered by a Design and Implementation Block Grant. Projects that protect water quality are eligible. The Project elements that are eligible include the stone toes with vegetation, removal of the concrete pad (and vegetation replacement), the bioswale retrofit, and the infiltration steps. The grant fundable and non-grant fundable design elements are separated into their own tables below.

3.2 Opinion of Probable Construction Cost

Below are the tables presenting our opinion of construction cost (OPCC) for the erosion control measures and landscape improvements. The OPCC was developed using a combination of the VTrans 2018 Average Price List, D&K's in-house experience based on bid tabulations for recent similar projects. This OPCC is also included as Attachment B.

Note: In providing OPCCs, the Client understands that DuBois & King, Inc. has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's methods of pricing, and that our OPCCs are made on the basis of our professional judgement and experience. DuBois & King, Inc. makes no warranty, expressed or implied, that the bids or the negotiated costs of the Work will not vary from the OPCC provided herein

Lake Raponda Erosion Control-Non-Grant Eligible Design Elements					
ITEM NO.	DESCRIPTION	UNIT	QUANT	UNIT PRICE	AMOUNT
1	COMMON EXCAVATION	CY	70	\$18.00	\$1,266.00
2	Stone Fill, Type 1	CY	30	\$62.00	\$1,860.00
4	Dry Stacked Stone Wall	LF	105	\$100.00	\$10,500.00
6	Grass Pavers	SF	1150	\$5.00	\$5,750.00
8	Bench	EA	3	\$1,560.00	\$4,680.00
9	Stone Bridge	LS	1	\$2,000.00	\$2,000.00
10	Existing Plunge Pool Modification	LS	1	\$1,000.00	\$1,000.00
12	Turf Establishment	SY	128	\$45.00	\$5,750.00
15	Handrai I	LF	16	\$75.00	\$1,200.00
	Running Total				\$34,006.00
	Contingency (15%)				\$5,100.90
					\$39,106.90
	OTHER COSTS				
	Final Design/Construction Phase Services				\$21,200.00
	OTHER COSTS TOTAL				\$21,200.00
	Grand Total				\$60,306.90

Lake Raponda Erosion Control - Grant Eligible Design Elements					
ITEM NO.	DESCRIPTION	UNIT	QUANT.	UNIT PRICE	AMOUNT
1	Stone Toe	CY	35	\$125.00	\$4,375.00
2	Infiltration Steps	SF	280	\$50.00	\$14,000.00
3	Vegetation Area	SF	225	\$50.00	\$11,250.00
4	Topsoil	CY	7	\$65.00	\$455.00
5	Mulch	TON	0.10	\$1,400.00	\$140.00
6	Shrub Planting	EA	33	\$45.00	\$1,485.00
8	Bioswale Overflow Riser Retrofit	LS	1	\$4,982.00	\$4,982.00
	Running Total				\$30,220.00
	Contingency (15%)				\$4,533.00
					\$34,753.00
	OTHER COSTS				
	Final Design/Construction Phase Services				\$18,800.00
	OTHER COSTS TOTAL				\$18,800.00
	Grand Total				\$53,553.00

4.0 PERMIT REQUIREMENTS

Local Permit

Permit #2024-269 was issued by the Town of Wilmington, VT on October 4th, 2024 for the Shoreline Erosion Control Project described in this report. See Attachment C.

State Permits/Approval

A Lake Encroachment Permit must be secured through the Vermont Department of Environmental Conservation prior to commencing construction work. The application form and instructions are available at the DEC's website (<https://dec.vermont.gov/watershed/lakes-ponds/permit/encroachment/appresources>).

There is a \$155 application fee and the review typically takes 60-90 days once an application is complete.

5.0 OPERATION AND MAINTENANCE

Bioswale Maintenance

Monthly:

Remove weeds and invasive plants

Remove any trash that has washed into the facility or any inlets or pipes

Check for standing water more than 2 days after a rain storm; if needed, remove sediment from overflow pipes or contact design engineer

Inspect for signs of erosion, obstructions or unhealthy vegetation

Seasonally:

Remove fallen leaves

Perform regular inspections every six months to check for blockages, erosion, and sediment buildup. Inspections should also be done after major storms.

Rock Lined Swale Maintenance

Perform regular inspections to remove sediment or debris build up. Reset any dislodged stones.

Existing Vegetated Buffer Maintenance

Regularly check for invasive species and remove them as needed

String trimming outside of vegetated area is allowed but not removal of mature perennials

APPENDIX--Site Photos



Existing bench and boulders between vegetated buffers, site of proposed infiltration steps



Existing plunge pool, debris build up on left of picture, to be removed



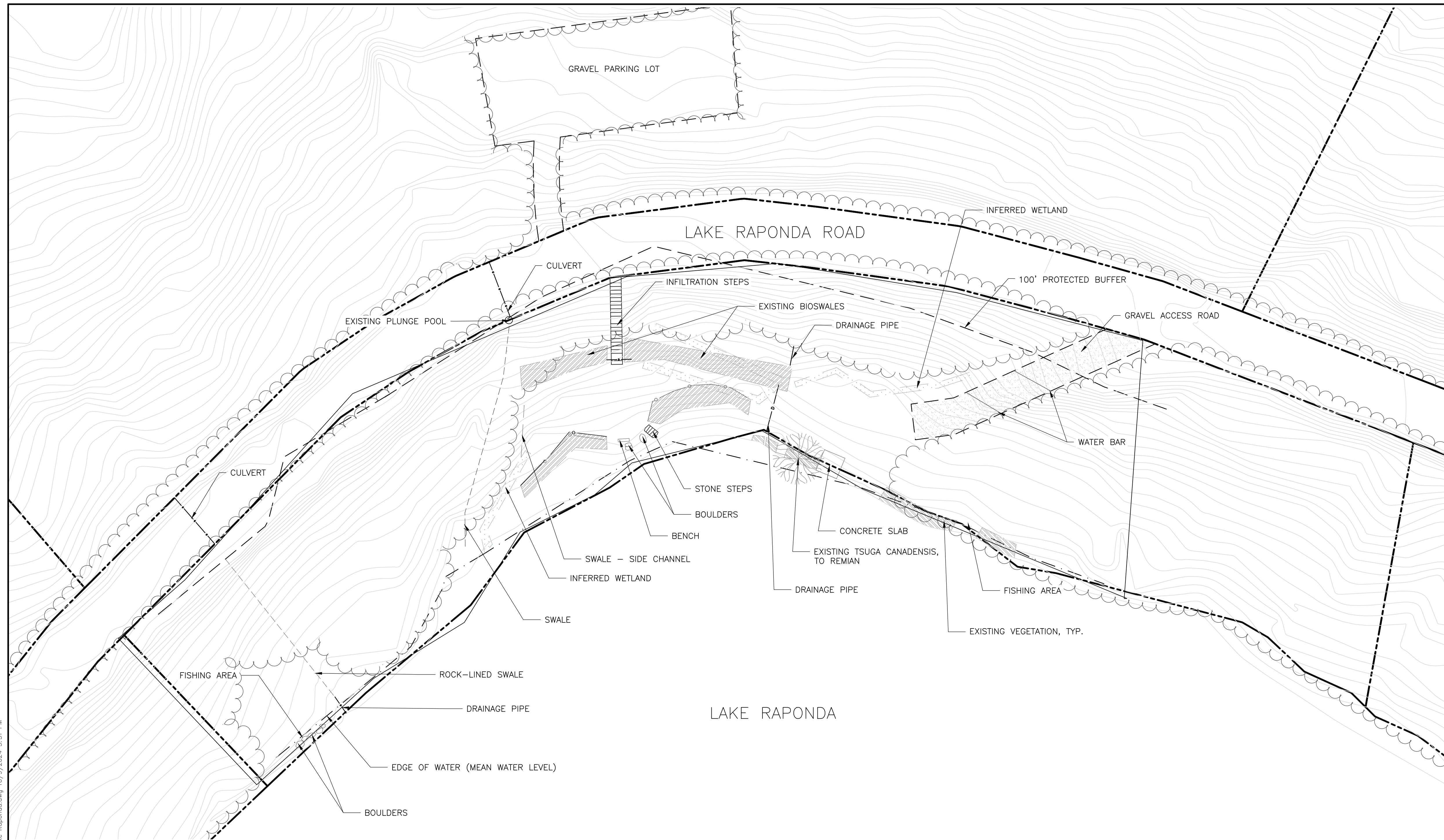
Gravel access road and parking area



Existing dry swale (rock lined swale)



Sedimentation where dry swale outlets to lake (left side of photo)



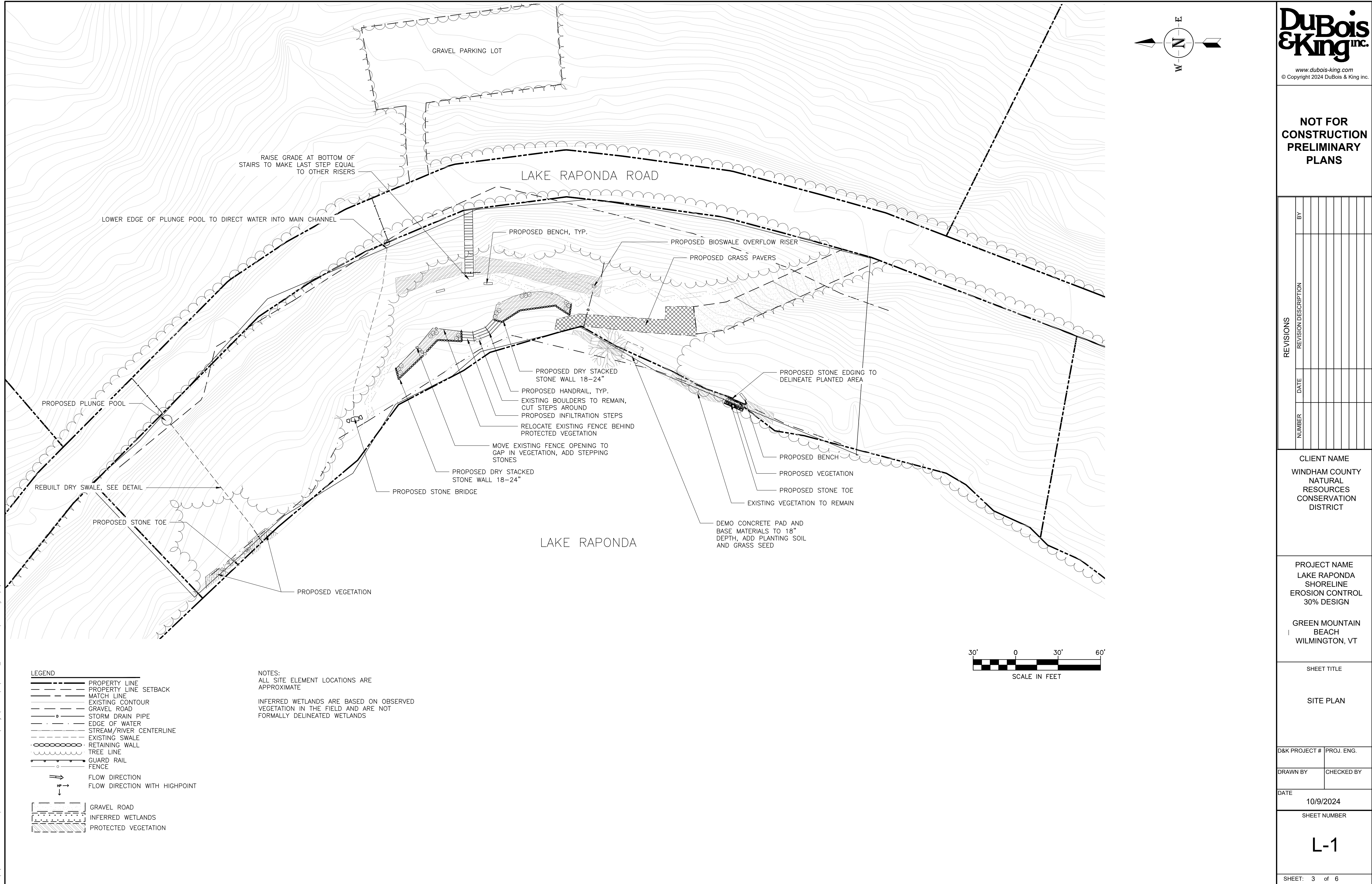
**DuBois
& King inc.**

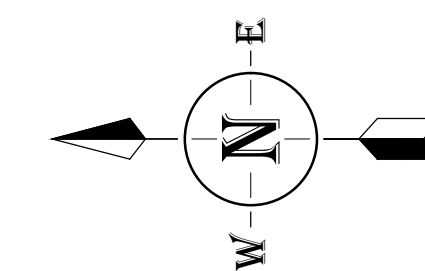
www.dubois-king.com
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**NOT FOR
CONSTRUCTION
PRELIMINARY
PLANS**

CLIENT NAME
WINDHAM COUNTY
NATURAL
RESOURCES
CONSERVATION
DISTRICT

GREEN MOUNTAIN
| BEACH
WILMINGTON, VT

D&K PROJECT #	PROJ. ENG.
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DRAWN BY	CHECKED BY
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DATE	10/9/2024
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SHEET NUMBER

L-2

SHEET: 4 of 6

A graphic scale bar labeled "SCALE IN FEET". It has markings at 0, 30, and 60 feet. The segment from 0 to 30 feet is divided into alternating black and white squares, each representing 5 feet. The segment from 30 to 60 feet is a solid black bar.

NOTES:
ALL SITE ELEMENT LOCATIONS ARE
APPROXIMATE

INFERRED WETLANDS ARE BASED ON OBSERVED
VEGETATION IN THE FIELD AND ARE NOT
FORMALLY DELINEATED WETLANDS

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CLIENT NAME
WINDHAM COUNTY
NATURAL
RESOURCES
CONSERVATION
DISTRICT

PROJECT NAME
LAKE RAPONDA
SHORELINE
EROSION CONTROL
30% DESIGN

GREEN MOUNTAIN
| BEACH
WILMINGTON, VT

SHEET TITLE

TYPICAL SITE DETAILS

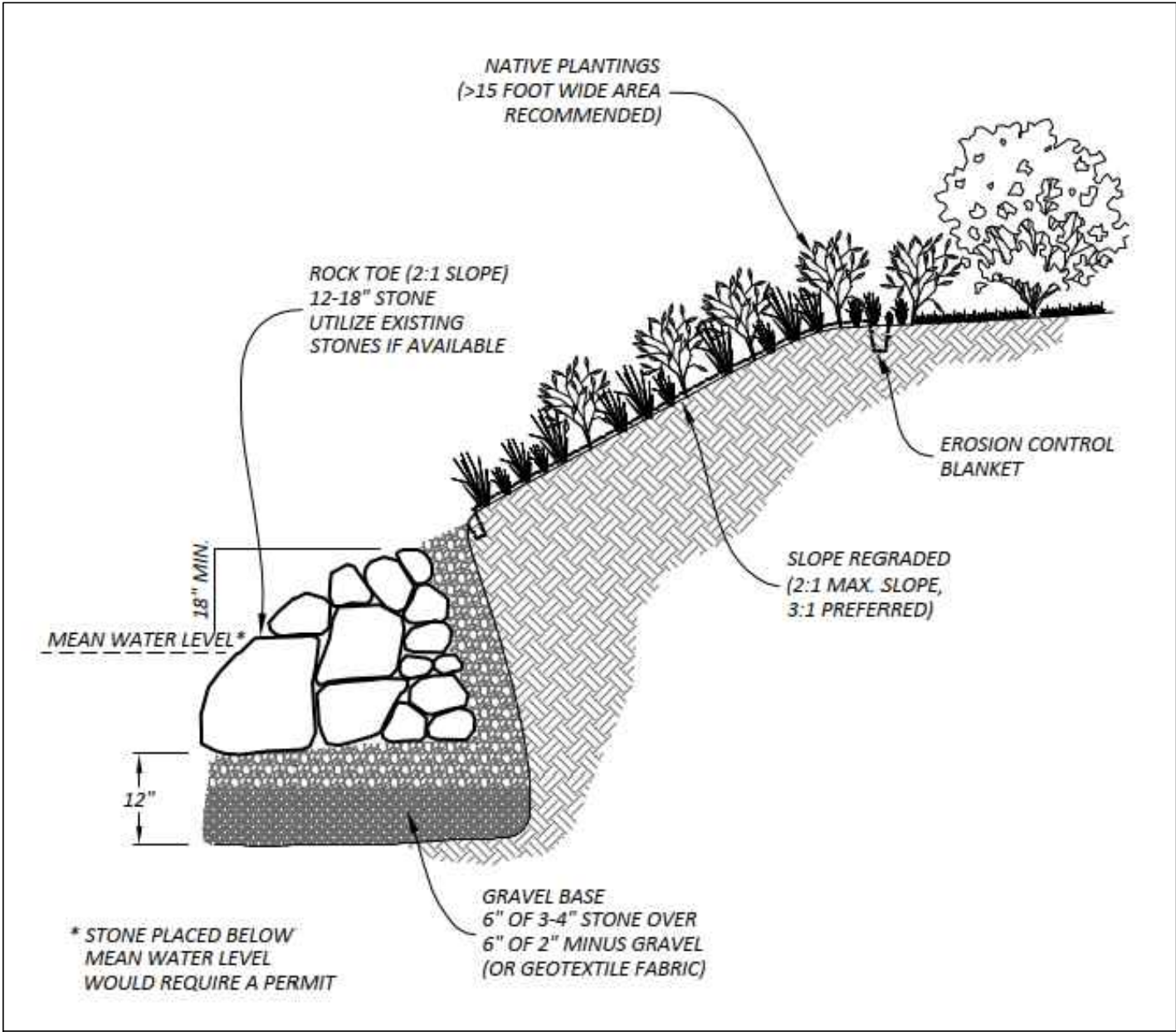
D&K PROJECT #	PROJ. ENG.
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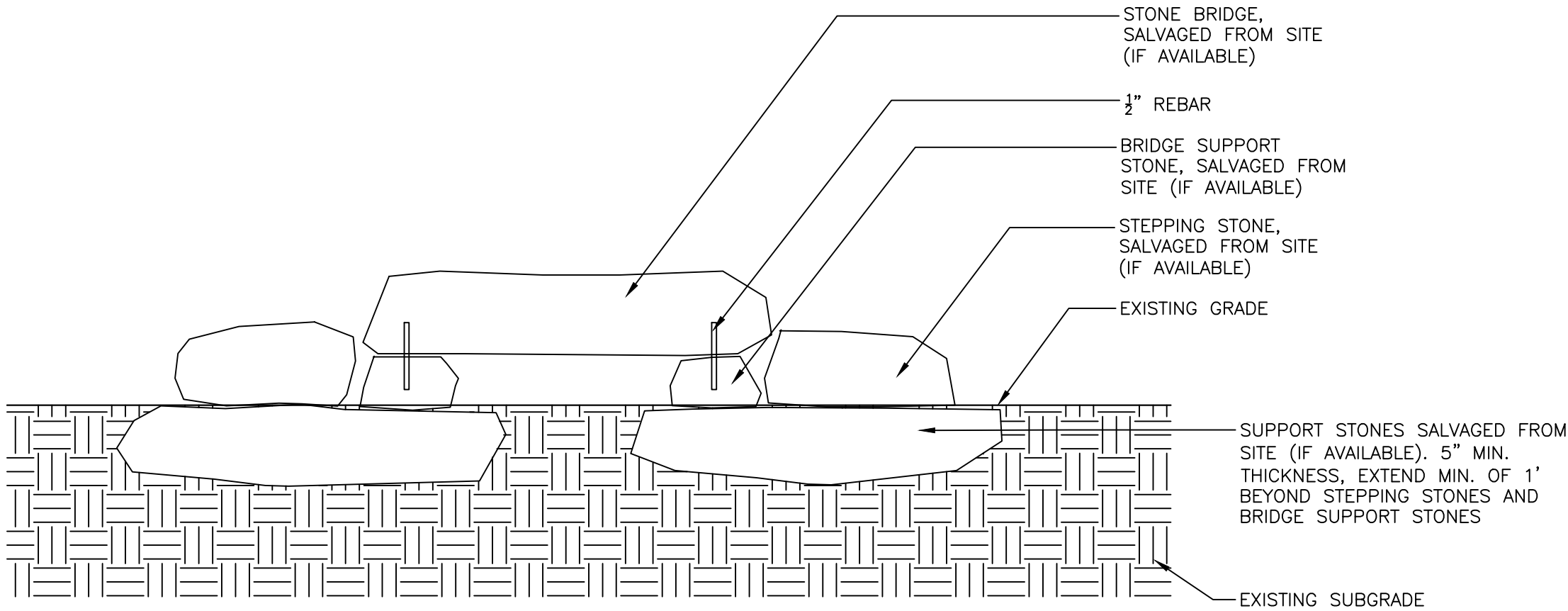
DATE 10/9/2024

SHEET NUMBER

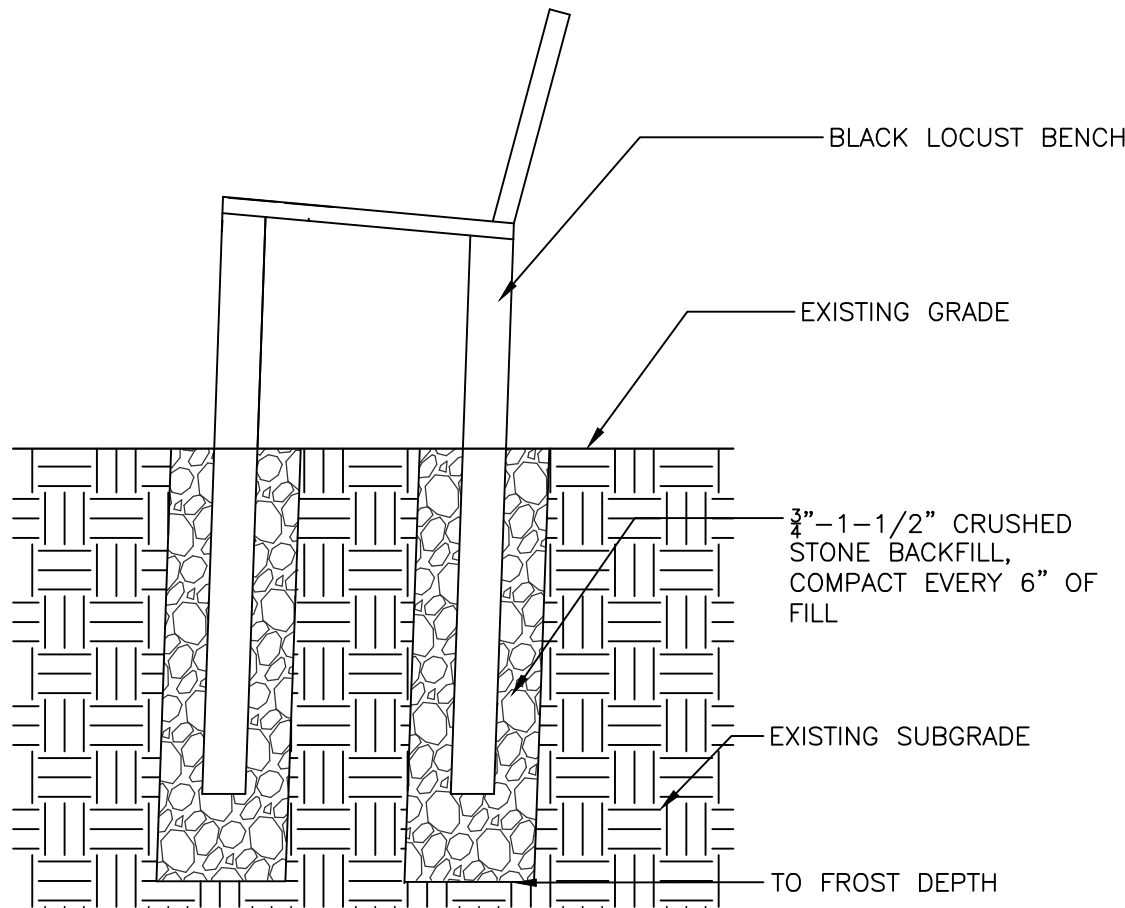
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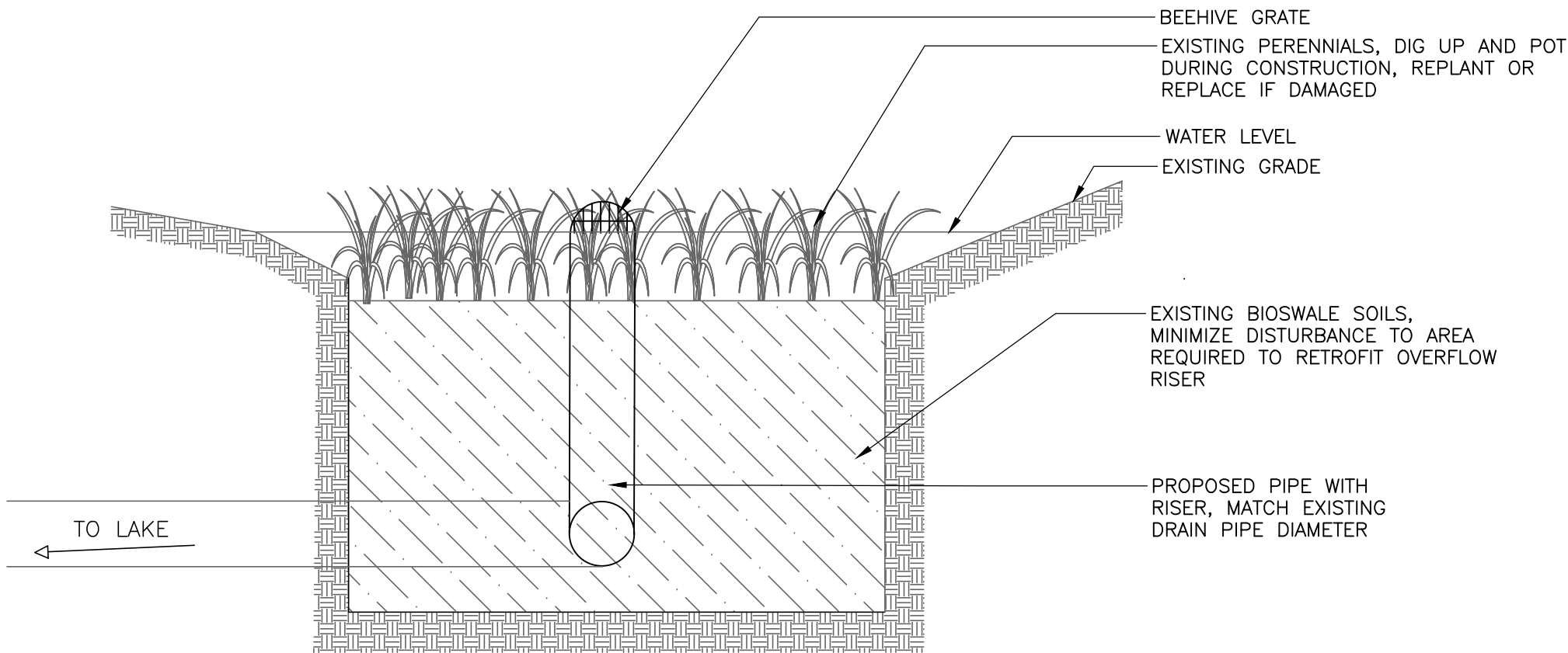
TYPICAL STONE TOE DETAIL
NOT TO SCALE



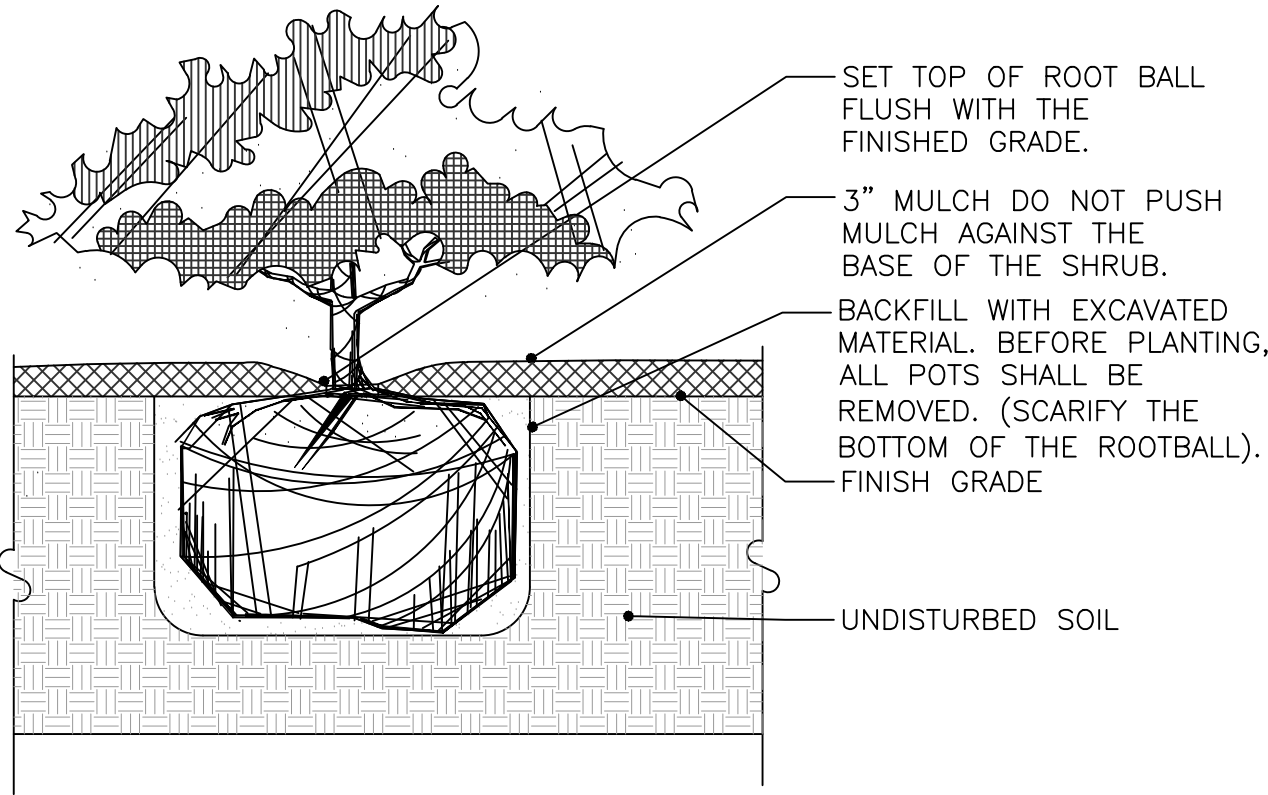
STONE BRIDGE DETAIL
NOT TO SCALE



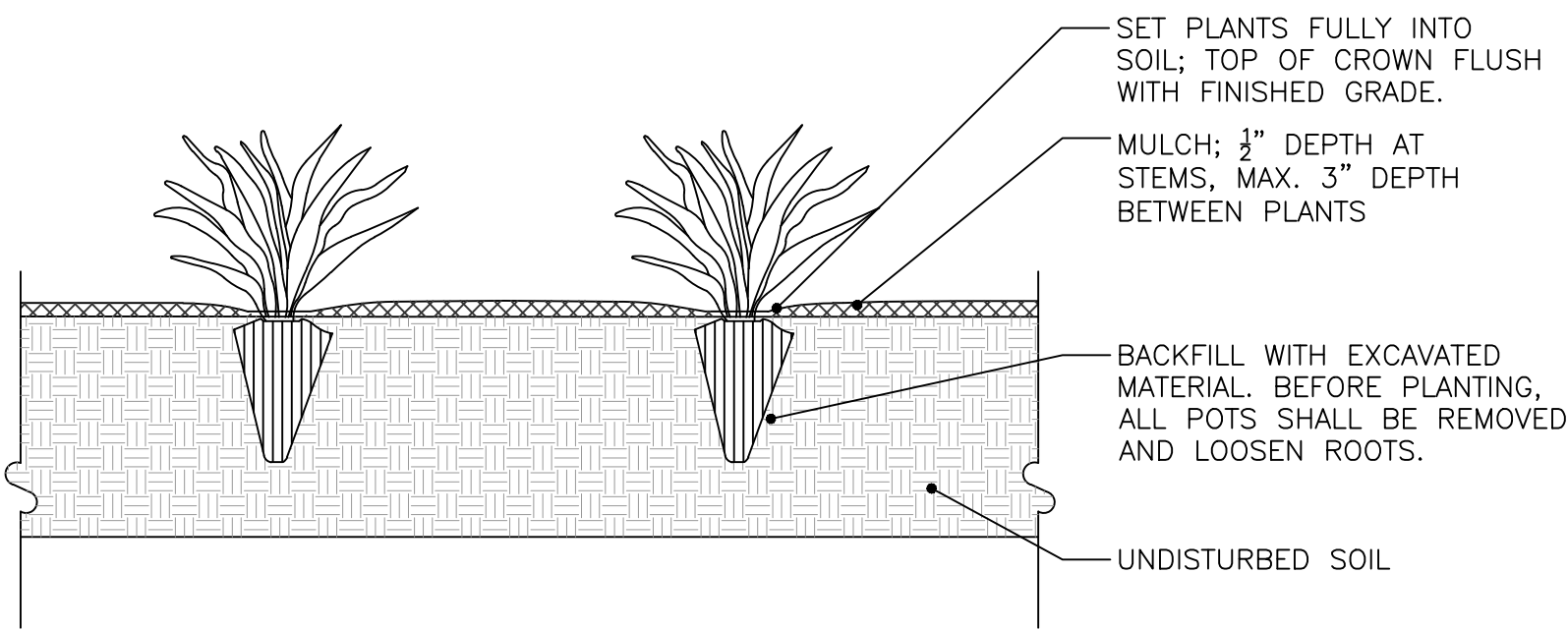
BENCH EMBEDMENT DETAIL
NOT TO SCALE



BIOSWALE OVERFLOW RISER RETROFIT DETAIL
NOT TO SCALE



SHRUB PLANTING DETAIL
SCALE: NTS



HERBACEOUS PLANTING DETAIL
SCALE: NTS

NOT FOR
CONSTRUCTION
PRELIMINARY
PLANS

REVISIONS	BY		DATE		NUMBER	
	REVISION DESCRIPTION					

CLIENT NAME
WINDHAM COUNTY
NATURAL
RESOURCES
CONSERVATION
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PROJECT NAME
LAKE RAPONDA
SHORELINE
EROSION CONTROL
30% DESIGN

GREEN MOUNTAIN
BEACH
WILMINGTON, VT

SHEET TITLE

TYPICAL SITE
DETAILS

D&K PROJECT # PROJ. ENG.

DRAWN BY CHECKED BY

DATE
10/9/2024

SHEET NUMBER

L-4

SHEET: 6 of 6



☐ Bedford, NH 03110 (603) 883-0463
☒ Randolph, VT 05060 (802) 728-3376
☐ S. Burlingt., VT 05403 (802) 878-7661
☐ Springfield, VT 05156 (802) 591-4326

Engineering • Planning • Development • Management

JOI Lake Raponda Shoreline Erosion

SH 1 OF 1

CALCUL LD DATE: 10/9/2024

CHECKED CJR/ANH DATE: 10/9/2024

SC

Lake Raponda Erosion Control - Grant Eligible Design Elements

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Engineering • Planning • Development • Management

JO: Lake Raponda Shoreline Erosion

SH 1 OF 1

CALCUL LD DATE: 10/9/2024

CHECKED CJR/ANH DATE: 10/9/2024

SC _____

Lake Raponda Erosion Control-Non-Grant Eligible Design Elements

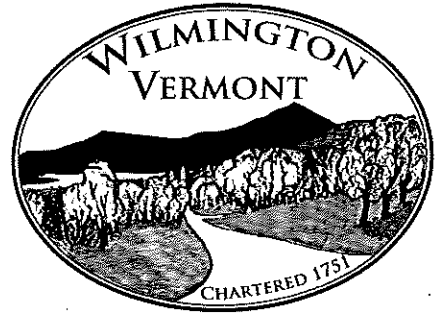
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TOWN OF

Wilmington

ZONING PERMIT



Permit Number: #2024-269

Date Issued: October 4, 2024

Owner: Town of Wilmington

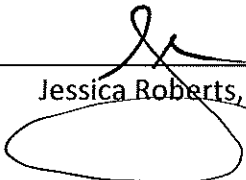
Property Address: (see Parcel ID)

Parcel ID #: 22-21-51

This certifies that the owner of the subject property has permission:

To complete the Shoreline Erosion Control Project.

The work authorized by this permit shall be completed in conformance with the application materials submitted by the applicant and in conformance with no conditions. This permit shall not take effect until fifteen (15) days after the date of issue, pursuant to 24 VSA § 4449. Any decision of the Zoning Administrator may be appealed to the Appropriate Municipal Panel (AMP) by an interested person, pursuant to 24 VSA § 4465, provided that such appeal is made in writing to the Chairperson of the AMP within fifteen (15) days of the date of issue of the permit. The work authorized by this permit must be substantially complete within two years, at which time the permit expires. Required notice is given that Vermont State permits may be required, and the permittee should contact State agencies to determine what permits must be obtained before any construction may commence.



Jessica Roberts, Zoning Administrator