



WPA Form 1- Request for Determination of Applicability

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

A. General Information

Important:

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



1. Applicant: **Eversource Energy**
 (attn. **Devleena Ghosh-Brower, PWS, CPESC**)
 Name devleena.ghosh-brower@eversource.com
 E-Mail Address
107 Selden Street
 Mailing Address
Berlin
 City/Town C 06037
 State Zip Code
860-665-5033
 Phone Number
 Fax Number (if applicable)

2. Representative (if any):
Fuss & O'Neill, Inc.
 Firm
Timothy F. Keane, P.E., LSP
 Contact Name tkeane@fando.com
 E-Mail Address
78 Interstate Drive
 Mailing Address
West Springfield
 City/Town MA 01089
 State Zip Code
413-452-0445 x4410
 Phone Number
 Fax Number (if applicable)

B. Determinations

1. I request the Leverett Conservation Commission make the following determination(s). Check any that apply:

- a. whether the **area** depicted on plan(s) and/or map(s) referenced below is an area subject to jurisdiction of the Wetlands Protection Act.
- b. whether the **boundaries** of resource area(s) depicted on plan(s) and/or map(s) referenced below are accurately delineated.
- c. whether the **work** depicted on plan(s) referenced below is subject to the Wetlands Protection Act.
- d. whether the area and/or work depicted on plan(s) referenced below is subject to the jurisdiction of any **municipal wetlands ordinance** or **bylaw** of:

Name of Municipality

- e. whether the following **scope of alternatives** is adequate for work in the Riverfront Area as depicted on referenced plan(s).
- _____



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C. Project Description

1. a. Project Location (use maps and plans to identify the location of the area subject to this request):

ROW between Rattlesnake Gutter Rd & Shutesbury Rd Leverett

Street Address

City/Town

NA - Electric utility right-of-way

4-0-56

Assessors Map/Plat Number

Parcel/Lot Number

b. Area Description (use additional paper, if necessary):

See attached.

c. Plan and/or Map Reference(s):

2017 Structure Replacement Project 354 Line Overview Sheets and
Sheets 1-6

Title

8/22/17

Date

2017 Structure Replacement Project Locus Map

Title

June 2017

Date

Figure 1 Access Road Detail

Title

8/17/17

Date

2. a. Work Description (use additional paper and/or provide plan(s) of work, if necessary):

See attached.



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C. Project Description (cont.)

b. Identify provisions of the Wetlands Protection Act or regulations which may exempt the applicant from having to file a Notice of Intent for all or part of the described work (use additional paper, if necessary).

See attached.

3. a. If this application is a Request for Determination of Scope of Alternatives for work in the Riverfront Area, indicate the one classification below that best describes the project.

- Single family house on a lot recorded on or before 8/1/96
- Single family house on a lot recorded after 8/1/96
- Expansion of an existing structure on a lot recorded after 8/1/96
- Project, other than a single family house or public project, where the applicant owned the lot before 8/7/96
- New agriculture or aquaculture project
- Public project where funds were appropriated prior to 8/7/96
- Project on a lot shown on an approved, definitive subdivision plan where there is a recorded deed restriction limiting total alteration of the Riverfront Area for the entire subdivision
- Residential subdivision; institutional, industrial, or commercial project
- Municipal project
- District, county, state, or federal government project
- Project required to evaluate off-site alternatives in more than one municipality in an Environmental Impact Report under MEPA or in an alternatives analysis pursuant to an application for a 404 permit from the U.S. Army Corps of Engineers or 401 Water Quality Certification from the Department of Environmental Protection.

b. Provide evidence (e.g., record of date subdivision lot was recorded) supporting the classification above (use additional paper and/or attach appropriate documents, if necessary.)



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D. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Request for Determination of Applicability and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge.

I further certify that the property owner, if different from the applicant, and the appropriate DEP Regional Office were sent a complete copy of this Request (including all appropriate documentation) simultaneously with the submittal of this Request to the Conservation Commission.

Failure by the applicant to send copies in a timely manner may result in dismissal of the Request for Determination of Applicability.

Name and address of the property owner: ****Note: Eversource is a owner of a Line 354 Deeded Easement.**

<u>Eversource Energy</u>	
Name	
<u>107 Selden Street</u>	
Mailing Address	
<u>Berlin</u>	
City/Town	
<u>CT</u>	<u>06037</u>
State	Zip Code

Signatures:

I also understand that notification of this Request will be placed in a local newspaper at my expense in accordance with Section 10.05(3)(b)(1) of the Wetlands Protection Act regulations.

<u>Joshua Brower</u>	<u>8-24-17</u>
Signature of Applicant	Date
<u>Timothy F. Keane</u>	<u>8-24-17</u>
Signature of Representative (if any)	Date



Work associated with STR 34086 (construction of gravel work pad) is located outside the Buffer Zone of the nearby wetland. However, *Sheet 4* shows the overestimated Buffer Zone for permitting purposes.

Regulatory Review/Establishing Jurisdiction

Eversource is submitting this RDA for the ancillary work needed to complete the replacement of two structures (STR 34077 and STR 34086) for the Leverett Conservation Commission’s judgement of jurisdiction per 310 CMR 10.02(2)(b).

Work	Jurisdiction	
	310 CMR 10.02 (WPA, administered by Leverett CC)	314 CMR 9.00 (Under ACO Permit #WE-17- 6W001-NT, administered by MassDEP WERO)
Structure Replacement in BVW	Exempt ¹ 310 CMR 10.02(2)(a)(2)	X
Structure replacement in Riverfront Area or 100-foot Buffer Zone		---
Permanent impacts to Buffer Zone (new access road or work pad construction)	X	---
Temporary impacts in Riverfront Area from construction mats	X	---
Temporary impacts to BVW from construction mats	---	X

¹= per **310 CMR 10.02(2)(a)(2)** when certain conditions within this citation are met as they consist of *“activities conducted to maintain, repair or replace, but not substantially change or enlarge an existing and lawfully located structure or facility used in the service of the public and used to provide electric services....”*

The work associated with the construction a permanent access road and work pad (to conduct the exempt structure replacement work) is not exempt and is the justification for submitting this RDA.

- **For the construction of permanent access road and work pad in the Buffer Zone of BVW**, Eversource is seeking a Negative Determination – Category 3 finding that *“the work described in the Request is within the Buffer Zone, as defined in the regulations, but will not alter an Area subject to protection under the Act. Therefore, said work does not require the filing of a Notice of Intent...”*
- For the placement of **temporary access road in Riverfront**, Eversource is seeking a Negative Determination – Category 2 finding that *“the work described in the Request is within an area subject to protection under the Act, but will not remove, fill, dredge or alter that area. Therefore, said work does not require the filing of a Notice of Intent.”*

Wetland Resource Areas

- Date of Delineation: June 1, 2017
- Completed By: Fuss & O’Neill, Inc.



- Methodology: Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-12-1. Vicksburg, MS: U.S. Army Engineer Research and Development Center (Version 2.0).

Work Description

The overall work includes:

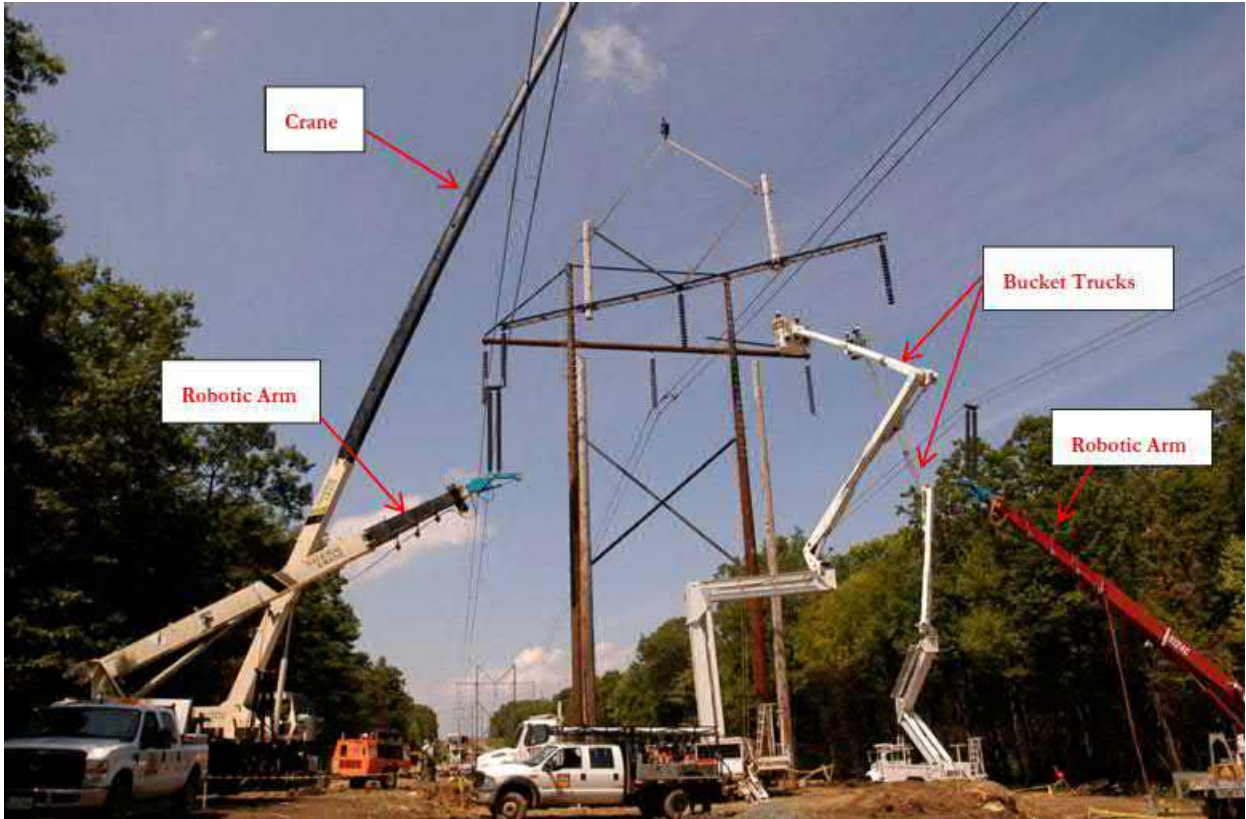
1. STRUCTURE REPLACEMENT ACTIVITIES (Not Subject to WPA Review)

Existing transmission structures STR 34077 and STR 34086 have incurred severe woodpecker damage and will be replaced. Structure 34077 is located in BVW (i.e., an Area Subject to Protection under M.G.L. c. 131, § 40). Structure 34086 is located in (an overestimated) Buffer to BVW. As previously discussed, the replacement of the structures is an exempt activity per 310 CMR 10.02(2)(a)(2).

2. WORK PAD INSTALLATION

In order to safely replace the structure, temporary construction matting will be applied in the ROW around STR 34077. The construction matting proposed around STR 34077 will be approximately 150 feet by 150 feet. This large work pad is warranted because the work is anticipated to occur "live line" (i.e. when overhead lines are energized) which requires specialized equipment (such as bucket trucks, robotic arms, cranes and excavators plus additional support vehicles and trucks) for the structure replacement activities.

An illustration of the equipment and work area required for "live line" work is provided for your reference as follows.



STR 34077:

- Approximately 4,800 square feet (SF) of the work pad will be located in Riverfront Area
- Approximately 15,700 SF of the work pad will be located within the BVW (not subject to WPA review per ACO Permit #WE-17-6W001-NT, administered by MassDEP WERO)

The perennial stream (Sawmill River) that is located near STR 34077 and within the footprint of the work pad (see *Sheet 1*) will be bridged with construction mats. No mats will be placed below Ordinary High Water (OHW) of the Sawmill River.

The temporary placement of construction mats in BVW are not subject to review under 310 CMR 10.00, rather will be authorized under Section 401 of the CWA under a recently formalized Administrative Consent Order between MassDEP and Eversource (ACO Permit #WE-17-6W001-NT).

STR 34086:

- Approximately 16,900 SF of the work pad will be located in Buffer Zone (overestimated)

A gravel work pad will be constructed around STR 34086 (*Sheet 4*) to create a stable work area for the crews and equipment during structure replacement activities. The work pad, as shown on *Sheet 4*, technically is outside the 100-foot Buffer Zone of the nearby BVW. As previously discussed, Eversource does not yet know the USACE's jurisdictional determination of the eroded access road (channel).



Because of this, Eversource is showing the work pad in a Buffer Zone for the channel as a conservative measure for permitting.

3. TEMPORARY ACCESS ROAD to STR 34077

Because a portion of the existing access road near STR 34077 conveys the flow of a perennial stream associated with the Sawmill River, an alternate, temporary access road will be built with construction mats to access the work pad from the south. Approximately 420 linear feet of construction mats (16 feet wide) will be placed in the ROW within Riverfront and BVW to provide access to the work pad. The construction mats will span the perennial stream as shown on *Sheet 1*.

The square footage of temporary construction mats in Riverfront and BVW is 6,700 SF. Approximately 10 linear feet (160 SF) of the construction matted access road is in BVW. (Temporary construction mats in BVW are not subject to WPA review, authorized by ACO Permit #WE-17-6W001-NT).

4. PERMANENT ACCESS ROAD to STR 34077

An existing access road is present to the structures in portions of the ROW in Leverett. This access road is visible on the attached Sheets. However, portions of the former access road to STR 34077 intercept flow certain times of the year. Wherever flows are visible along this historic eroded access road, a new access road will be constructed in the nearby upland within the ROW, within the 100-foot Buffer Zone. In order to avoid impacts to the preferential flow path, Eversource plans to construct a new access road outside of the historical access road bed in the upland area within the ROW to gain access to STR 34077. The new access road will be used to access STR 34077 and will be used for future maintenance and emergency work. The proposed access road is shown on *Sheet 1* through *Sheet 6*.

The new access road will be constructed of clean modified riprap (6"-8" diameter) or equivalent stone. The top of the access road will be top-dressed with 1.5"-3" diameter clean stone. A detail of the access road is provided as *Figure 1*. Where road alignment is generally linear, the road surface will be 14 feet wide with a 16 foot wide base. The access road will be wider (up to 16 foot travel surface) in some locations where there is a bend in the road configuration. The road is wider at the bends to accommodate the outside turning radius of a typical design vehicle. New, permanent access road will not be constructed in resource areas (such as BVW or Riverfront Area) – temporary construction mats will be used in BVW or Riverfront Areas and the channel will be spanned. The areas where construction mats will span the channel are shown on the attached Sheets. (Note: placement of construction mats in BVW is authorized by ACO Permit #WE-17-6W001-NT.)

Approximately 6,870 linear feet of new access road will be constructed within Buffer Zone. Although the travel width of the access road will be 14 feet, the base width (footprint) will be approximately 16 feet. Therefore, it is estimated that there will be approximately 2.5 acres (109,920 sq. ft.) of new road constructed in the Buffer Zone. This is a conservative estimate because portions of the new access road are not located in Buffer to BVW, but rather the overestimated "buffer" to the channel since USACE has not yet made a determination about the jurisdiction of the channel.



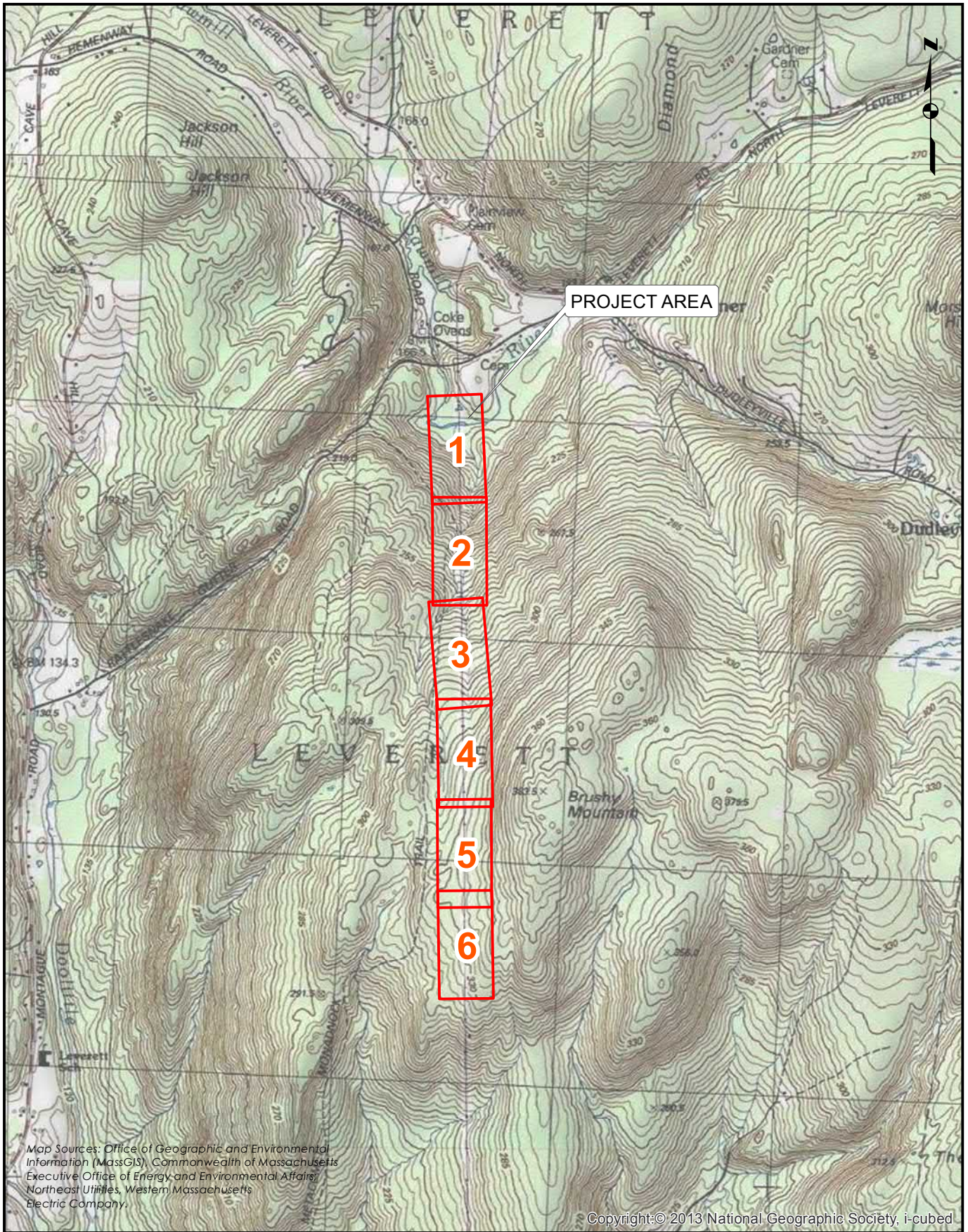
Protective Measures

The use of erosion and sedimentation control measures is proposed to protect the BVW and the Buffer Zone during construction. Erosion and sedimentation control measures will be installed prior to start of construction. Erosion and sedimentation control will be installed in accordance with the standard Eversource BMPs: *Construction & Maintenance Environmental Requirements, Best Management Practices Manual for Massachusetts and Connecticut, September 2016*. Pertinent sections of the BMPs are attached.

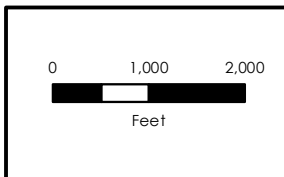
Spoils generated during excavation to replace the damaged structures will be placed in upland areas outside Buffer Zones, with proper erosion and sedimentation controls.

The use of construction mats to provide a temporary access to Structure 34077 is considered a BMP. Approximately 420 linear feet of access road located in Riverfront and BVW will be matted (*Sheet 1*). As mentioned in the Eversource BMPs (September 2016), “use of construction mats is proven to minimize soil disturbance and rutting when work needs to occur during non-frozen ground conditions.” The wooden construction mats (8-inch by 16 feet by 4 feet, typically) will be placed to construct a 16-foot wide temporary access road through this area. (Note, the use of construction mats in BVW is authorized under Section 401 by ACO Permit #WE-17-6W001-NT). The construction mats will be positioned edge to edge so each board is perpendicular to the direction of travel. Mats will be placed ahead of the vehicle as they are installed. Mats will be placed on the existing vegetation and *not* dragged on the ground to minimize disturbance. Details showing the typical construction mat access road and additional descriptions of the construction mats and installation procedure are included in the Eversource BMP.

Upon completion of the structure replacement, the construction mats will be removed.



Path: K:\p99\99549\B23\Data\VRDA\Locus\Leverett1.mxd



www.FandO.com



FUSS & O'NEILL

78 INTERSTATE DRIVE WEST SPRINGFIELD, MA 01089 413.452.0445

2017 STRUCTURE REPLACEMENT PROJECT

LOCUS MAP

EVERSOURCE ENERGY

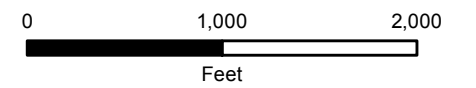
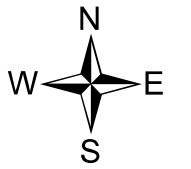
PROJ. No. 1999549.B23
 DATE: JUNE 2017

FIG. 1









**2017 STRUCTURE
REPLACEMENT PROJECT
354 LINE - LEVERETT**

EVERSOURCE ENERGY
PROJECT RESOURCE AREAS

OVERVIEW SHEET



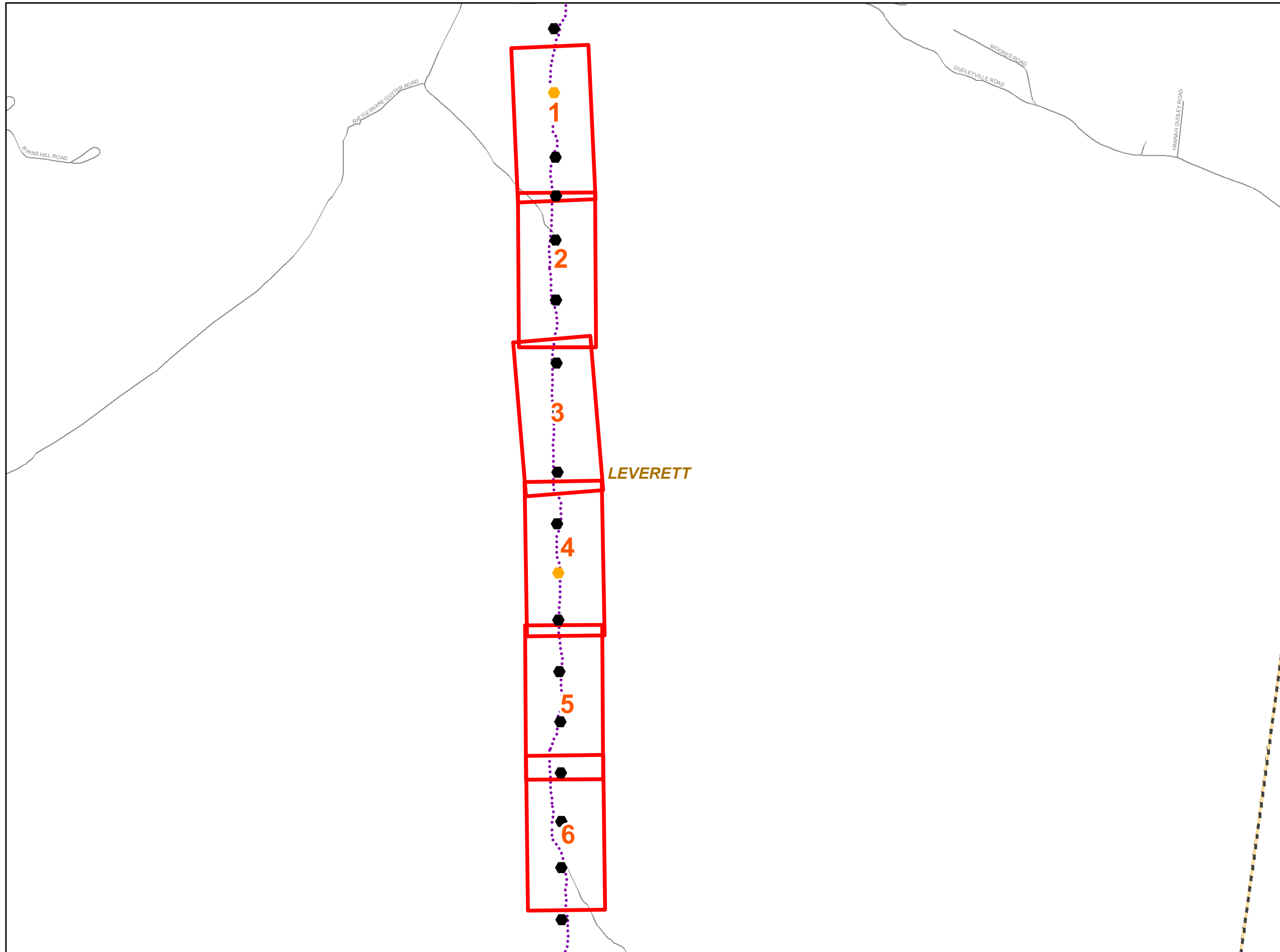
Legend

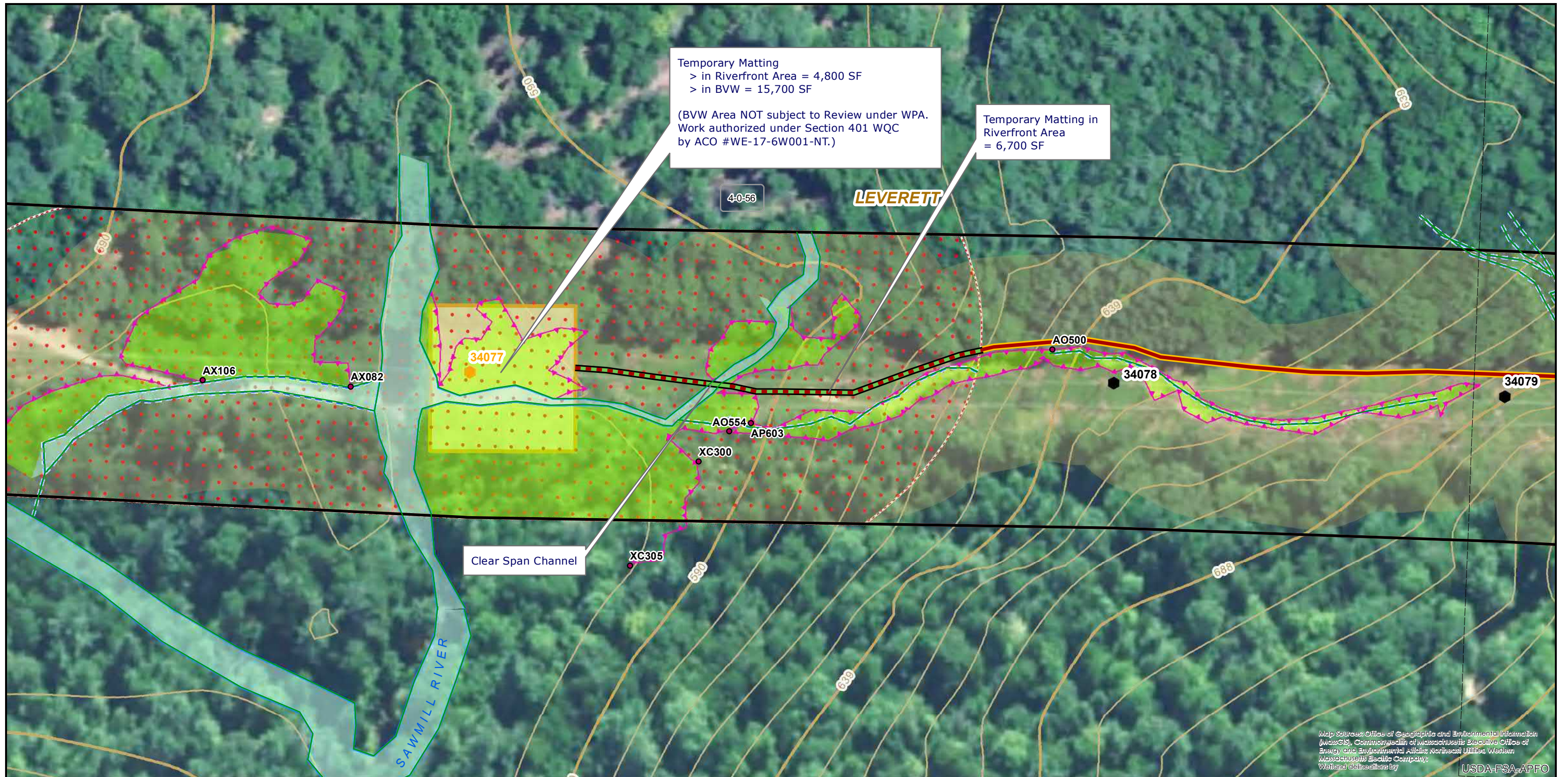
-  Outstanding Resource Waters - Public Water Supply Watershed
-  Town Boundary
-  U.S. Highway
-  State Route
-  Local Roadway
-  Access Road
-  Existing Structure
-  Replacement/Service Structure



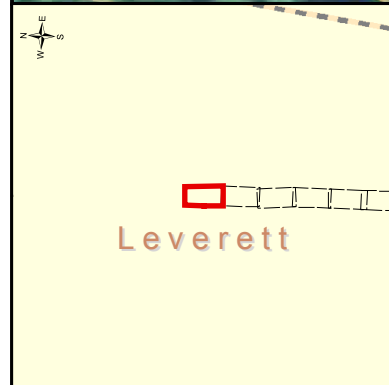
Map Sources: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs; Northeast Utilities, Western Massachusetts Electric Company.

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Map Sources: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, Northeast Utilities, Western Massachusetts Electric Company, Wetland delineations by USDA-FSA-APFO



Legend	
	Wetland (Bordering)
	Wetland (Isolated)
	Mean High Water
	Channel
	200 ft Riverfront Area
	100 ft Buffer Zone
	Wetland Flag ID
	Approximate ROW
	Index Sheets
	Eversource Fee Owned Parcels
	Town Boundaries
	Parcel Boundary
	Gravel Constr. Pad
	Matted Constr. Pad
	Replacement/Service Structure
	Structure
	Existing Road (No Work)
	Existing Road (Work)
	New Road (Upland/Buffer Zone)
	Temporary Road (Matting in Res. Area)
	Road Span (Over Channel)

General Construction Notes
 * For areas where material is used to restore existing access roads through BVW or LUWW, contractor shall install material to minimize water quality impacts. Contractor shall install geotextile under clean (no fines) modified riprap (6-8" diameter) or equivalent stone. Only BVW areas may be top-dressed with 1.5 - 3" diameter clean stone.
 **Existing roads shall be maintained up to the existing limits unless otherwise noted.
 *** For structures and access roads in Priority Habitat where bedrock excavation is required, excavated bedrock material shall be used to restore existing access roads only. Excavated bedrock shall not be used as fill around structures except as noted.

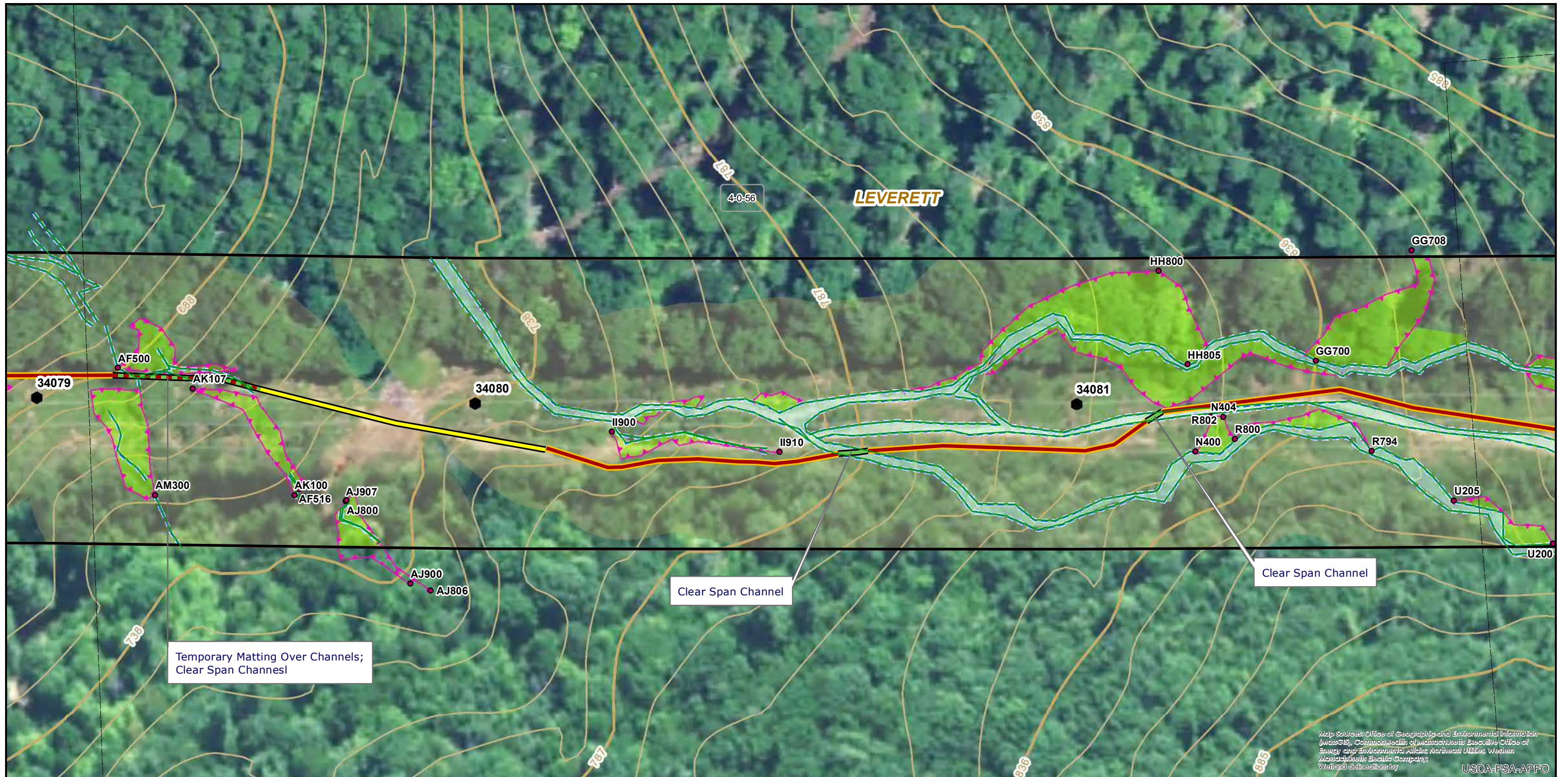
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	34063 Structure ID (Other)
	23_9600_24_1 Parcel ID

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 Feet
 1 inch = 100 feet

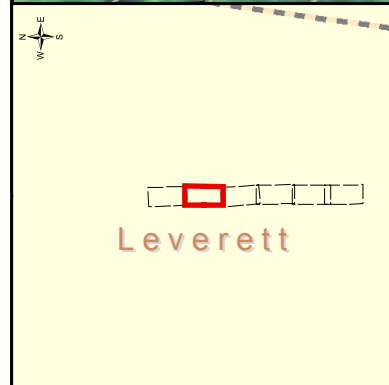
EVERSOURCE

FUSS & O'NEILL

2017 STRUCTURE REPLACEMENT PROJECT
354 LINE
 Leverett, Massachusetts
Sheet 1



Map Sources: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, Northeast Utilities, Western Massachusetts Electric Company, Wetland delineation by USDA-FSA-APFO



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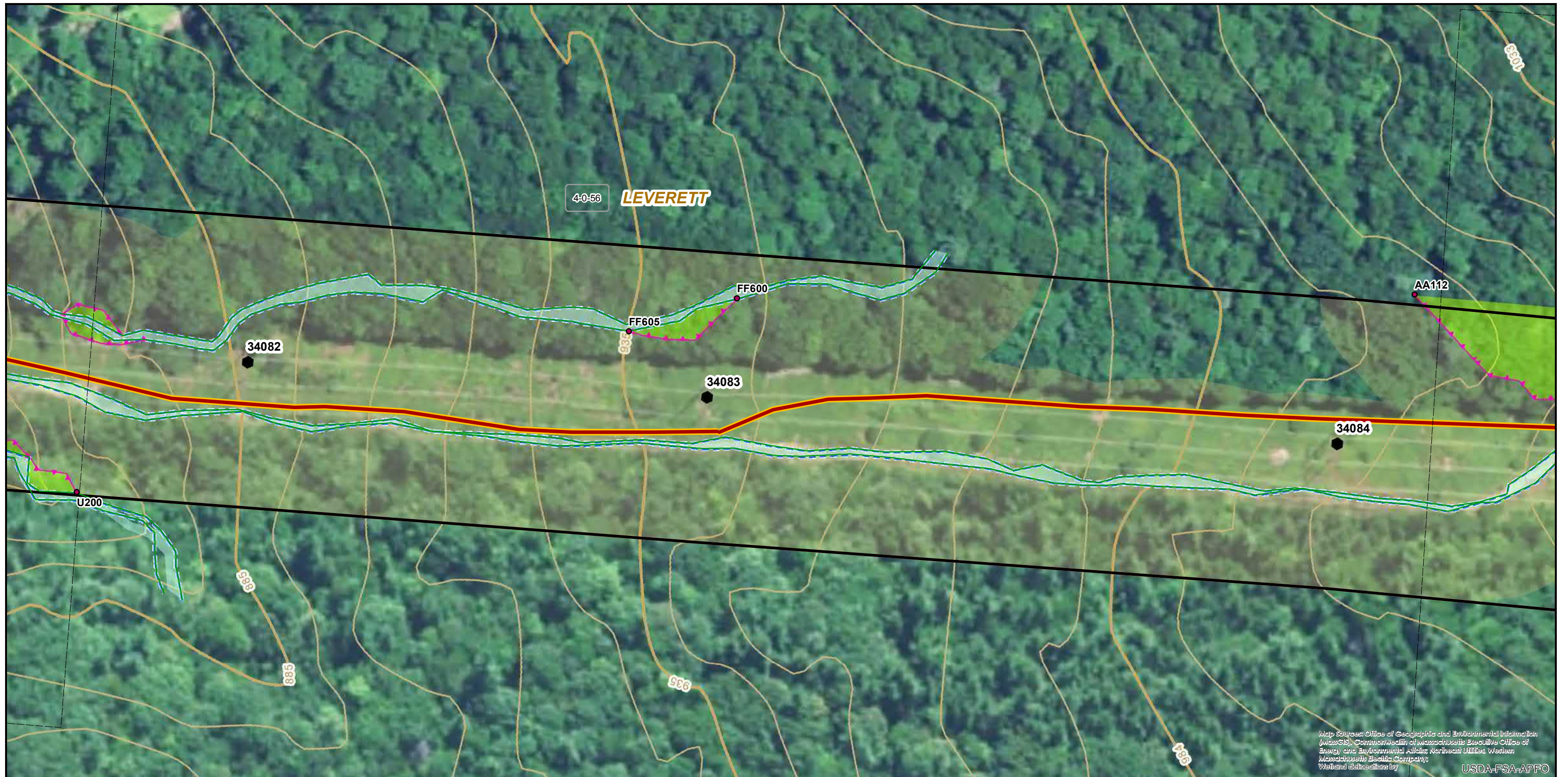
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Map Labels	
34131	Structure ID (to be Repaired)
34063	Structure ID (Other)
23_9600_24_1	Parcel ID

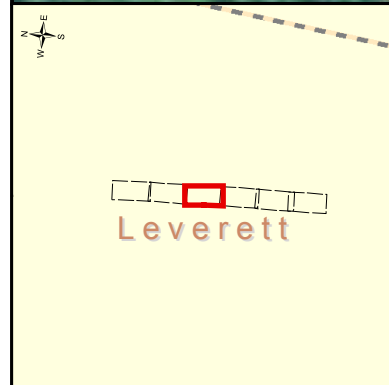
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 Feet
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EVERSOURCE
 FUSS & O'NEILL

2017 STRUCTURE REPLACEMENT PROJECT
354 LINE
 Leverett, Massachusetts
Sheet 2



Map Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs; Northeast Utilities; Western Massachusetts Electric Company; Wetland delineation by USDA-FSA-APFO



Legend	
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	Wetland (Isolated)
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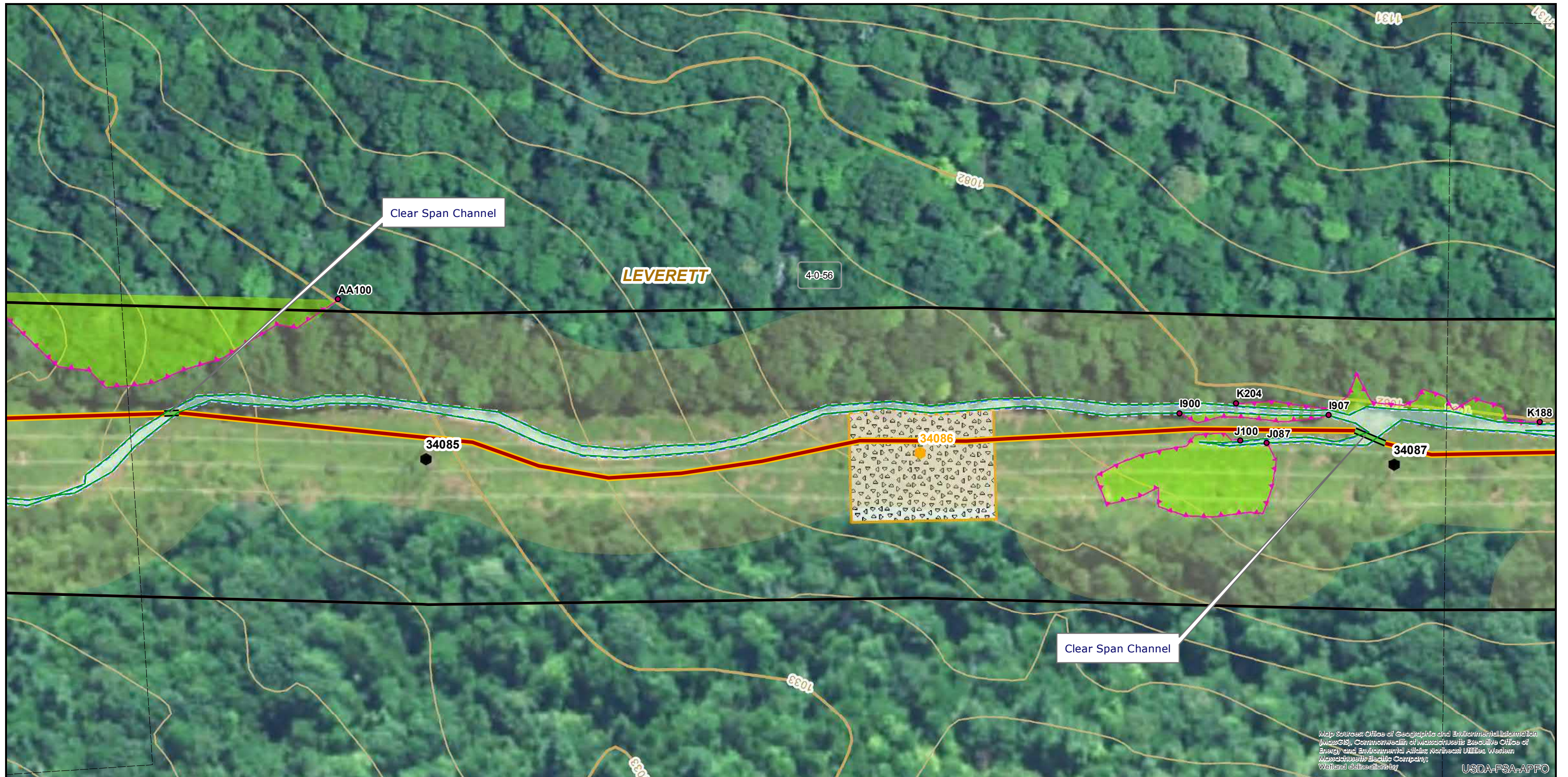
EVERSOURCE

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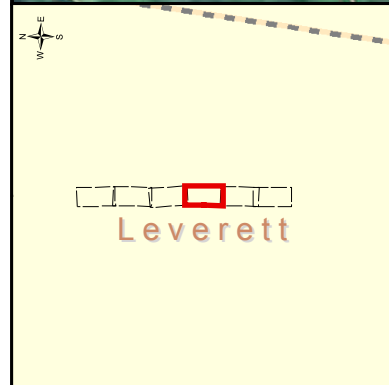
2017 STRUCTURE REPLACEMENT PROJECT
354 LINE

Leverett, Massachusetts

Sheet 3



Map Source: Office of Geographic and Environmental Information
 MassGIS, Commonwealth of Massachusetts Executive Office of
 Energy and Environmental Affairs, Northeast Utilities, Western
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 Wetland delineation
 USDA-FSA-APFO



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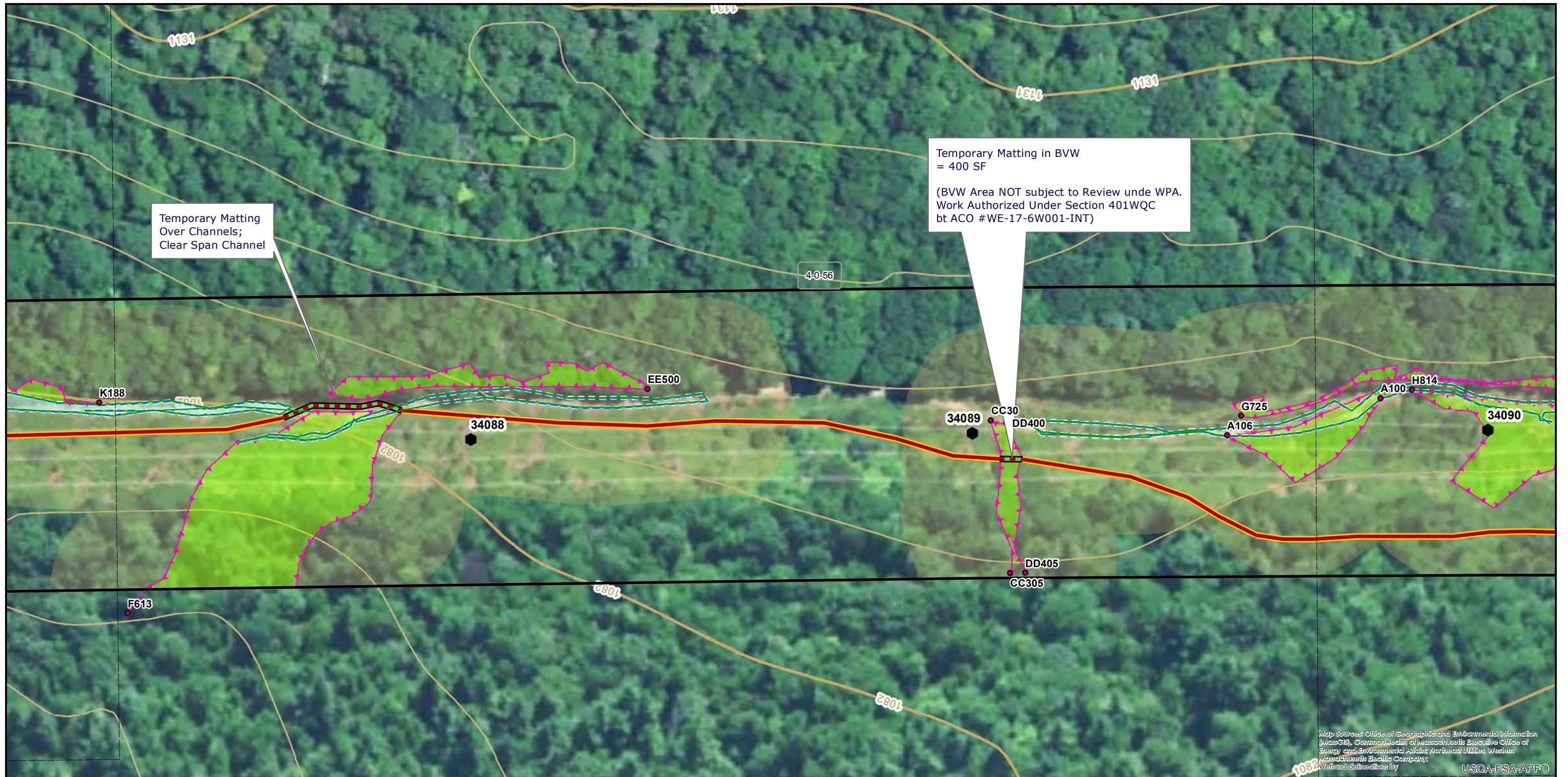
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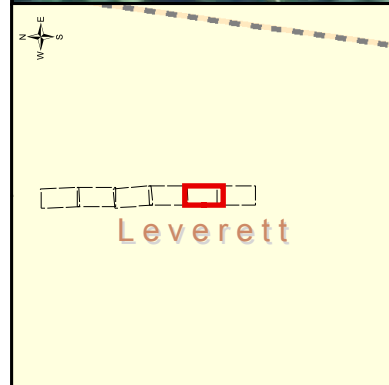
EVERSOURCE

FUSS & O'NEILL

2017 STRUCTURE REPLACEMENT PROJECT
354 LINE
 Leverett, Massachusetts
Sheet 4



Map Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, Northeast Utilities, Western Massachusetts Electric Company, Wetland delineation by USDA-FSA-APFO



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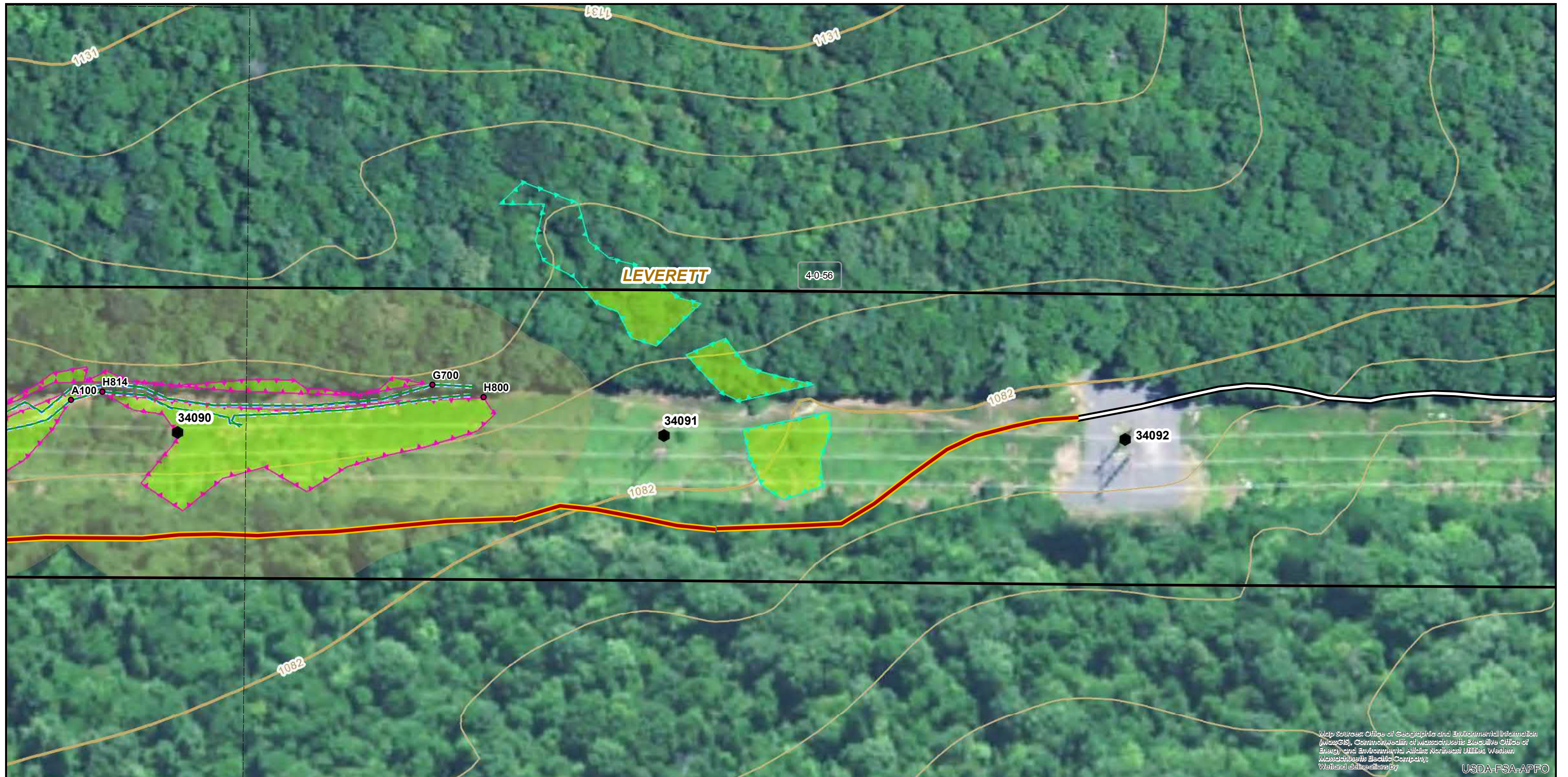
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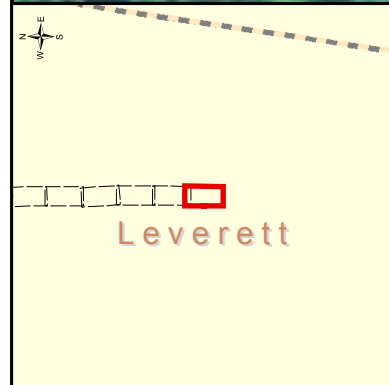
EVERSOURCE

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2017 STRUCTURE REPLACEMENT PROJECT
354 LINE
 Leverett, Massachusetts
Sheet 5



Map Sources: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, Northeast Utilities, Western Massachusetts Electric Company, Wetland delineation by USDA-FSA-APFO



Legend	
	Wetland (Bordering)
	Wetland (Isolated)
	Mean High Water
	Channel
	200 ft Riverfront Area
	100 ft Buffer Zone
	Wetland Flag ID
	Approximate ROW
	Index Sheets
	Eversource Fee Owned Parcels
	Town Boundaries
	Parcel Boundary
	Gravel Constr. Pad
	Matted Constr. Pad
	Replacement/Service Structure
	Structure
	Existing Road (No Work)
	Existing Road (Work)
	New Road (Upland/Buffer Zone)
	Temporary Road (Matting in Res. Area)
	Road Span (Over Channel)

General Construction Notes
 * For areas where material is used to restore existing access roads through BVW or LUWW, contractor shall install material to minimize water quality impacts. Contractor shall install geotextile under clean (no fines) modified riprap (6-8" diameter) or equivalent stone. Only BVW areas may be top-dressed with 1.5 - 3" diameter clean stone.
 **Existing roads shall be maintained upto the existing limits unless otherwise noted.
 *** For structures and access roads in Priority Habitat where bedrock excavation is required, excavated bedrock material shall be used to restore existing access roads only. Excavated bedrock shall not be used as fill around structures except as noted.

Map Labels

34131 Structure ID (to be Repaired)

34063 Structure ID (Other)

23_9600_24_1 Parcel ID

0 50 100
 Feet
 1 inch = 100 feet

EVERSOURCE

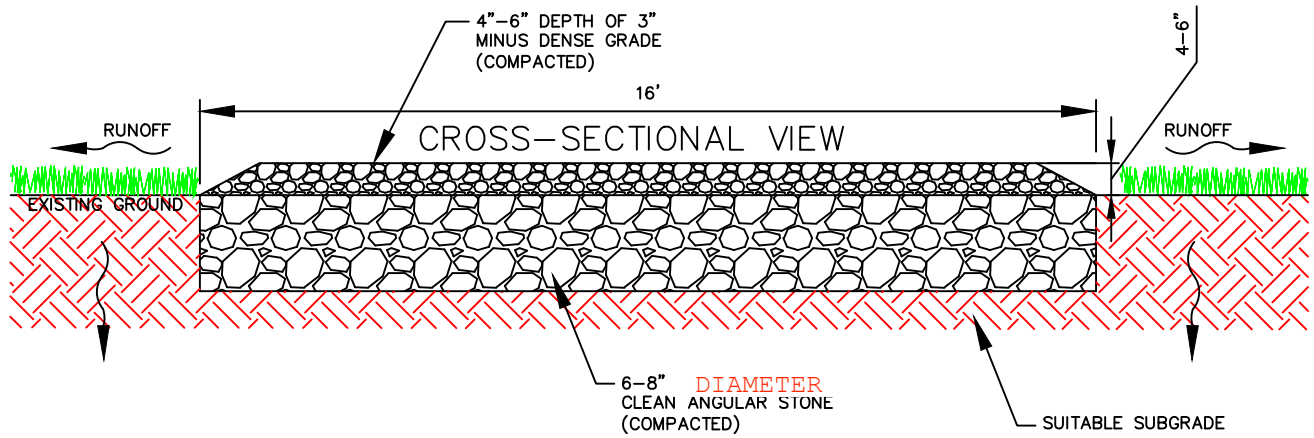
f FUSS & O'NEILL

2017 STRUCTURE REPLACEMENT PROJECT
354 LINE

Leverett, Massachusetts

Sheet 6

TYPICAL ACCESS ROAD CONSTRUCTION IN UPLAND



File Path: F:\P\1999549\B23\Deliverables\1999549B23 - Access Road Detail.dwg Layout: 08.5X11-P Plotted: Thu, August 17, 2017 - 2:53 PM User: tmoreau
 Plotter: DWG TO PDF-PC3 CTB File: FO.STB

LAYER STATE:

SCALE:
HORZ.: VARIES
VERT.:
DATUM:
HORZ.:
VERT.:
0 0 0
GRAPHIC SCALE



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 WEST SPRINGFIELD, MA 01089
 413.452.0445
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EVERSOURCE ENERGY
 ACCESS ROAD DETAIL

LEVERETT

MASSACHUSETTS

PROJ. No.: 1999549.B23
 DATE: 8/17/17

FIG. 1

Section 3

Construction Considerations

During all project activities (e.g., maintenance, new construction), federal, state, and local regulatory authorities require steps be taken to avoid, minimize, and/or mitigate disturbance to the environment. Wetlands and other sensitive areas should be avoided whenever practicable. However, some work may require entrance into these areas in order to perform work. This section discusses measures that should be taken to minimize disturbance to if work must occur within sensitive areas.

BMPs were developed to aid in this process and should be carefully selected and implemented based on the proposed activities and the nature of sensitive area(s) encountered at each site. Proper selection of BMPs should take into consideration the project goals, permit requirements, and site specific information. Once an assessment of the area is made and requirements of the project are established, all BMPs should be considered and implemented as appropriate.

Tables TOC-1 and TOC-2 summarize BMP types. This section addresses BMPs specific to construction of new access roads, repair of existing access roads, the installation of work pads, structure-related work, and soil stockpile management. Information regarding recommended erosion and sedimentation controls or stormwater controls is also discussed. Please refer to Appendix A for typicals and representative photographs of BMPs used for erosion and sedimentation control and water diversion during construction.

3.1 Avoidance and Minimization

Avoidance and minimization should always be considered before beginning any construction or maintenance project. Take appropriate measures to avoid construction impacts to wetlands, waterways, rare species habitats, known below and above ground historical/archeological resources, and other environmentally sensitive areas. Use existing ROW access whenever practicable. Keep to approved routes and roads and do not widen or deviate from them. Consult with the Environmental Licensing and Permitting Group, when avoidance is not practicable, to determine measures to minimize the extent of construction impacts. Alternate access routes and/or staging areas that will minimize construction impacts to the natural environment may be considered.

3.2 Rare Species Habitat

The Environmental Licensing and Permitting Group coordinates with state and local agencies when work is within areas that are identified as rare species habitat. In Connecticut, the Natural Diversity Database (NDDB) is used to identify rare species habitat and is under the Department of Energy and Environmental Protection (CTDEEP). In Massachusetts, the Natural Heritage Endangered Species Program (NHESP) is consulted to identify rare species habitat, which is under the Department of Fisheries and Wildlife and part of the Natural Heritage network. State regulatory agencies may require crew training and turtle sweeps of work areas, botanist identification of rare plants for avoidance, and protection of vernal pools, prior to starting the work.

3.3 Vernal Pools

Construction within and across wetlands and in proximity to vernal pools should be limited to the extent practicable to avoid working in the periods between April 1st and June 1st. This will allow for obligate vernal pool species to emigrate to the breeding areas, deposit egg masses, and allow for hatching and development of juveniles. Silt fence should be installed at the limits of the construction to prevent individual reptiles and amphibians from entering the workspace, but in a manner that does not impede movement to and from pools from adjacent forested uplands. Consider installing syncopated silt fencing.

Protection Measures

When performing construction activities in proximity to vernal pools, a number protection measures should be implemented.

Vegetation Removal

- Maintain existing scrub-shrub vegetation (consistent with ROW vegetation management requirements) within 25 feet of vernal pools, except in areas where access roads and work pads must be installed.
- Minimize removal of low growing (scrub-shrub) vegetation surrounding vernal pools by utilizing construction matting where access is needed. If vegetation must be cut adjacent to vernal pools, the cut vegetation (slash) should be left in place to serve as recruitment for leaf litter and coarse woody debris.

Erosion and Sedimentation Control

- Install and maintain erosion and sedimentation control measures along construction access roads and work pads to protect water quality and to limit the potential for sediment transport to vernal pools.
- Promptly remove erosion and sedimentation control devices upon final revegetation and stabilization of the ROW.

Access Roads

- Use construction mats, corduroy roads, or clean materials (i.e., clean riprap, gravel, stone or equivalent and rock fords) in locations where existing on-ROW access roads must be improved and are adjacent to vernal pools.
- Man-made depressions along existing on-ROW access roads provide low-quality vernal pool breeding habitat (due to an insufficient hydroperiod). Access roads must be graded and/or improved to accommodate project construction vehicles and may eliminate these depressions and the associated potential for amphibian breeding habitat. Perform improvements to on-ROW access roads outside of the breeding and migration seasons of vernal pool species to avoid direct impacts to amphibians that may breed in the man-made depressions along existing on-ROW access roads.

Scheduling and Site-Specific Considerations

- To the extent practicable (considering circuit outages and other construction timing constraints), schedule access road and work pad installation in and around vernal pool habitats to minimize interference with amphibian breeding and migration seasons.
- For project activities that must occur adjacent to vernal pools during amphibian migration periods, implement measures on a site-specific basis to facilitate unencumbered amphibian access to and from vernal pools. Consider the site-specific conditions including the type of construction activity that will occur in proximity to a vernal pool, the amphibian species known to occur in the vernal pool, and seasonal conditions. Identify appropriate mitigation measures. Options to be evaluated to allow amphibian access to vernal pools may include, but not be limited to: syncoated silt fencing in the immediate vicinity of vernal pools; elevated construction matting; and aligning erosion and sedimentation controls to avoid bifurcating vernal pool habitat.

3.4 Access Roads

Existing construction access roads are unpaved roadways that work crews use to access a site within a ROW. These access roads were generally either permitted previously or constructed prior to the promulgation of regulations and are grandfathered in under past general permits.

3.4.1 New Access Roads

New access roads are generally associated with new or large-scale projects that have separate permitting requirements. Construction of new access roads will be based on plans that are reviewed and approved by applicable federal, state, and local agencies. If a new access road is needed and not associated with a large project, notify the Environmental Licensing and Permitting Group to make a decision on best access routes and identification of the necessary permits and approvals required to construct the new road. **Permit requirements must be followed.**

3.4.2 Existing Access Roads

The travel surface width of access roads in upland areas will not exceed 16 feet. This does not include side slopes. Maintaining existing access roads includes mowing of vegetation, grading, placement/replacement of stone, and the installation/maintenance of erosion control features (e.g., water bars, swales, sedimentation basins).

When access roads are in wetlands, measures should be taken to avoid disturbance to wetlands, waterways, and sensitive areas. If avoidance is not practicable, then measures should be taken to minimize the extent of disturbance. Alternate access routes should always be considered. Below is a list of methods that should be considered where disturbance is necessary:

- Minimize the width of typical access roads through wetlands. If an existing access road is evident in the wetland, the existing width of the access road must be maintained. If unable to ascertain the original width of the access, then do not make the road wider than 16 feet (including side slopes).

- To the extent practicable, use low-impact vehicles and/or vehicles with low ground pressure when driving through wetlands.
- Coordinate the timing of work to cause the least impacts during the regulatory low-flow period under normal conditions, when water/ground is frozen, after the spring songbird nesting season, and, outside of the anticipated amphibian migration window (mid- February to mid-June). The United States Army Corps of Engineers defines the low-flow periods for streams as follows:
 - Connecticut streams—July 1 through September 30
 - Massachusetts non-tidal streams—July 1 through September 30
 - Massachusetts tidal streams—November 16 to February 15
 - New Hampshire streams—July 15 through October 1
- Use construction mats in wetlands to minimize soil disturbance and rutting when work needs to occur during non-frozen ground conditions.
- If practicable, conduct work manually if warranted (decision to be made by Project Team).

Existing access roads that have become part of the wetland are considered previous fill that were either permitted or grandfathered and where it is evident that an access road exists, it is acceptable to place stone over the previously placed fill. Where the existing access road is not evident, Environmental Licensing and Permitting must be consulted to make a determination whether stone can be placed in the wetland. If stone is not evident, through soil cores, hand digging or other methods, construction mats will be used. If permanent access is warranted through the wetland, the new access road will need to have a permitting review and will likely require permits.

The access road in the wetland should not exceed 16 feet in width (unless there is evidence that the road was originally wider than 16 feet).

Over time, existing access roads require maintenance and repair. Travel by construction equipment and general traffic to reach a particular portion of the ROW must be via the designated access road and route. Changes in the location of the access road or the use of alternate roads must be reviewed and approved by the Project Team prior to their construction or use. Access road routes were selected to prevent degradation of the utility corridor, and must be constructed, used, and maintained in accordance with this manual, as well as federal, state, and local requirements, and other project plans.

Though, in some situations, they may be necessary, constructing duplicate access roads should be avoided to the extent practicable. Some appropriate reasons for suggesting alternate routes are:

- Poor site conditions along preferred route because of weather or season.
- Property rights constraints, or property owner's preference.
- Equipment requirements.
- Unanticipated off-site access limitations along existing roads.
- Unanticipated access opportunities (e.g., ice, snow, other developments) which may avoid environmental disturbance and/or reduce cost.

General Design: New and Existing Access Roads

Construction access roads that require new grading and/or filling, or are to be heavily used require the creation of a stable, tractable, load-bearing surface resistant to erosion. If the existing soil and subsoil are not well drained, it may be necessary to import an aggregate road base (i.e., gravel borrow) such as that meeting the requirements of aggregate found in the:

- *Commonwealth of Massachusetts Department of Public Works Standard Specifications for Highways and Bridges, Section 400*
- *Connecticut Standard Specifications for Roads, Bridges and Incidental Construction, Section M1.02*

When the construction access road follows the same route as the permanent design road, constructing the grades and subgrade for the permanent roadway early in the construction sequence is recommended.

The travel surface of construction access roads shall typically not exceed 16 feet in width except for passing points, where necessary. Subgrading shall not extend beyond the space required for the finished road and normal side slopes.

Where practicable, construction access roads should conform to the contours of the land, avoiding grades steeper than 10 percent and creating side slopes no steeper than a ratio of 2:1. If the side slopes are steeper than 2:1, then use of engineered slope stabilization methods may be necessary. Consider the volume and type of construction traffic as well as the extent that natural ground must be altered to accommodate the traffic. If no grading is required and the construction traffic is very intermittent (i.e., access roads used to maintain utility lines) the measures used may be limited to water bars, or some top dressing with gravel or stone in areas where the vegetation over soft soil is destroyed by traffic.

During wet weather, these roadways can generate significant quantities of sediment if not constructed with adequate stormwater management and erosion control measures. During an active construction or maintenance activity, inspection of the construction access road and the associated erosion and sedimentation measures should be conducted by the person(s) designated at the pre-construction meeting, should occur regularly while the activity is occurring, and repairs to controls should be made in a timely matter. Repairs may include regrading and/or top dressing the traveled surface with additional aggregate to eliminate ruts, as well as those repairs required by each erosion and sedimentation measure used. When the roadway is no longer needed on a regular basis, the access road should be reviewed to ensure that the road is left in a condition that prevents future erosion and sedimentation (i.e., installation of water bars, gravel, etc.). In some cases, permit conditions may warrant that the access road be removed and that the disturbed area be seeded and mulched as required to match the pre-construction conditions.

Erosion and Sedimentation Controls

Construction personnel are reminded to control erosion and flow conditions during access road construction or maintenance by utilizing the following erosion and sedimentation measures which are described and illustrated further in Appendix A:

- **Outlet protection, a level spreader, a trench breaker, a sediment trap or basin, or a stone check dam** may be used to de-energize concentrated flows from diversions and in temporary channels.
- **Geotextile silt fencing, compost filter berms, straw wattles and hay/straw bale barriers** may be utilized to provide protection at the toe of fill slopes and discharges from water bars.
- Side slopes can be protected by installing **erosion control blankets** and **seeding** the area with a fast-growing native or annual grass mix.
- **Dust control** should be employed when construction access road conditions create airborne dust.
- **Geotextile fabric** shall be used beneath all new fill and construction entrances, where needed.

3.4.2.1 Best Management Practices – New Access Roads

The following are BMPs that are applicable to new access roads in uplands and are described at the following tabs:

Construction Entrance Track Pad – Tab 1A

Stormwater Management BMPs (includes Water Bars, Drainage Swales, and Sedimentation Basins) – Tab 1B

Construction Mats (i.e., timber or swamp mats)

Applications: Wetland crossings, rut minimization

- Used for access where the ground surface is unstable due to shallow, standing water, saturated soils, or other substrates not suitable for heavy vehicles.

Limitations:

- Only for temporary use. Generally mats should be removed upon construction completion.
- May float away in high water conditions.
- Need to be installed with heavy machinery.
- AlturnaMATS® limited to smaller vehicles and equipment.
- Equipment operators should remain cautious so as not to drive off or slip off the side of the mats.
- In winter, mats must be plowed and sanded or heated to prevent equipment from sliding off mats. Use of a deicing agent requires approval by the Environmental Licensing and Permitting Group.

Installation:

- Place mats along the travel area without any gaps and so that each board is positioned perpendicular to the direction of traffic. Position mats so that they are offset far enough from the resource area so that ruts are not created when equipment enters and exits a sensitive area.
- Remove mats by “backing” out of the site and removing mats one at a time. Regrade soils to pre-existing contours while taking care not to compact soils.
- Clean mats after use to remove any invasive plant species seed stock. Cleaning methods may include, but are not limited to, shaking or dropping mats in a controlled manner with a piece of machinery to knock off attached soil and debris, spraying with water or air, sweeping, or exposing the mats to high temperatures.
- Clean mats that were used in wetlands dominated by invasive species using brooms, shovels, and compressed air, if needed.

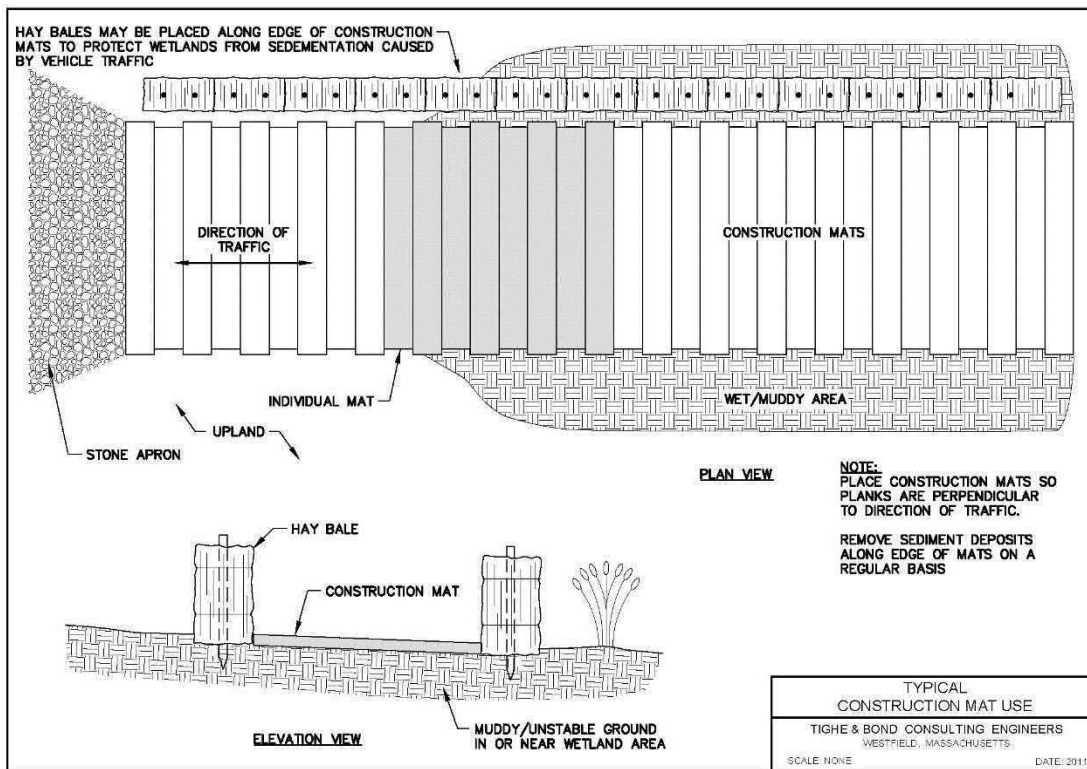
Additional Comments:

Lightweight, easy to maneuver alternatives to traditional mats are available. For example, AlturnaMATS® are half-inch thick polyethylene slip-resistant ground protection mats available in dimensions up to 4 feet by 8 feet and weigh between 21.5 and 86 pounds.

See photograph and typical sheet on following pages.



Construction mat access road.



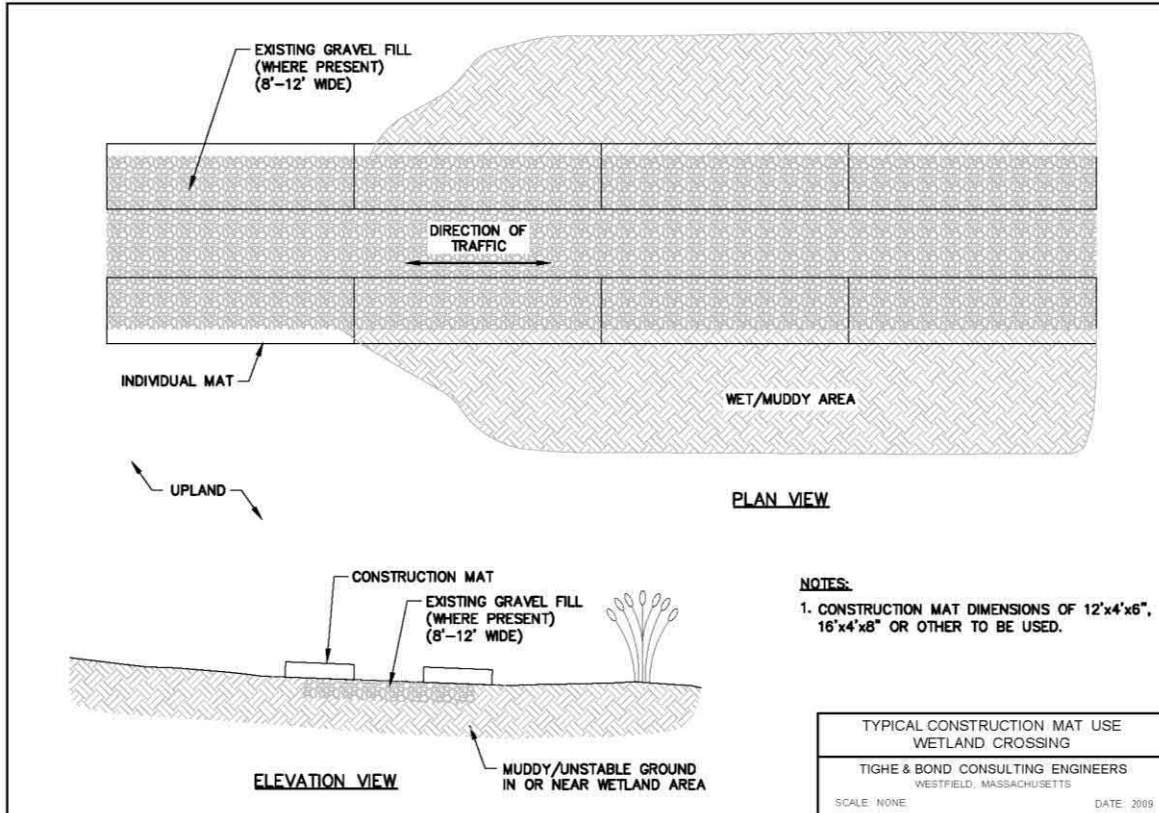
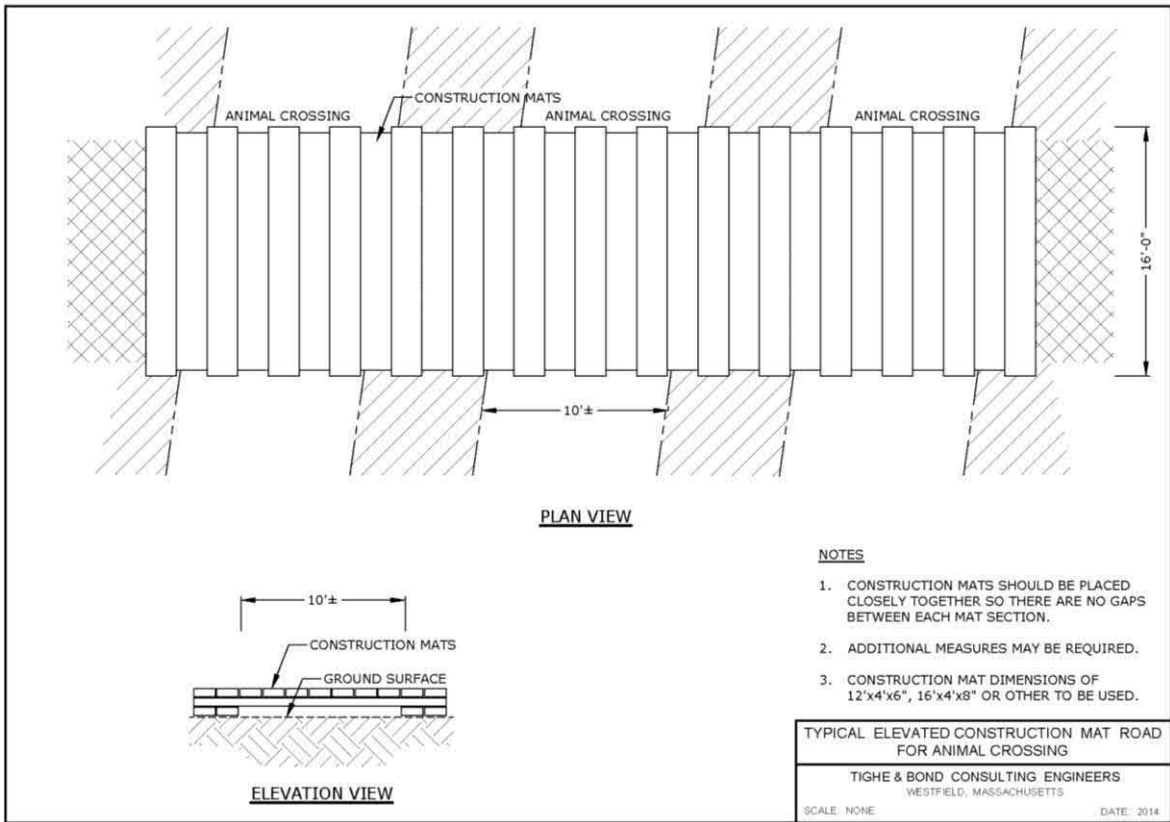




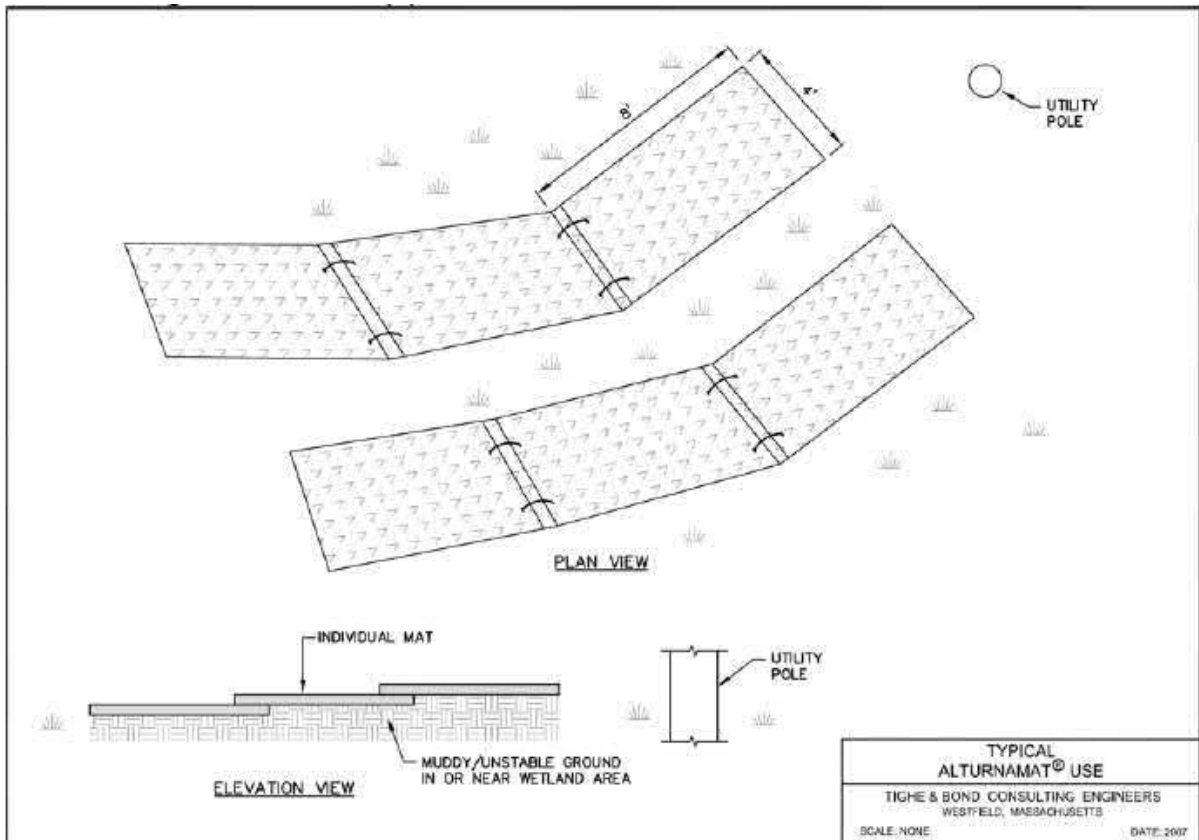
Photo provided courtesy of Tighe & Bond, Inc

Elevated construction mat road with bridging for animal crossing.





AlturnaMAT® tracks to utility pole in wetland.



3.7 Work Pads

3.7.1 De-Energized and Energized

Applications: Work in wetlands

- Reconnaissance of each workpad area in or adjacent to wetlands should be performed to determine if the construction mat workpad areas could be located outside of wetland resource areas. Wetland disturbances should be avoided or minimized where practicable. Contact Environmental Permitting and Licensing.

Limitations:

- Requires heavy machinery for installation.
- Significant amount of time required for installation and removal.
- Pads for live line work require a considerably larger footprint.
- Several layers of matting may be needed in deep, construction areas.
- Animals may be injured or killed when attempting to cross workpads.
- May not be suitable in deep/open water wetlands.

How to Use:

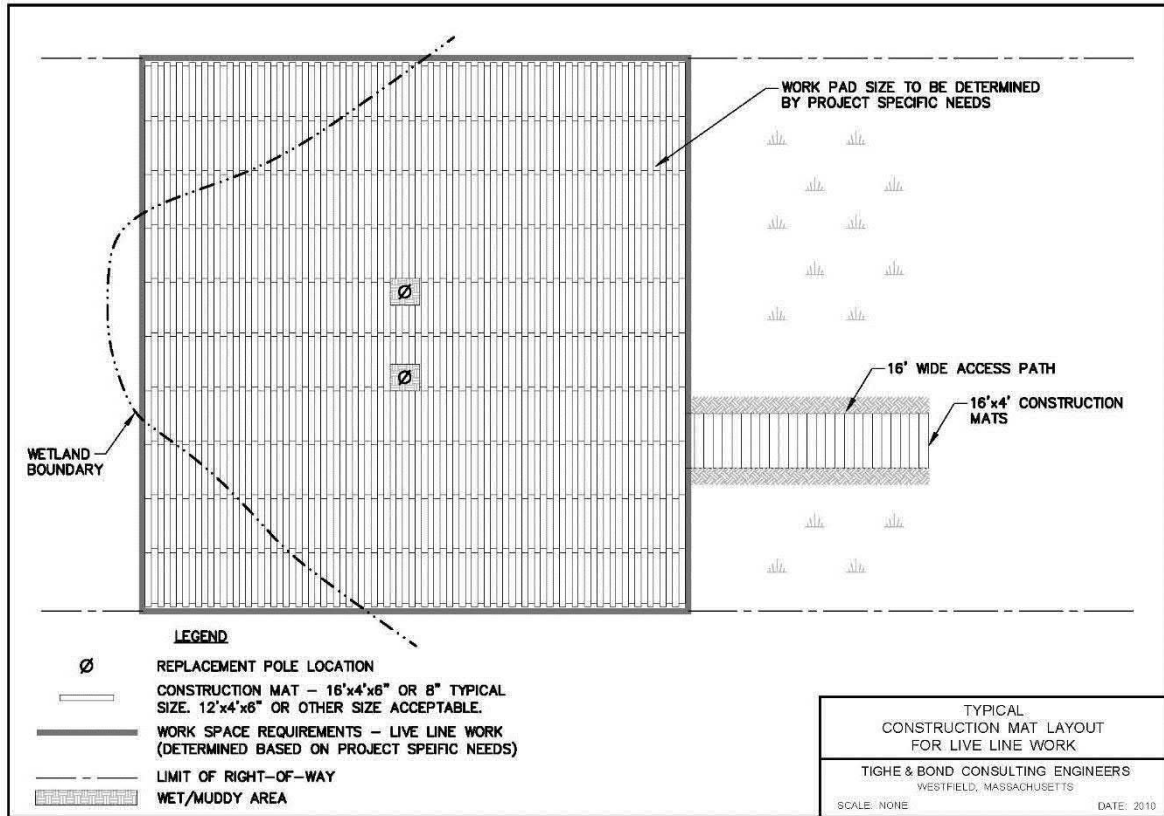
- Work at structures may require placement of construction mats to provide safe and stable workpad areas for employees and contractors.
- Live line work, which is work that is done while the line is energized, requires a much larger workpad area. Efforts should be made to stay out of wetland areas to the extent practicable.
- Sizes of workpads vary based on the type of work being proposed.
- Workpad areas may extend into wetlands where structures that require maintenance either fall within or are in close proximity to wetlands. In these cases, untreated wooden construction mats shall be used to limit disturbance.
- Install silt fencing around work pads in identified amphibian and reptile priority habitat and where matting is greater than one mat thick. The exclusionary silt fencing will deter animals from moving across workpads and reduce the likelihood of being crushed by heavy equipment.
- Following construction activities all mats at each workpad and vehicle access locations must be removed.
- Remove mats by “backing” out of the site and removing mats one at a time. Regrade soils to pre-existing contours while taking care not to compact soils.
- In areas with invasive species, plant material should be removed from mats following removal from the infested area to prevent the spread of invasive species.

3.7.1.1 Best Management Practices – Work Pads

De-energized work requires small workpad areas, while live line work (i.e., work that is done while the line is energized) requires a much larger workpad areas.

De-energized construction mat workpads – Tab 4A

Energized construction mat workpads – Tab 4B



Construction mat wetland workpad for live line work.

3.8 Structure-Related Work

3.8.1 Wetland

Structure-related activities that may occur in wetlands include structure replacement/installation (including casing installation), guy wire anchor installation, counterpoise installation, and pole butt removal. Access to these areas and completion of the activities can cause disturbance to wetland vegetation and soils. Therefore, structure-related activities in wetlands should entail use of adequately sized work-pads and proper dewatering methods. Inspection of the construction access and associated dewatering measures should occur daily during construction to ensure that controls are in working order, and repairs to damaged/deteriorating controls are made in a timely matter. Repairs may include regrading the traveled surface to eliminate ruts as well as those repairs required by each erosion and sedimentation measure used.

Structure Replacement/Installation

Structure replacement may require impacts to wetlands to install new poles and their casings. Poles that are significantly damaged must be replaced to comply with engineering and safety standards. Not replacing damaged structures could result in the eventual failure of one or more structures within or adjacent to wetlands.

Replacement structures will often be replaced within a few feet of the original structure to maintain the required distances and line sags between other existing structures. Therefore, options for relocating proposed replacement structures are limited. Pole replacement will also require placement of construction mats in wetlands to provide a safe workpad for the required structure replacement activities. Usually, there are no alternatives to conduct this work from nearby upland areas or to install the replacement structures in upland areas. Each structure replacement area should be assessed to determine the required footprint needed for construction mat workpads. Typical installation is as follows:

- At each pole location, remove wetland topsoil with an excavator and stockpile.
- If a borehole is drilled, collect and dispose of drilling spoils in an upland area.
- A galvanized steel casing is then driven into place at least 12 inches below the ground surface. The new pole is installed within the casing with a crane. The casing is then backfilled with crushed rock and compacted.
- Stockpiled wetland topsoil is placed above the casing to the ground surface. No net fill in wetlands occur, as the original poles are removed.
- Following installation of the new structures, the old structures are removed. Each pole is cut with a chainsaw and allowed to fall to the ground, which in wetland areas is protected by construction mats. Pole butts will remain in place; if removing the pole butt will cause more damage than if left in place.
- Remove the pole and all appurtenant accessories (e.g., cross-arms, insulators) and properly dispose off-site. Remove each pole butt by pulling with an excavator positioned on a construction mat. If it is apparent that pole removal will compromise the integrity of the new pole installation, or that removal will result in additional disturbance to wetland areas, cut off the old pole at least 12 inches below ground level.

Guy Wire Anchor Installation

Guy wire anchors supporting the structures may also require replacing. There are two types of anchors: 1) helical and 2) plate type. The helical anchor is preferred over the plate anchor because the installation of the helical anchor results in less disturbance to the wetland.

- Load test the existing anchor to 15,000 pounds to determine whether it will support the pole structure. In the event the existing anchor cannot be re-used, remove it and install a new anchor.
- Screw in place a special triple helix ("screw type") anchor with 1 ½-inch square rods with an anchor installation rig operated from the matting area. Add rod sections in five foot increments as needed until proper holding capacity of the anchor is achieved.
- Helical anchors are turned into the ground with only the rods protruding. Disturbance to the wetland from the helical anchor is minimal.
- Plate anchors are used in wetlands when proper holding cannot be achieved with screw anchors. To install a plate anchor, a pit is excavated to a sufficient depth and if necessary a concrete footing would be installed several feet below surface grade.
- When excavating to install plate anchors, segregate the top 12 inches of wetland topsoil from the underlying material. When the plate anchor has been set, backfill the excavation with underlying material. Then following the backfilling of underlying material return the segregated topsoil to the surface of the excavation.

Counterpoise Installation/Grounding

To install grounding equipment in wetlands, use hand digging or minimally invasive methods to dig around the structure and restore soil to previous grades. In some cases, grounding rods can be driven directly into the ground with hand tools. Where work is occurring in the vicinity of wetland areas, sedimentation and erosion controls will be used to limit disturbance to wetlands.

Underground facility repair/replacement

Underground facilities such as cables and conduits may be present beneath wetland areas. In the event underground facilities require repair, BMPs are required for both access and construction. Construction mats are used for access where warranted, and sedimentation and erosion controls are used to isolate the work area. During excavation activities, excavate wetland topsoil and store separately from subsurface soils. Dewatering is often required during excavation and repair activities.

An alternative to repairing a subsurface line by excavation would be to install a new line via trenching or horizontal directional drilling. The decision to use one of these alternatives is made on a case by case basis. Consult with Environmental Licensing and Permitting to determine if any permits will be needed.

Pole Butt Removal

When transmission poles are decommissioned or otherwise taken out of service, in most cases the entire pole shall be removed. Treated wood pole butts shall be removed completely from the ground and properly disposed at an off-site location. Locations where

the removal of pole butts may cause significant disturbance to wetlands or other sensitive areas will be considered for exception to this practice on a site-by-site basis. The Transmission Line Construction and Maintenance Manager, in consultation with Environmental Licensing and Permitting, will be responsible for determining if a pole butt can be removed if located in a sensitive area.

All pole butt holes must be backfilled and compacted (every 3') with appropriate fill material. Existing material on-site can be reused if it does not include materials that can rot (e.g., vegetation) and cause sink holes.

Disposal

Treated and non-treated wood products owned by the Transmission Group shall be stored in an area(s) designated by the Transmission Line Construction/Contract Field Services Supervisor until collected by an approved disposal vendor.

3.9 Gas Piping-Related Work

Gas piping-related activities will typically occur within roadways or along roadway shoulders. There may be some instances where wetland permitting is required when wetlands are located adjacent to or in the vicinity of roadways. However, when work is performed within the roadway/shoulder, no permitting is typically required. In all cases, BMPs should be followed to ensure environmental compliance.

Roadways and Shoulders

When working in roadways, particularly in residential areas, the following activities should be performed in addition to standard construction BMPs:

- Repave disturbed paved areas and return to original elevations on the same day that construction is performed.
- Restore all non-paved areas to preexisting or better conditions. Replace any sod or other plantings in kind or with an acceptable alternative.
- Employ dust control as necessary to minimize airborne dust.

Under certain circumstances, gas piping must be installed beneath existing culverts within roadways. Take care to ensure that any saturated material excavated from the trench be properly stored and disposed as to not cause sedimentation issues. Implement dewatering methodologies, as required.

There may be cases where a drainage ditch or swale must be crossed to gain construction access from paved roads onto ROWs along the roadway shoulder. Install construction mats, mat bridges, or temporary culverts, as necessary, to facilitate access. Culverts should be for temporary use, sized for peak flow, and removed after construction is complete. Consult with Environmental Licensing and Permitting prior to installation.

Bridges and Culverts

Attachment of gas piping to bridges or culverts is the environmentally preferable method for crossing a wetland or watercourse. Consult with the appropriate people (engineers,

Type	Description/Use
Vegetative Cover	<ul style="list-style-type: none"> • Most effective and practical method. • Use in disturbed areas not subject to traffic. • Follow seeding requirements as directed by local guidelines or permit requirements.
Stone	<ul style="list-style-type: none"> • Cover soil surface with crushed stone/coarse gravel.
Water/Sprinkling	<ul style="list-style-type: none"> • Sprinkle exposed soils until wet (Water trucks may be used depending on size of the site). • Do not excessively wet the soil as this causes run-off and also wastes water.
Barriers	<ul style="list-style-type: none"> • Board fences, wind fences, and sediment fences control air currents and blowing soil. • Wind barriers protect soil downgradient for a distance of ten times the barrier height. • Perennial grasses and stands of existing trees also serve as wind barriers, stressing the importance of planning work phasing properly and minimizing the amount of exposed soil.
Plastic Covering	<ul style="list-style-type: none"> • Cover soil piles with sheets of plastic/tarp to minimize dust.
Calcium Chloride	<ul style="list-style-type: none"> • Loose, dry granules of calcium chloride may be applied with a mechanical spreader. • Apply at a rate that keeps the surface moist but not high enough to cause water pollution or plant damage. This method should be done under consultation with an expert in order to maintain this balance and to determine if the site is applicable.

3.13 Soil Stockpile Management

Some projects may involve excavation and stockpiling of soil. Stockpiles should be located outside sensitive areas to the extent practicable and managed to prevent erosion and sedimentation of adjacent areas. Typical measures include the installation of protective measures (e.g., siltation fence and/or hay bales) around the perimeter of the stockpile. The stockpile must be seeded if left in place for more than 30 days. No snow or soil piles, construction materials, or equipment should be stored in the immediate vicinity at the top of a terrace escarpment slope.

When polluted/contaminated soil is encountered, it must be handled in accordance with the appropriate regulatory requirements. In addition to the measures discussed above, contaminated soils should be stockpiled on and covered by polyethylene sheeting. Sheeting used to cover the stockpile should be weighted down to prevent the wind migration of contaminated dust.

For soil stockpiles in substations, contact Environmental Licensing and Permitting. If soil/water must be stored and/or disposed, comply with existing soil and groundwater management guidelines. Coordinate with the Environmental Affairs Department (EAD) to ensure appropriate procedures are followed.

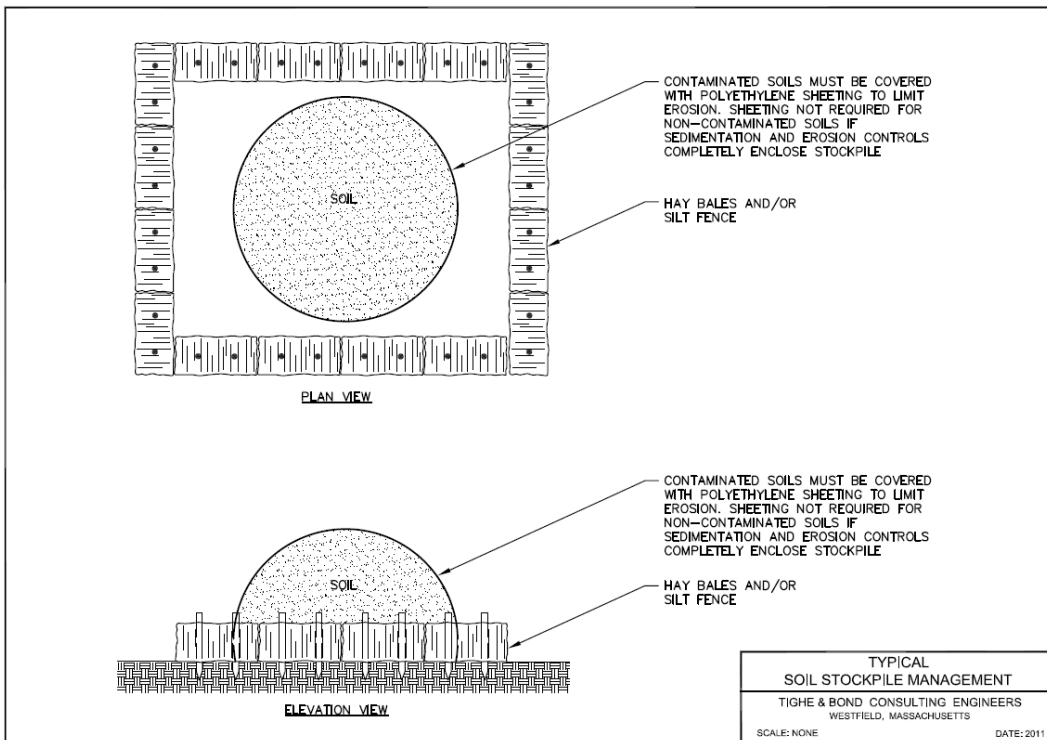
3.13.1 Best Management Practices – Soil Stockpile Management

The following BMP is applicable to soil stockpile management and is described at the following tab:

Soil Stockpile Management – Tab 5A



Soil stockpile management.



Section 4

Inspection and Maintenance

A pre-construction meeting will be held to discuss how often and who will be checking that all erosion and sedimentation controls are in working order. All BMPs will be inspected at least once per week during construction and at least once per month during restoration. Construction sites will be inspected after major storm events (rainfall events greater than 0.25 inches).

4.1 During Construction

Construction sites, construction access roads, and the associated erosion and sedimentation controls should be inspected by the person(s) designated at the pre-construction meeting, as required by permit conditions. Any damage observed must be repaired in a timely matter, at least within 48 hours of observation. Repairs may include regrading and/or top dressing the surface with additional aggregate to eliminate ruts as well as those repairs required by each erosion and sedimentation measure used.

All inspections will be documented in the project folder.

4.1.1 Maintenance of E&S Controls

Spare erosion and sedimentation control materials such as straw wattles, hay/straw bales and silt fencing should be kept on site or readily available so they may be replaced if they become non-functional due to deterioration or damaged during a storm, extreme water or wind, or other unexpected events.

4.1.2 Rapid Wetland Response Restoration

In the event of unintended discharges of sediment into wetlands, Eversource will quickly control, contain and remove sediment using non- or marginally invasive methods. Responding quickly to unintended discharges minimizes the difficulty and cost of restoration if the sediment is left in place for an extended period of time. Eversource will conduct sediment removal activities at the time of discharge and will notify the appropriate regulators of the discharge and the restoration process.

4.1.3 Vehicle Storage

All storage and refueling of vehicles and other equipment must occur outside of and as far away as practical from sensitive areas such as wetlands, unless specifically agreed by the Project Team and an alternate protocol is developed and approved internally. Refueling for larger, less mobile equipment such as drill rigs or large cranes, may be allowed within wetland resources only with prior approval and if specified precautions and protocols are followed. A proper location for refueling should be identified and designated before site work begins. The recommended minimum distance from wetland areas for storage of fuel and refueling is 100 feet. Additionally, equipment should be checked regularly for evidence of leaks. Construction material storage should also be located at least 100 feet from wetlands.

4.1.4 Spills

Spill kits consist of emergency cleanup and spill containment materials that can be used in the event of a fuel or other chemical spill. Spill kits must be kept on site and accessible at all times in case of an emergency spill. Such kits should generally contain multiple absorbent socks and/or pillows and wipes and temporary disposal bags. Follow the applicable Eversource Contractor Work Rules.

4.1.5 Post Construction

Post-construction inspections of restored areas will be conducted at regular intervals throughout the growing season, as required by any applicable permits, and/or after major storm events. Sites should be inspected for success or failure of revegetation, invasive species colonization, and erosion and sedimentation. In the event additional measures are required to achieve site restoration and stabilization, corrective actions shall be identified and implemented.

All information collected during inspections, regular maintenance, and repair procedures should be documented in project folders. In addition, photographic or diagrammatic logs may be kept to help record certain events and for documentation of project progress and any noteworthy observations.

The construction work is not complete until all areas are restored.

Section 5 Rehabilitation and Restoration

5.1 Restoration

All areas disturbed by construction, repair, and maintenance activities shall be substantially restored to pre-construction conditions. Please refer to Appendix A Section I for photos and typicals for loaming, seeding, and mulching. Prompt restoration minimizes the extent and duration of soil exposure and protects disturbed areas from stormwater runoff. Stabilization should be conducted as soon as practicable. Where appropriate, it is preferable to allow wetlands to naturally revegetate.

5.1.1 Seed Mixes

Several different seed mixes are available for upland and wetland restoration. State-specific comprehensive summaries of seed mixes for both temporary and permanent seeding of disturbed sites can be found within the following documents:

- Massachusetts: Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, page 157:
<http://www.mass.gov/eea/docs/dep/water/essec1.pdf>
- Connecticut: 2002 Connecticut Guidelines for Soil and Erosion Sediment Control, page 5-3-8: <http://www.ct.gov/deep/cwp/view.asp?A=2720&Q=325660>

Upland Seed Mix: If significant grading or upland alteration has occurred, annual rye grass seed shall be placed following manufacturer's recommendations after regrading activities.

Wetland Seed Mix: If significant grading or wetland alteration has occurred, a wetland seed mix shall be placed following manufacture's recommendations after regrading activities.

5.1.2 Upland

The following restoration techniques apply to restoration projects in upland areas.

- Soil excavated during construction and not used as backfill must be evenly spread onto disturbed areas to restore grades. Topsoil shall be stripped and separated to the extent practical, for re-use. Permanent soil protection shall be provided for all areas disturbed by construction activities. All areas will be seeded either by Hydro-seeding or broadcast seeding. If areas cannot be seeded due to the time of year, then mulch (hay or straw) is still required prior to the next precipitation event.
- Topsoil removed during construction activities will be replaced, seeded, and mulched.
- All areas that are broadcast seeded shall be treated with a layer of mulch, such as hay, but preferably straw, up to one inch thick to enhance moisture retention, dissipate disturbance from precipitation, and detract birds foraging on broadcast seed.

- Rehabilitation of access routes and other areas must be performed as soon as practicable after construction is completed, including reestablishment of water bars or other BMPs to control erosion of the access road, and the removal and restoration of temporary wetland or waterway crossings.
 - Temporary breaks in construction activities may warrant seeding and mulching of disturbed areas as interim erosion control measures.
- Erosion control measures shall remain in place until soils are clearly stabilized. Once soils are stable, erosion controls – especially silt fence, which presents an obstacle to movement of small animals shall be removed and properly disposed. Stakes should be removed from hay bales and spread as mulch to remove barriers to wildlife movement.
- Straw is preferred over hay to prevent the spread of invasive plant species seed stock.
- If a grading operation at a site shall be suspended for a period of more than 29 consecutive days, the disturbed area shall be stabilized by seeding, mulching, and/or other appropriate means within the first 7 days of the suspension of grading.
- Within 7 days after a final grade is established in any grading operation the disturbed area shall be stabilized by seeding, loaming, and/or other appropriate means.

5.1.3 Wetland/Watercourses

Regrading of Ruts: Upon removal of construction mats, or other BMPs, the wetland resource area should be inspected for rutting or disturbance from eroded upland soils. Any rutting should be regraded to pre-existing contours and upland soils removed from wetland areas while taking care not to compact soils.

The following restoration techniques apply to restoration project in wetlands:

Maintenance, Repair, and Emergency Projects (When No Permit is Required)

- Remove mats by “backing” out of the site and removing mats one at a time. Regrade soils to pre-existing contours while taking care not to compact soils.
- Soils excavated from wetland areas shall be segregated and stockpiled separately (i.e., topsoil/muck apart from mineral subsoil) in a dry/upland area at least 100 feet from wetland boundaries unless other provisions have been made to facilitate restoration activities.
- Excavated wetland soils that have been stockpiled during underground utility installations within wetlands shall be replaced in the same order (i.e., mineral subsoil beneath organic topsoil/muck) to the extent practicable and restored to pre-disturbance grades.
 - Grading activities should include the elimination of ruts within the area to be restored.
- If replacement of soil associated with temporary wetland or watercourse crossings for access roads is necessary, disturbed areas must be restored to pre-disturbance grades, either seeded and mulched, or allowed to revegetate from the natural seed bank.

- Disturbed wetland areas shall generally be allowed to revegetate from the natural seed bank. Measures to discourage the establishment or spread of plant species identified as non-native, invasive species by federal or state agencies shall be utilized. Environmental Licensing and Permitting can evaluate whether to let the wetland vegetate naturally.
- Any restoration plantings or seed mixes used in restoration shall consist of species native to the project area and, if feasible, from local nursery stock.
- Any stream banks and beds damaged shall be restored through use of geotextile erosion control blankets, and/or coir logs.
- All seeded areas shall be treated with a layer of mulch (i.e., hay, but preferably straw) up to one inch thick to enhance moisture retention, dissipate disturbance from precipitation, and detract songbirds foraging on broadcast seed.

5.2 Private Property

5.2.1 Improved Areas

Access to and along the ROW over private property must be improved to the extent necessary to ensure suitable passage for construction equipment, provide erosion control, and maintain proper drainage. Upon completion of construction activities, altered yards, lawns, agricultural areas, and other improved areas must be restored to a condition equal to or better than before their use for the construction project. If access is over a property off the transmission easement, then it is the responsibility of a construction representative to determine if legal access rights are available to cross the property.

5.2.2 Overall Work Site

Construction personnel should remove all work-related trailers, buildings, rubbish, waste soil, temporary structures, and unused materials upon satisfactory completion of work. All areas should be left clean, without any litter or equipment (wire, pole butts, anchors, insulators, cross-arms, cardboard, coffee cups, water bottles, etc.) and restored to a stable condition and close to the original condition. Debris and spent equipment should be returned to the operating facility or contractor staging area for disposal or recycling as appropriate.

5.2.3 Material Storage/Staging and Parking Areas

Upon completion of all work, all material storage yards, staging areas, and parking areas shall be completely cleared of all waste and debris. Unless otherwise directed or unless other arrangements have been made with an off ROW or off-property owner, material storage yards and staging areas shall be returned to the condition that existed prior to the installation of the material storage yard or staging area. Regardless of arrangements made with a landowner, all areas shall be restored to their pre-construction condition or better. Also any temporary structures erected by the construction personnel, including fences, shall be removed by the construction personnel and the area restored as near as possible to its original condition, including seeding and mulching as needed.

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Introduction

Adequate erosion and sedimentation control management measures shall be installed and properly maintained to reduce erosion and retain sediment on site during and after construction. These devices shall be capable of preventing erosion, collecting sediment (suspended and floating materials) and filtering fine sediment. Sediments collected by these devices shall be removed and placed in an upland location beyond buffer zones/upland review areas and any other regulatory setbacks preventing later migration into a waterway or wetland. Once work has been completed, all areas shall be stabilized with erosion control blankets and/or robust vegetation and erosion control devices shall then be removed. Erosion and sedimentation controls are provided in Section I of this Appendix. Note that stormwater management is an important part of erosion and sedimentation control. Accordingly, temporary stormwater management measures are outlined in Section II of this Appendix. Please refer to the below table for a complete list of BMP typicals and photos provided in this appendix.

Section 1

Erosion and Sedimentation Controls

1.1 Preservation of Existing Vegetation

Applications: Erosion and sedimentation control, habitat and aesthetic preservation, reduce landscaping and restoration costs

Limitations:

- Access needs on ROWs.
- Required distances between underground utilities and mature trees.

Overview:

Examine the area to identify vegetation (i.e., groundcovers, vines, shrubs, trees) that may be saved. Focus on preserving vegetation on steep slopes, near drainage ways, and/or drainage swales in order to help increase soil stability and decrease runoff volume and velocity. Use construction phasing to preserve vegetation in areas where activities are not scheduled to occur or will occur at a later time.

Identify and protect specified trees for erosion and sediment control benefits and/or aesthetic purposes. Consider saving trees that provide shading or screening benefits, particularly in residential areas.

Installation:

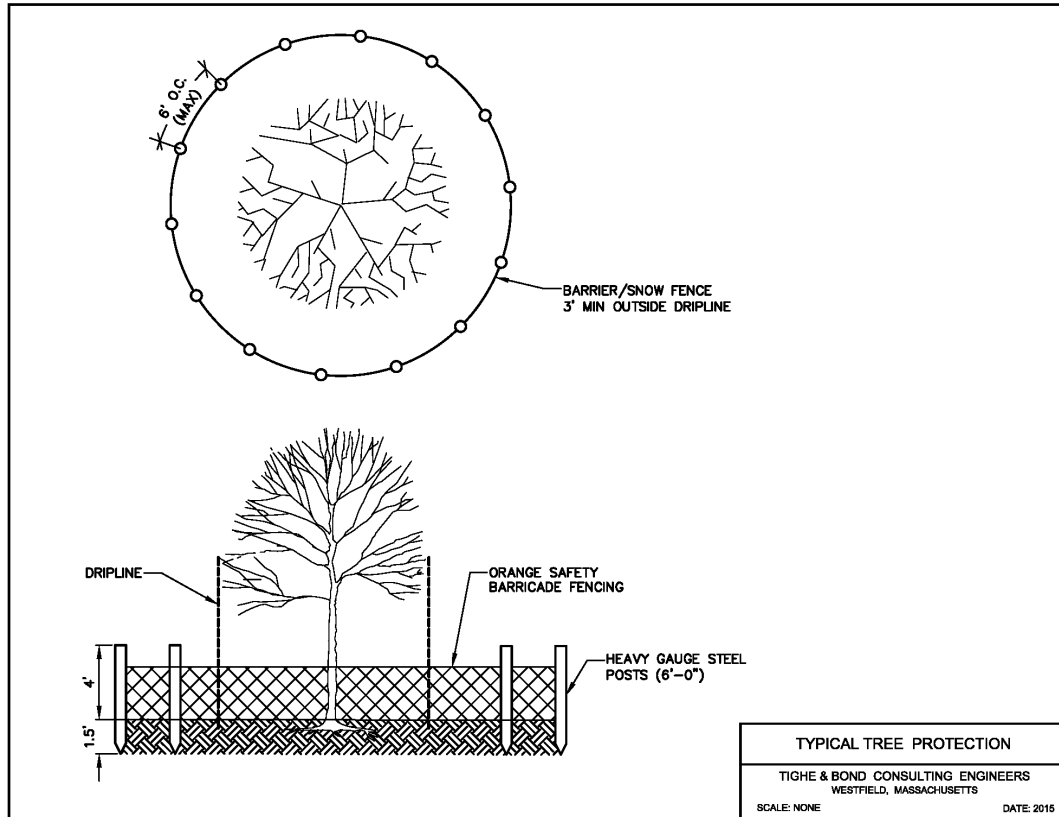
- Select healthy, relatively young trees (less than 40 years old) and vegetation that will not interfere with the installation or maintenance of utilities. Pay attention to the aesthetics of trees along roadways and preserve wherever practicable.
- Place barriers around trees least three feet from the drip line or five feet from the trunk (whichever is greater) using wooden and wire fencing made from scrap lumber or snow fencing. If fencing is not feasible, mark the selected trees with bright flagging.
- Construct the barrier (or place the flags) before heavy equipment arrives to the site and leave in place until the last piece of machinery is gone.
- Dig trenches as far from the trunks and outside of the canopy drip line as practicable. If large roots are encountered, consider trenching under them.
- The width of the ROW will vary depending on the corridor's designated use. Federal guidelines suggest that 15 feet on either side of a buried pipeline should remain clear of mature trees.

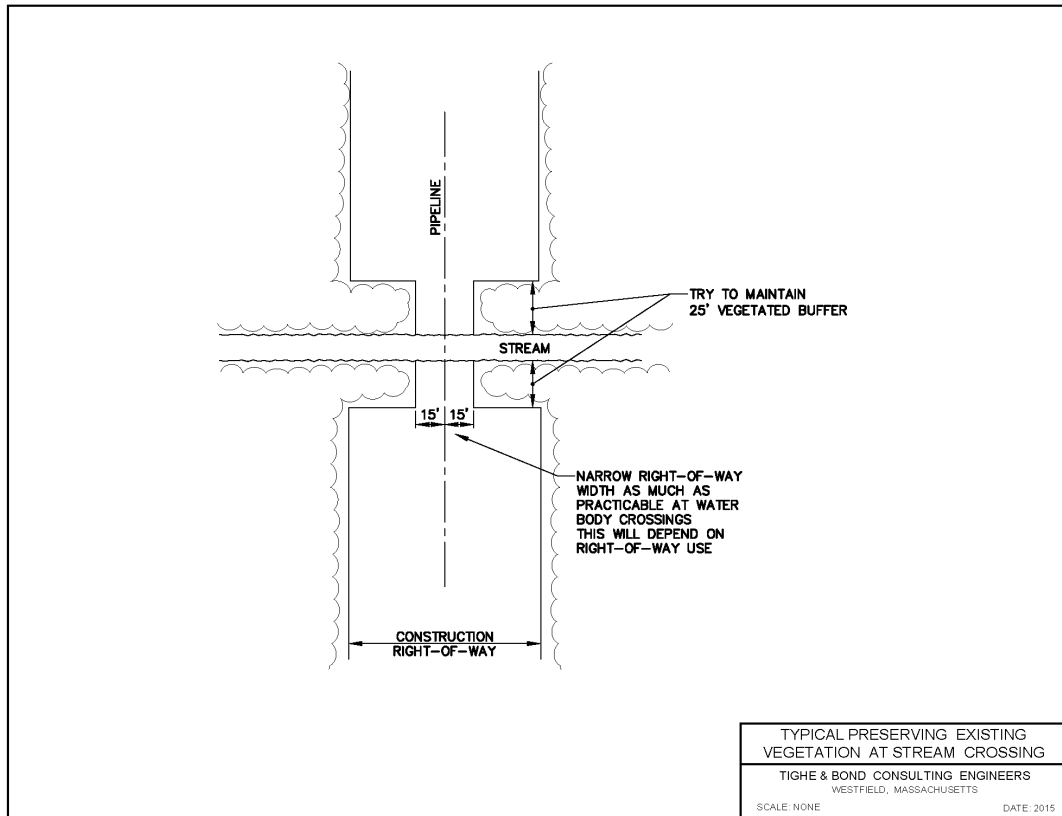
Maintenance:

- Inspect flagged and/or barricaded areas throughout construction. Replace flagging and repair/replace barriers as needed.
- Inspect exposed tree roots. Re-cover or re-seal roots that have been exposed and/or injured by construction activity.

Additional Comments:

When approaching a stream crossing, limit the amount of clearing of the existing stream bank and riparian vegetation to only the areas essential for construction and maintenance. Maintain a 25-foot wide vegetated buffer between the stream bank and the cleared ROW, except in locations where the line is directly installed.





1.2 Topsoil Segregation for Work in Wetlands and Agricultural Areas

Applications: During excavation in wetlands and agricultural areas

Limitations:

- May be site-specific limitations; otherwise none.

Overview:

The top 12 inches of soil are the most important for providing nutrients and a suitable growth medium to the existing vegetative cover in an area, as well as containing the root stock and seed bank of the plant community. Topsoil segregation is recommended for the first 12 inches of soil in all wetlands and agricultural land, but is also a good practice in any area, including uplands in order to provide a suitable growth medium and more rapid revegetation and restoration of the original plant species.

When digging a trench for installation or maintenance of a pipeline or conduit, or excavating for the installation or replacement of the base of a utility pole, it is good practice to segregate the first 12 inches of topsoil and stockpile it separately from the subsoil until the layers can be replaced into the excavation in the proper order. In some cases, it may be necessary to strip topsoil off the areas where the subsoil will be stockpiled as well. Additional topsoil can also be brought into an upland or residential area if necessary where the existing soil is too shallow to provide adequate rooting depth, moisture and nutrients, or too much topsoil was lost during construction.

Installation:

- Set up proper erosion control (i.e., hay bales, silt fence) around the work area before beginning any excavation near wetland areas.
- Identify the stockpile locations near the trench or excavation.
- Locate stockpiles from active work areas to the extent practicable.
- Remove the top 12 inches of topsoil from the trench or excavation. If less than 12 inches are available, remove the entire layer of soil.
- Place the topsoil in a separate stockpile than the layers of excavated subsoil.
- Place additional lines of erosion control around the stockpiles to control sedimentation, if necessary.
- Side slopes of soil stockpiles should not exceed 2:1.
- Stabilize stockpiles with temporary seeding or plastic covering if they will remain exposed for more than 21 days.
- Backfill the trench with the proper soil layers, subsoil followed by topsoil, when work activities are completed. Backfilling should take place immediately after activities are completed, and grading and site stabilization should take place within 10 days following backfilling.

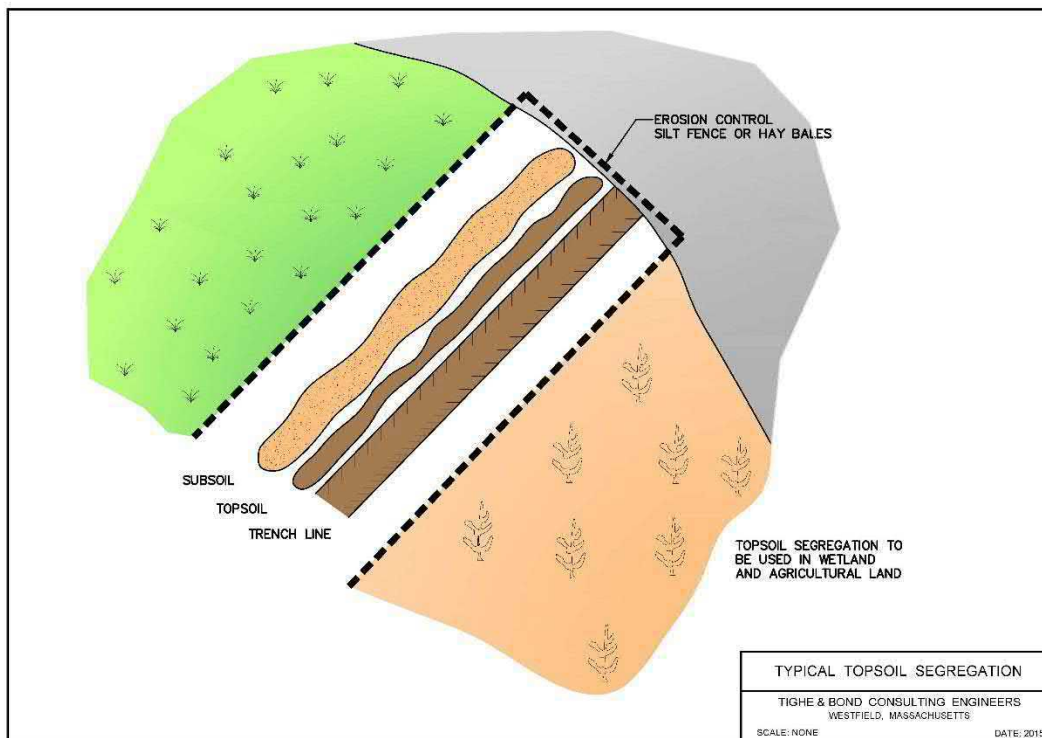
Maintenance:

- Inspect and maintain erosion control on a regular basis and observe the stockpiles for any signs of sedimentation or mixing.
- In residential and agricultural areas, make a reasonable effort to remove all rocks larger than 4 inches in diameter from the topsoil that have been turned up during construction.

Additional Comments:

If the topsoil and subsoil stockpiles are mixing:

- The piles are located too close together. Try placing the separate stockpiles on opposite sides of the trench or work area.
- The topsoil stockpile could also be individually enclosed in hay bales or silt fence. This will help create a barrier, keeping it separate from the subsoil.
- Avoid working with large amounts of trench or excavation open when heavy rains are predicted.
- If polluted/contaminated soil is encountered, handle in accordance with appropriate regulatory requirements. Stockpile contaminated soil on and cover with polyethylene sheeting. Weigh down sheeting covering contaminated soil to prevent the wind migration of contaminated dust.



1.3 Straw (or Hay) Bales

Applications: Erosion and sedimentation control, mulch

Limitations:

- Hay bales degrade quickly.
- Hay bale height can provide an obstacle to movement of smaller wildlife.
- Should not be used as a temporary check dam/ stormwater control within waterways.
- Difficult to install during frozen conditions.
- Generally only effective for 3-6 months (hay) or 6-12 months (straw) before replacement.

Overview:

Hay/straw bales should be placed end-to-end to form a temporary sedimentation control barrier. This barrier should run perpendicular to the slope and direction of runoff, and should be installed downgradient of the disturbed site (i.e., construction area). Hay/straw bales are intended to slow flow velocity and trap sediments to prevent siltation in sensitive areas, specifically downgradient areas with open and/or flowing water. Barriers should be removed once the project is complete and soils are stabilized with erosion control blankets and/or well-established vegetation.

Installation:

- Install hay/straw bales end-to-end lengthwise along the toe of a slope or along a slope contour being sure the bales are butted tightly against each other without gaps between them. The outer ends of the barrier should be turned slightly upslope.
- Entrench to a minimum depth of 4 inches and backfill around the base of the bale. If additional protection is needed, backfill both upslope and downslope to create better ground contact and reduce sediment passage through or beneath hay/straw bales.
- Stake each hay/straw bale into the ground by two stakes each approximately 3 feet long
- If a silt fence is being used with the hay/straw bale barrier, position the silt fence downgradient of the hay/straw bales (hay bales filter first).
- Since hay/straw bales degrade quickly, check barriers often and replace as needed. Routinely remove and dispose of sediment buildup in a stable upland area.
- The hay/straw bale barrier should be as far away from downgradient sensitive areas, and as close to the work areas as construction limitations allow, in order to minimize the total work area and disturb as little area as possible.
- Once the project is complete and soils are stabilized, hay/straw bales should generally be compacted and allowed to decay in place, as their height can provide an obstacle to movement of smaller wildlife. Spreading hay bales around a site as mulch could introduce weed seeds. Using hay/straw as mulch is not generally

problematic if the site is already colonized by invasive species. Plastic bailing twine should be removed from hay/straw bales. Wooden stakes should also be removed.

Maintenance:

- Inspect before a forecasted storm event and daily during a prolonged rain event.
- Remove accumulated sediment and properly disposed outside sensitive areas when it has reached a thickness of $\frac{1}{2}$ to $\frac{2}{3}$ the height of the bale.
- Replace rotted or sediment-covered bales when necessary.

Additional Comments:

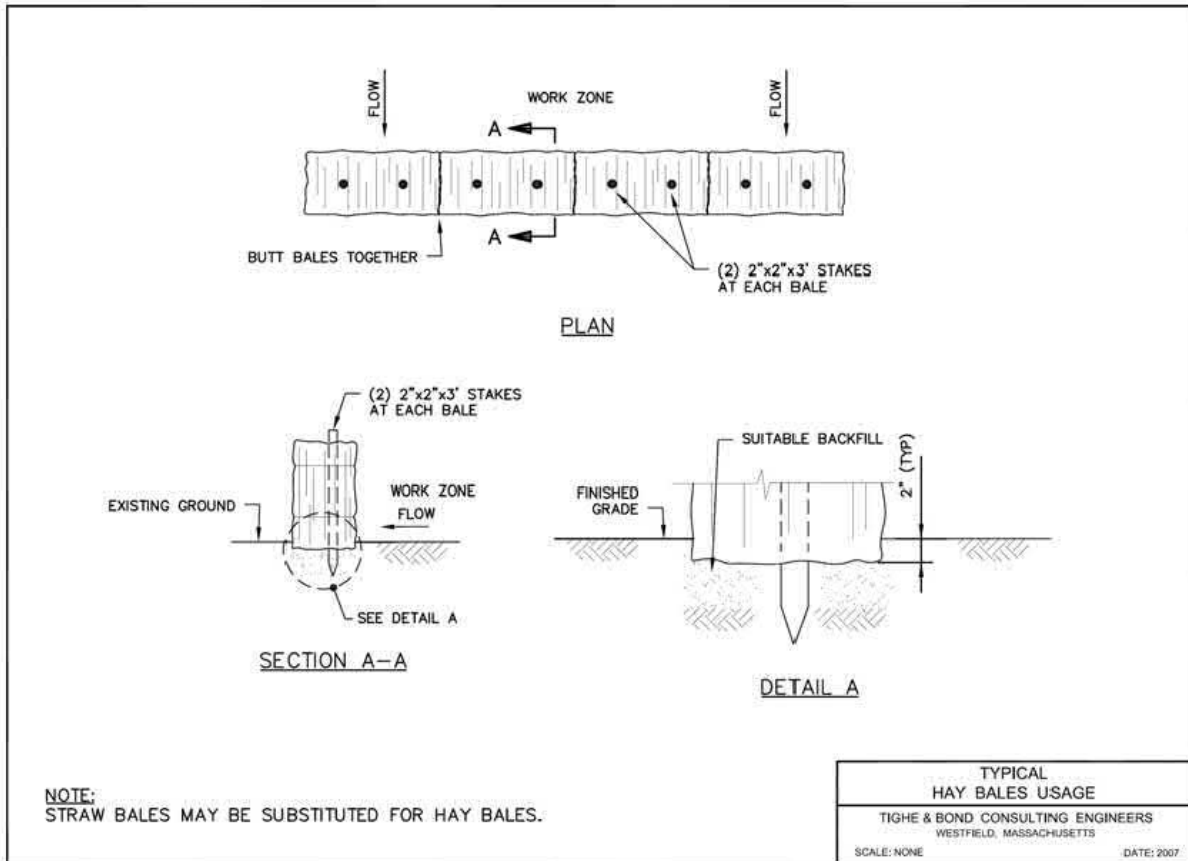
Straw bales are favored over hay bales for use as erosion control barriers. Since straw bales are composed of the dried stalks left over after a grain is harvested, they do not contain the plant's seeds and therefore will not spread growth of such species, some of which may be exotic, invasive or otherwise undesirable. Hay bales are generally less expensive, but consist of the seed heads and the upper, thinner portion of the stems which generally decay faster than straw.



Properly installed hay bale barrier with silt fence.



Properly installed hay bale barrier with silt fence.



1.4 Silt Fence

Applications: Sedimentation control, work limits, temporary animal barrier, slows flow on steep slopes

Limitations:

- Frozen or rocky ground (for installing stakes).
- May prevent critical movements of sensitive wildlife species.
- Disposal.

Overview:

Silt fence is constructed of a permeable geotextile fabric secured by wooden stakes driven into the ground. It is installed as a temporary barrier to prevent sediments from flowing into an unprotected and/or sensitive area from a disturbed site. A silt fence should be installed downgradient of the work area. Once the project is complete and soils are stabilized, silt fence materials (i.e., geotextile fabric and wooden stakes) must be removed and properly disposed off-site (see environmental scientist to determine if area is stabilized).

Installation:

- Install silt fence along the toe of a slope or along a fairly level contour with the outermost ends directed upslope. The fabric should be laid into a 6-inch wide by 6-inch deep trench dug on the upslope side of the fence and tamped down with fill material to ensure a sturdy base and so sediments will not flow beneath the fabric. Use of a Ditch Witch® or similar equipment is suggested for this task.
- Drive the silt fence stakes into the ground until secure (≥ 6 inches below grade).
- If a hay bale or straw bale barrier is being used with the silt fence, position the silt fence downgradient of the bales.
- The silt fence should be as far away from downgradient sensitive areas, and as close to the work areas as construction limitations allow, in order to disturb as little area as possible.

Maintenance:

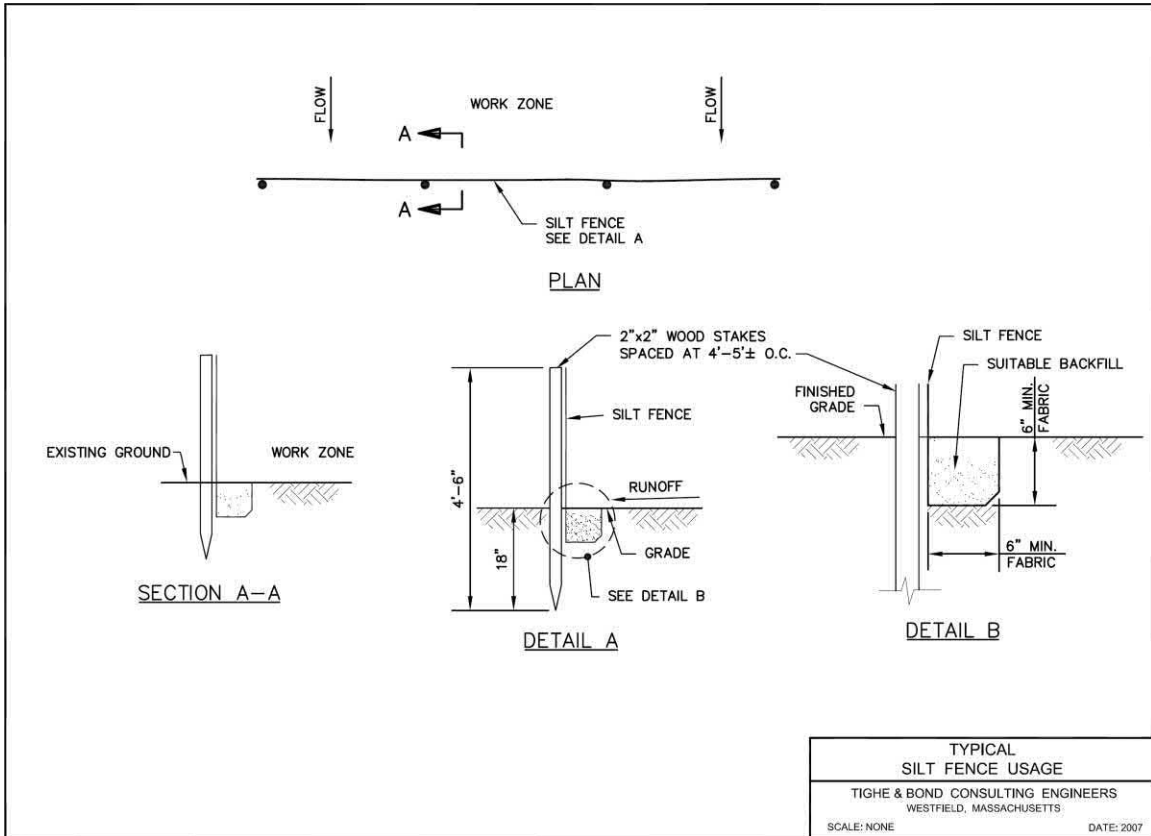
- Inspect frequently and replace or repair as needed, especially during long-term projects.
- Routinely remove and properly dispose of sediment buildup in a stable upland area, outside of sensitive areas. Remove sediment when it has accumulated to a thickness of $\frac{1}{2}$ the height of the silt fence.

Additional Comments:

A silt fence must be installed in an excavated trench and located where shallow pools can form so sediment can settle. The fence must be placed along the contour. If placed otherwise, water may concentrate to a low point and is likely to flow beneath the fence.



Properly installed and functioning silt fence. Direction of flow indicated by blue arrow.



1.5 Syncopated Silt Fence

Applications: Sedimentation control, work limits, slow flows on steep slopes, and permit wildlife movement.

Limitations:

- Frozen or rocky ground (for installing stakes).
- Complex installation compared to standard silt fence.
- Disposal.

Overview:

Syncopated silt fence refers to silt fence that is installed in a specific layout that permits wildlife movement. Many construction projects continue over at least one wildlife activity season, and silt fence may impede the movement of animals. Syncopated silt fencing is to be installed in areas where silt fencing may impede wildlife access to a resource (i.e., vernal pool, wooded area). These areas will be identified when developing wetland protection measures.

Installation:

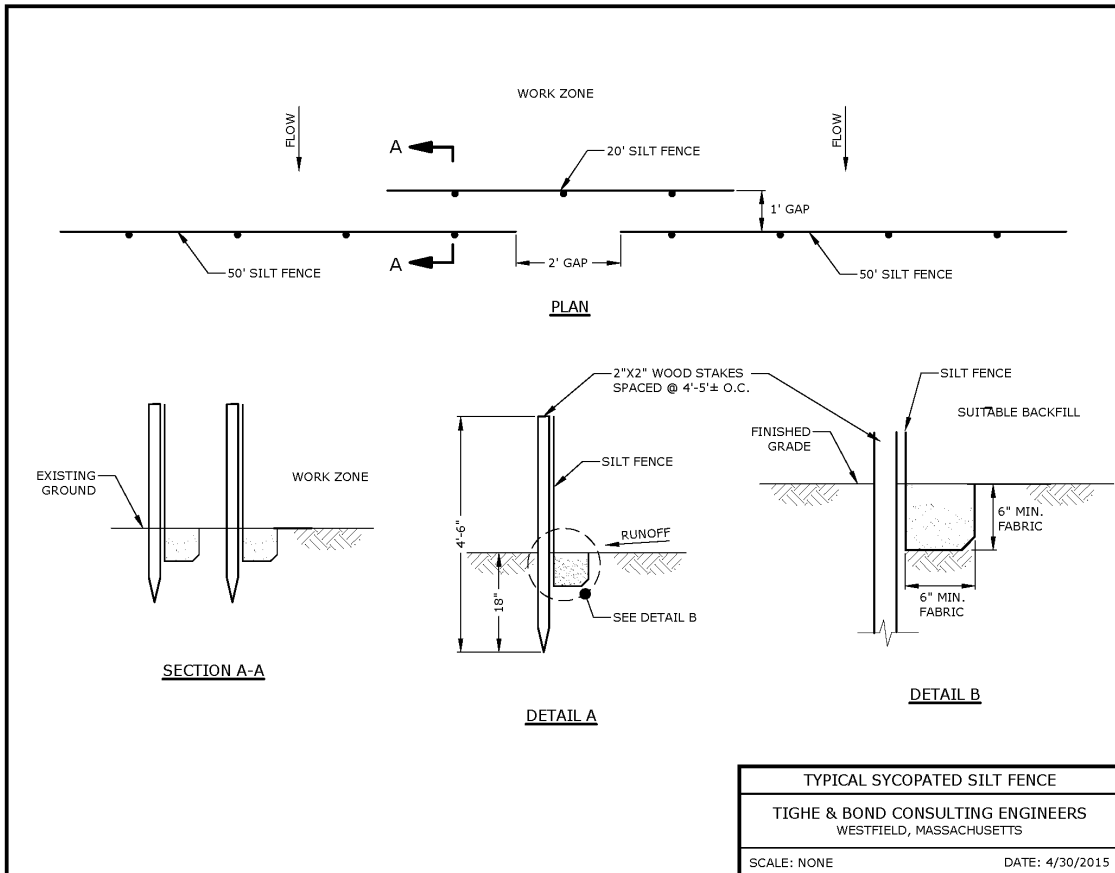
- The syncopated silt fence layout is shown on the typical below. For every 50 feet of siltation fence installed, allow for a gap of two feet before installing the next section. The gap allows wildlife movement. One foot behind the main silt fence line, install a second row of silt fence approximately 20 feet in length and centered at the gap.
- Install silt fence along the toe of a slope or along a fairly level contour with the outermost ends directed upslope. The fabric should be laid into a 6-inch wide by 6-inch deep trench dug on the upslope side of the fence and tamped down with fill material to ensure a sturdy base and so sediments will not flow beneath the fabric. Use of a Ditch Witch® or similar equipment is suggested for this task.
- Drive the silt fence stakes into the ground until secure (≥ 6 inches below grade).
- If a hay bale or straw bale barrier is being used with the silt fence, position the silt fence downgradient of the bales.
- The silt fence should be as far away from downgradient sensitive areas, and as close to the work areas as construction limitations allow, in order to disturb as little area as possible.

Maintenance:

- Inspect frequently and replace or repair as needed, especially during long-term projects.
- Routinely remove and properly dispose of sediment buildup in a stable upland area, outside of sensitive areas. Remove sediment when it has accumulated to a thickness of $\frac{1}{2}$ the height of the silt fence.

Additional Comments:

A silt fence must be installed in an excavated trench and located where shallow pools can form so sediment can settle. The fence must be placed along the contour. If placed otherwise, water may concentrate to a low point and is likely to flow beneath the fence.



1.6 Erosion Control Blankets

Applications: Slope stabilization, erosion and sedimentation control

Limitations:

- Can be used on steep (i.e. greater than 45°) slopes but not on rocky soils.
- Mulches may be more cost effective on flatter areas.

Overview:

Erosion control blankets are generally composed of biodegradable or synthetic materials and are used as a temporary or permanent aid in the stabilization of disturbed soil on slopes. These blankets are used to prevent erosion, stabilize soils, and protect seeds from foragers while vegetation is recolonized.

Installation:

- Always follow manufacturer's instructions for properly installing erosion control blankets. Different composition blankets are recommended for site-specific conditions (slope grades, contributing watershed areas) and use requirements (biodegradable, photodegradable, non-biodegradable).
- Prior to installation, clear the slope of any rocks, branches, or other debris.
- Rolled out blankets in a downward direction starting at the highest point of installation. Secure blankets above the crest of the slope using a berm tamped down along the top of the disturbed area.
- Tack down blankets with stakes or staples every 11 to 12 inches (or closer) horizontally and every 3 feet (or closer) vertically. Biodegradable staples are preferred.
- Overlap each blanket section horizontally with the next section by approximately 2 or 3 inches. Vertical overlaps should be approximately 6 inches, with the upslope section overlaying that of the down-slope section.

Maintenance:

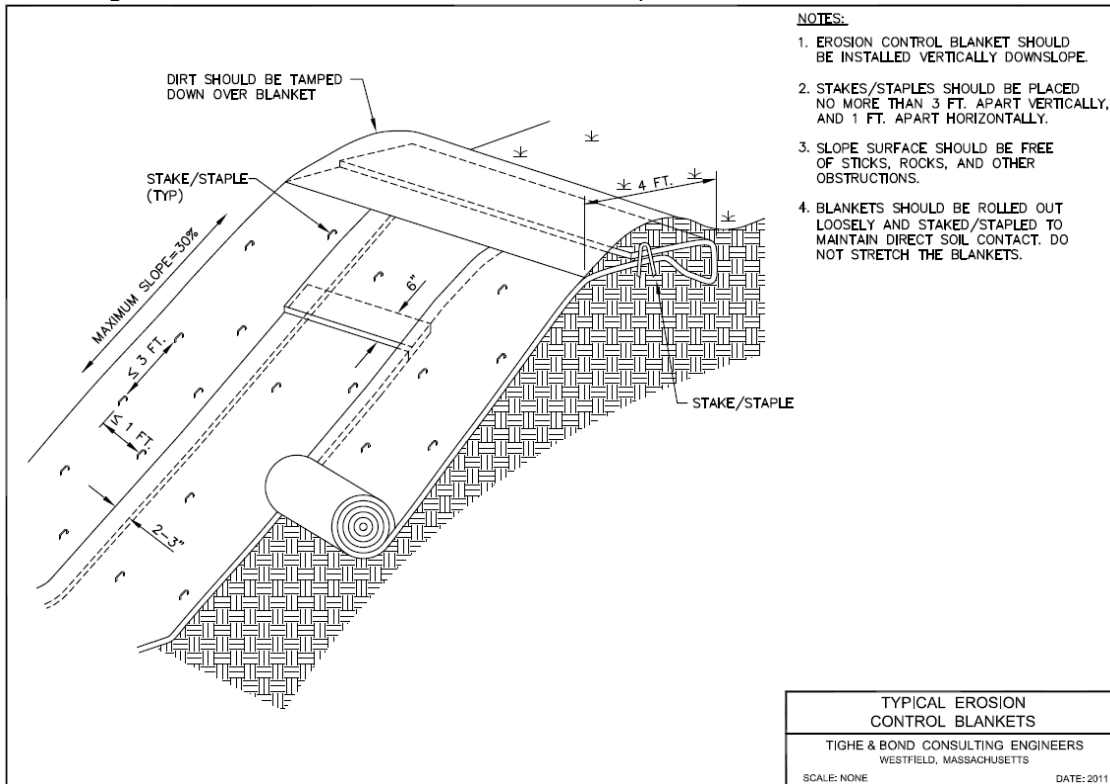
- Inspect for movement of topsoil or erosion weekly and after major precipitation events. Inspect until vegetation is firmly established.
- Repair surface, reseed, replace topsoil, and install new netting if washout, breakage, or erosion occurs.

Additional Comments:

Additional materials used for erosion control with a continuous sheet or material include Jute Mats (sheets of woven jute fiber) and Turf Reinforcement Matting (geotextile matrix most effective for channels).



Installing erosion control blanket on an unstable slope.



1.7 Straw/Compost Wattles

Applications: Erosion and sedimentation control, work limits

Limitations:

- Not recommended for steep slopes.

Overview:

Straw wattles are used as an erosion control device to slow runoff velocities, entrain suspended sediments, and promote vegetation growth until an area is stabilized. They are not generally intended for steep slopes, but rather, to stabilize low to moderate grades where there is a broad area of disturbance. Straw wattles may also be used along small stream banks to protect areas before vegetation has stabilized the soils. The wattles are constructed from a biodegradable netting sock stuffed with straw and may be left to biodegrade in place once a project is complete.

Wattles should be placed lengthwise, perpendicular to the direction of runoff. The wattles are typically spaced about 10 to 40 feet apart, depending on the slope angle. Additionally, the soil texture should be considered – for soft, loamy soils, wattles should be placed closer together; for coarse, rocky soils, they may be placed further apart.

Installation:

- Install prior to disturbing soil in the upgradient drainage area.
- Install so that the ends of each row of wattles on a slope are slightly turned downhill to prevent ponding behind them.
- Where straw wattles are installed end-to-end, butt the wattles tightly together so as not to allow water/sediments to flow between them.
- Place straw wattles in a shallow trench to assure stabilization and soil should be packed against the wattle on the uphill side.
- Securely stake straw wattles to the ground by driving a stake directly through the wattle approximately every four feet. A portion of each stake should remain approximately 2 to 3 inches above the wattle.
- Use *without* silt fence reinforcement: at the base of shallow slopes, on frozen ground, bedrock, and rooted, forested areas.
- Use *with* silt fence reinforcement: at low points of concentrated runoff, below culvert outlets, at the base of slopes more than 50 feet long, and in places where standalone mulch wattles have failed.

Maintenance:

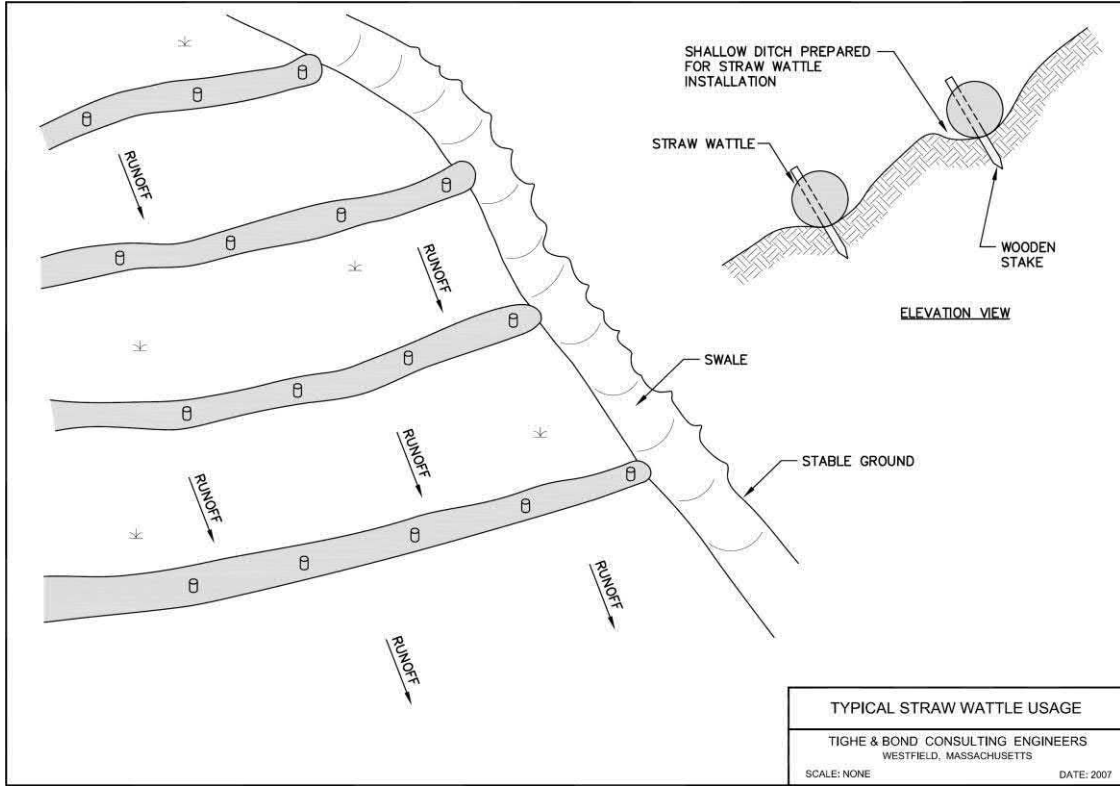
- Routinely inspect wattles and after rain events. Repair as needed with additional wattles and/or stakes.
- Remove sediment deposits when they reach half the height of the wattle. Repair or reshapes wattles when they have eroded or have become sediment clogged or ineffective.

- If flow is evident around the edges, extend the barriers or evaluate replacing them with temporary check dams.
- Reinforce the berm with an additional sediment control measure, such as silt fence or a temporary rock check dam, if there is erosion or undercutting at the base or sides of the berm or if large volumes of water are being impounded behind the berm.

Additional Comments:

Woody vegetation and tall grasses may need to be removed before installing the berm to prevent voids that allow sediment under the berm. Wattles can also be planted with woody vegetation and seeded with legumes for additional stability.





1.8 Wood Chip Bags

Applications: Erosion and sedimentation control, mulch

Limitations:

- Frozen or rocky ground (for installing stakes).
- Can pose a barrier to small animal movements.
- Requires close attention for maintenance and repair.

Overview:

Wood chip bags are perimeter barriers that intercept, filter, and reduce the velocity of stormwater run-off. They may be used separately or in conjunction with hay/straw bales and are installed and maintained in a similar manner. Wood chip bags should be staked in a line around perimeters of disturbed areas, especially those adjacent to wetlands, waterways, roadways or at the base of slopes.

Installation:

- Install wood chip bags end-to-end lengthwise in a single row along the toe of a slope or along a slope contour. Ensure that the bags are butted tightly against each other without gaps between them.
- Entrench to a minimum depth of 4 inches and backfill around the base of the bag.
- Stake each hay/straw bale into the ground using two stakes each that are approximately 3 feet long.

Maintenance:

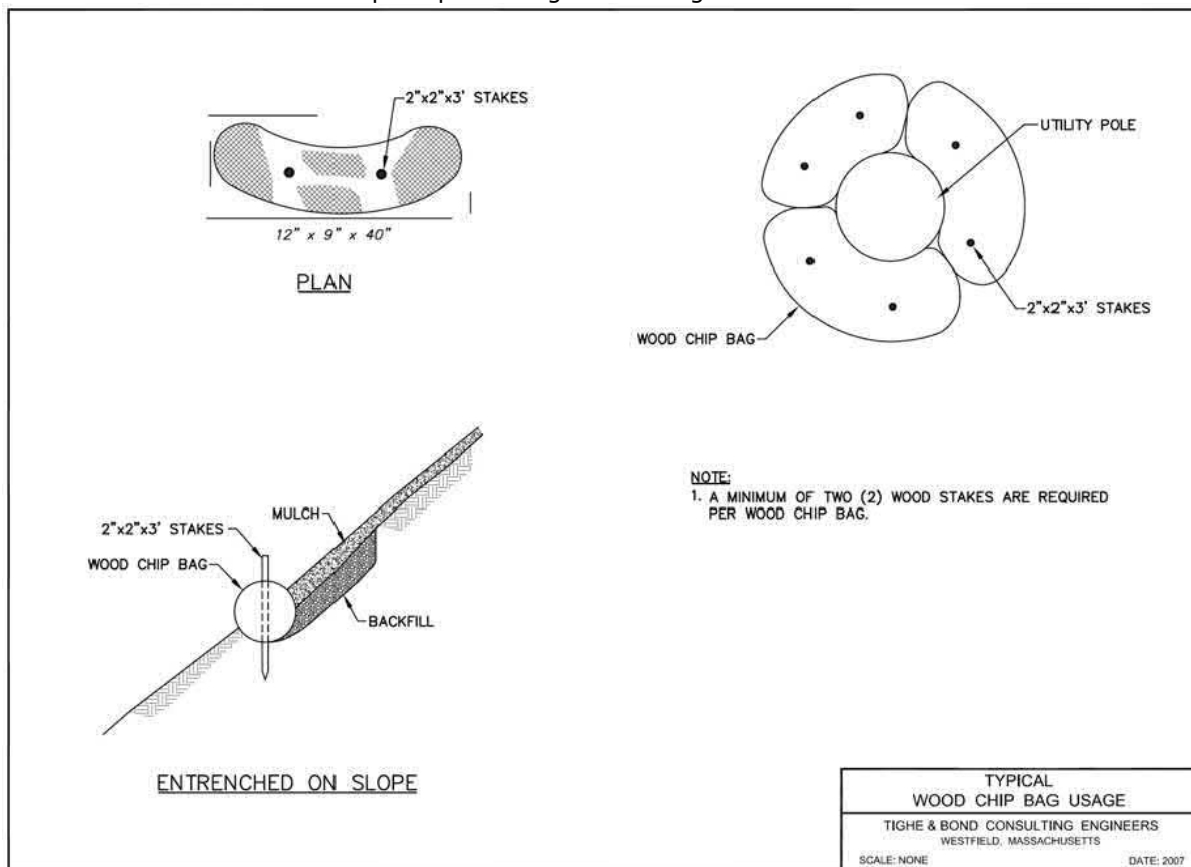
- Inspect before a forecasted storm event and daily during a prolonged rain event.
- Remove accumulated sediment and properly disposed outside sensitive areas when it has reached a thickness of $\frac{1}{2}$ to $\frac{2}{3}$ the height of the bag.
- Replace rotted or sediment-covered bag when necessary.

Additional Comments:

Wood chip bags can stabilize soils in a number of applications. They may be left in place as they eventually photo-degrade, as long as they do not pose a barrier to small animal movements.



Wood chips in photo-degradable bags used to stabilize soils.



1.10 Loaming and Seeding

Applications: Erosion control, soil stabilization, site restoration

Limitations:

- May be site specific limitations (e.g. permit or State requirements).
- Applies to upland areas only.

Overview:

Permanent seeding is appropriate for vegetated swales, steep slopes, or filter strips. Temporary seeding is used if construction has ceased and if an area will be exposed.

Installation:

- Apply loam/ topsoil prior to spreading seed mix per manufacturer’s recommendations. Apply water, fertilizer, and mulch to seedbed, as needed.
- Plant native species of grasses and legumes where practicable.

Maintenance:

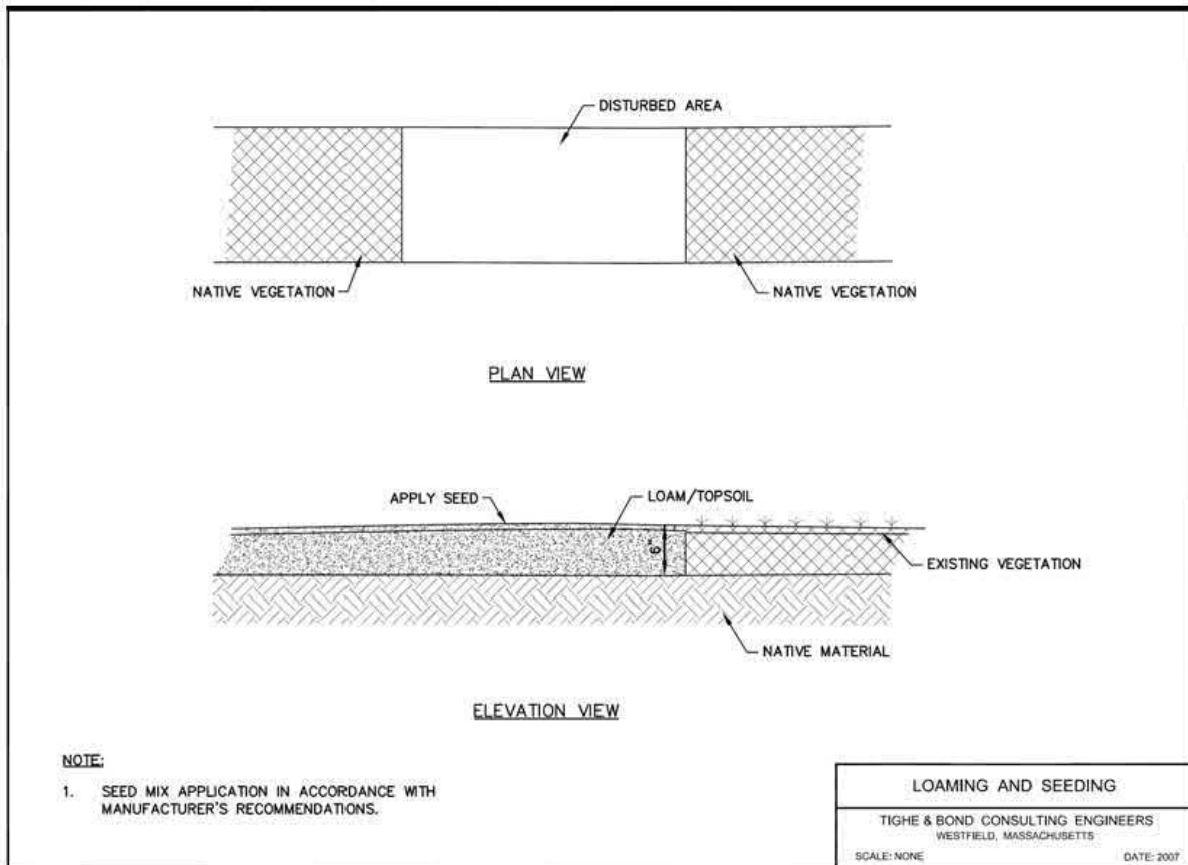
- Inspect on regular basis until vegetation has established.
- If washout or erosion occurs, repair surface, re-seed, re-mulch and install new netting.
- Follow permit requirements regarding use of wetland seed mix in wetlands where required.

Additional Comments:

Cool Season Grasses	Warm Season Grasses
<ul style="list-style-type: none"> • Best growth in the cool weather of fall and spring, set seed in June and July. • Seed April 1-May 31 and Aug 1-Sept 10. 	<ul style="list-style-type: none"> • Growth begins in the spring, accelerates in the summer, and plants set seed in the fall. • Seed April 1-May 15, dormant seeding Nov 1-Dec 15.



Loaming and seeding of recently disturbed right of way.



1.11 Mulching with Hay/Straw/Woodchips

Applications: Erosion control, soil stabilization, site restoration

Limitations:

- May be site specific limitations (e.g. permit or State requirements).
- Applies to upland areas only.
- Thick mulch may prevent seed germinations.
- Mulch on steep slopes must be secured with netting to prevent it from being washed away.

Overview:

Mulching consists of an application of a protective blanket of straw or other plant residue, gravel, or synthetic material to the soil surface to provide short term soil protection. It enhances plant establishment by conserving moisture and moderating soil temperatures, and anchors seed and topsoil in place. Mulch also reduces stormwater runoff velocity.

Application rates and technique depend on material used. Select mulch material based on soil type, site conditions and season. Straw/hay provides the densest cover if applied at the appropriate rate (at least ½ inch) and should be mechanically or chemically secured to the soil surface. Woodchip application can be less expensive if on-site materials are used.

Installation:

- Use in areas which have been temporarily or permanently seeded.
- Use mulch netting on slopes greater than 3% or in concentrated flows.
- Mulch prior to winter (ideally in mid-summer).

Maintenance:

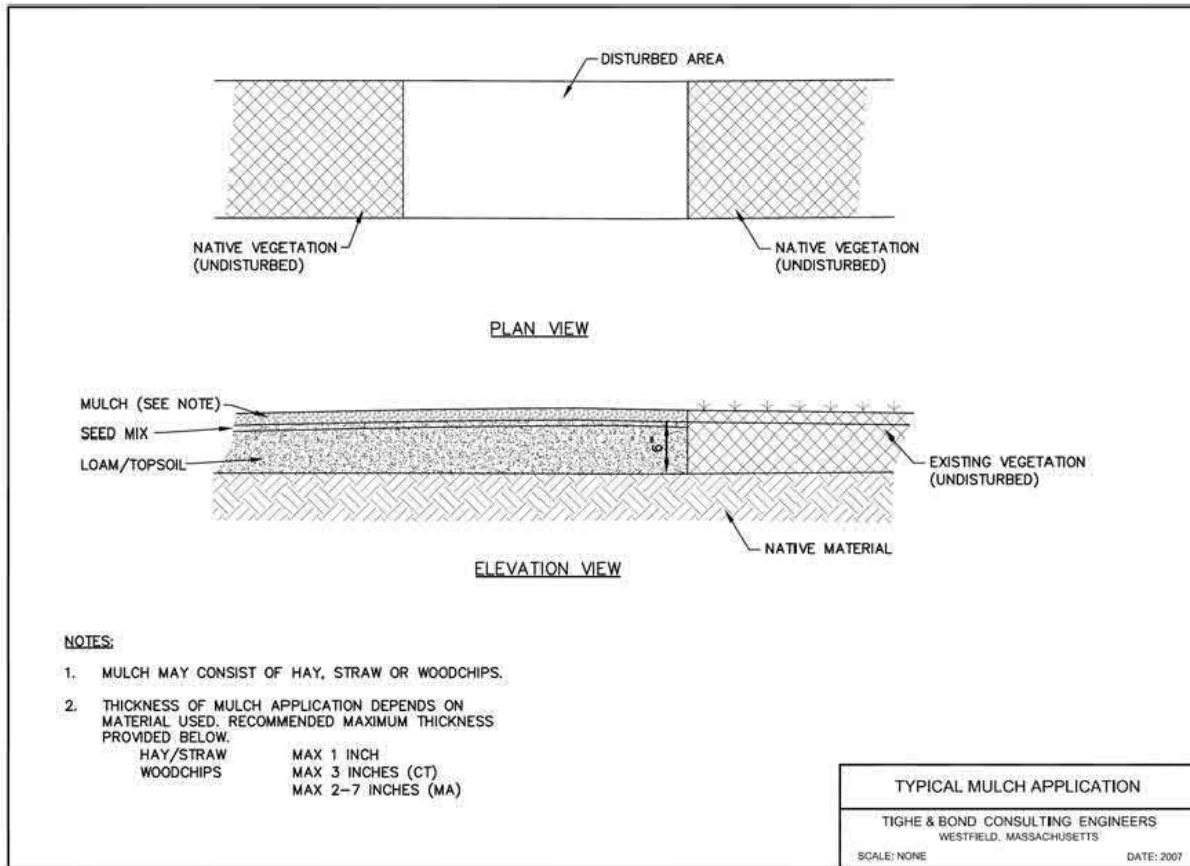
- Inspect on regular basis until vegetation has established.
- If washout or erosion occurs, repair surface, re-seed, re-mulch, and install new netting.

Additional Comments:

Type	Description/Use
Straw/Hay	<ul style="list-style-type: none"> • Straw or hay applied to surface at 2-4 tons per acre • Mechanically or chemically secured to soil surface • Provides the densest cover to protect soil and seeds
Wood Fiber/Hydraulic Mulch	<ul style="list-style-type: none"> • Chopped up fibers applied to the soil surface with a hydroseeder • Tackifier when necessary can be applied with fiber, seeds and fertilizer in one step. This is best when done with fast growing seeds
Compost	<ul style="list-style-type: none"> • Compost acts as a soil amendment but is more expensive than most mulches • Its efficiency is comparable to wood fiber
Wood Chips	<ul style="list-style-type: none"> • Use of wood chips as a mulch saves money if on-site materials are used • Effective when applied at high levels (6 tons per acre) and on up to 35% slopes



Typical view of light mulching atop unstable, seeded soils.



1.12 Coir Log Use for Bank Stabilization

Applications: Bank stabilization, wetlands and watercourse restoration

Limitations:

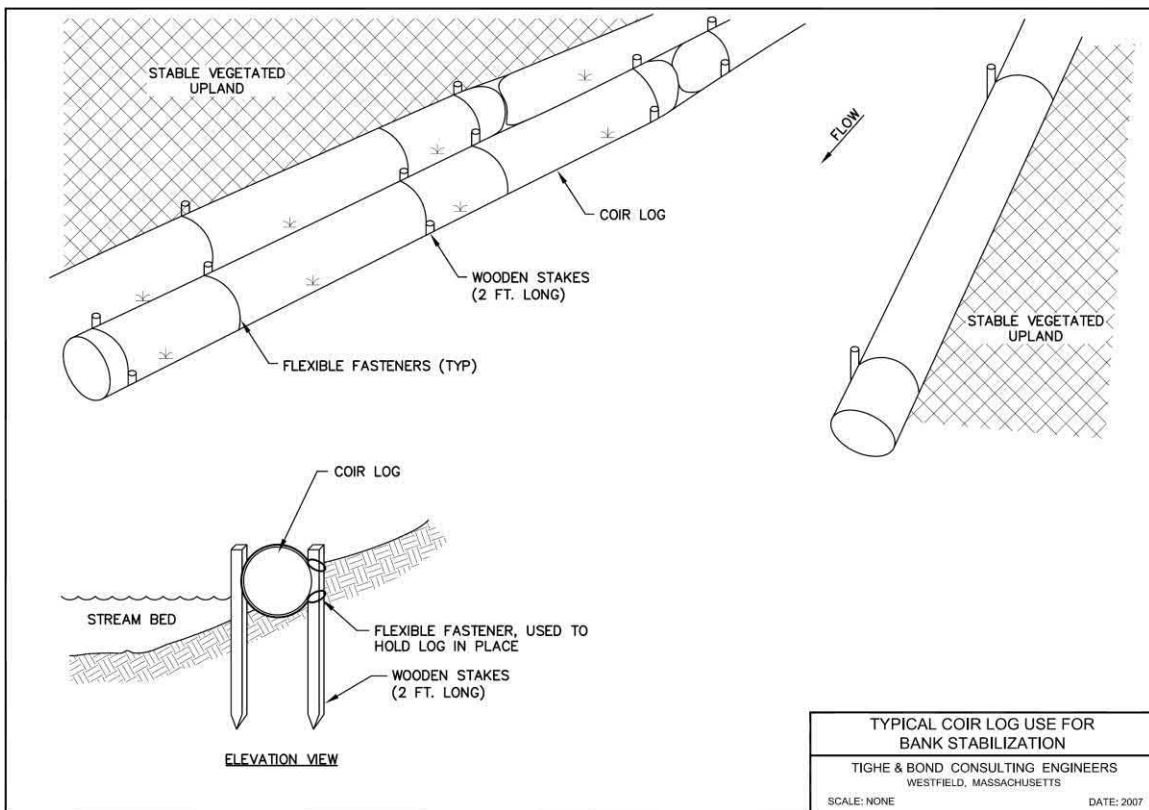
- Moderately expensive.

Overview:

- Refer to permit requirements (if applicable) and manufacturer's specifications.
- Install along banks between upland and watercourse using wooden stakes (2 foot long) and flexible fasteners (to hold log in place).



Coir logs used to restore a stream bed and banks.



1.13 Level Spreader

Applications: Erosion and sedimentation control

Limitations:

- Downgradient area must be adequately vegetated and have minimum width of 100 feet before surface water
- No vehicle traffic over level spreader

Overview:

Level spreaders, also called grade stabilization structures, are excavated depressions constructed at zero percent grade across a slope. They convert concentrated flow into sheet flow and discharges to stable areas without causing erosion.

Level spreaders are not applicable at all locations. Some general site requirements include:

- Drainage area of 5 acres or less
- Undisturbed soil (not fill)
- A level lip that can be installed without filling
- Area directly below is stabilized by existing vegetation
- At least 100 feet of vegetated area between the spreader and surface waters
- Slope of the area below the spreader lip is uniform and a 10% grade or less
- Water won't become concentrated below the spreader and can be released in sheet flow down a stabilized slope without causing erosion
- There will be no construction traffic over the spreader

Installation:

- Set the channel grade to be no steeper than 1% for the last 20 feet entering the level spreader.
- Install level spreader using the suggested dimensions: length—5 to 50 feet, width—at least 6 feet, and depth—approximately 6 inches (measured from the lip) and uniform.
- Stabilize the level spreader with an appropriate grass seed mixture and mulch, if necessary. Protect the level lip with an erosion stop and jute netting/excelsior matting. The downgradient area should have stable, complete, erosion resistant vegetative cover.

Maintenance:

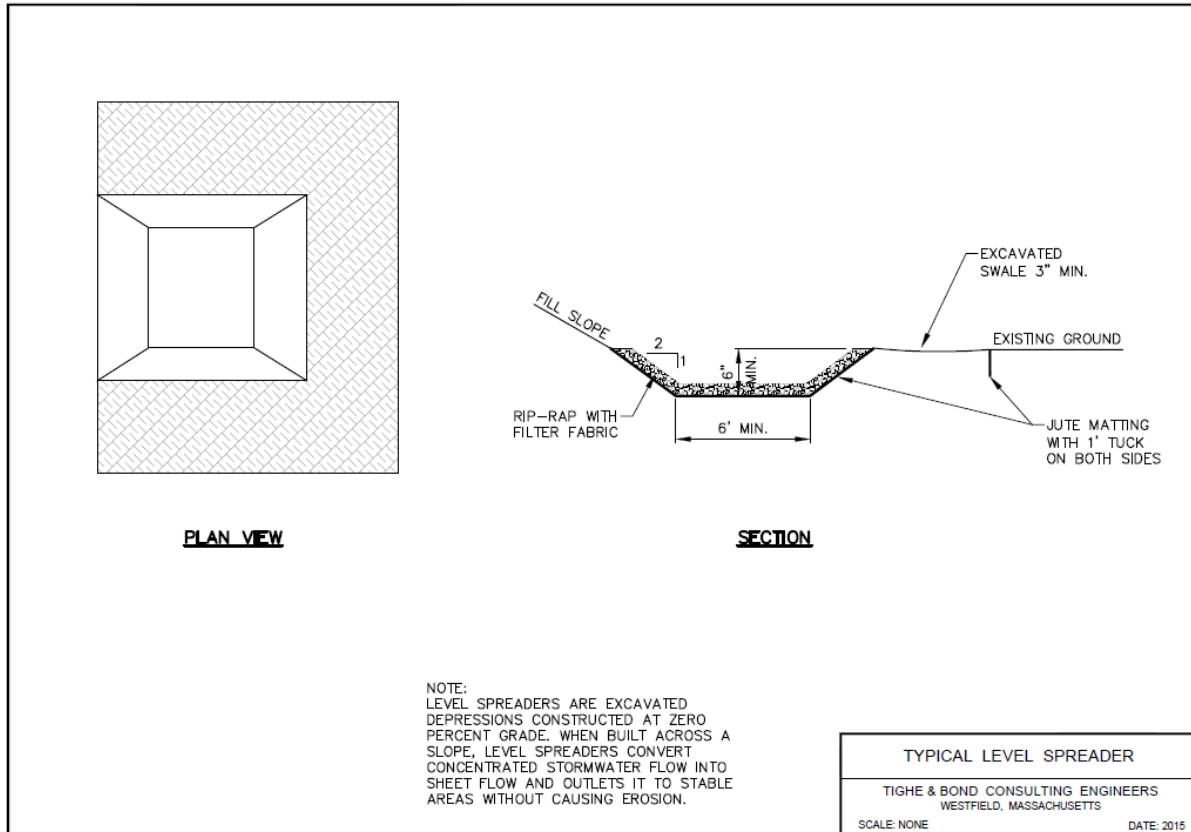
- Inspect after every rain event and remove accumulated sediment. Repair erosion damage and re-seed as necessary.

- Mow vegetation occasionally to control weeds and the encroachment of woody vegetation.

Additional Comments:

If channels form and erosion is evident in level spreader, the level spreader is not uniformly flat. Repair the low spots in the level spreader.

If erosion is occurring downgradient of the level spreader, the level spreader is not long enough or not wide enough. Alternatively, the vegetation is not stable. Re-seed the area.



1.14 Check Dams

Applications: Stormwater management, erosion control

Limitations:

- Need to be adequately sized based on expected rain events.

Overview:

Check dams are porous physical barriers placed across a drainageway to reduce the velocity of concentrated stormwater flows and erosion. Check dams also temporarily pond stormwater runoff to allow sediment in the water column to settle out. Permanent or long-term check dams are typically constructed of rip rap or other stone material. Short-term check dams can be constructed of rip rap. Rip rap check dams are preferred over hay bales.

Installation:

- Place stone by hand or machine, making side slopes no steeper than 1:1 and with a maximum height of 3 feet at the center of the check dam. A geotextile may be used under the stone to provide a stable foundation and/or to facilitate removal of the stone.
- The minimum height of the check dam shall be the flow depth of the drainageway, but shall not exceed 3 feet at the center.
- Install the check dam so that it spans the full width of the drainageway, plus 18 inches on each side. Leave the center of the check dam approximately 6 inches lower than the height of the outer edges.
- The maximum spacing between check dams should be such that the toe of the upstream check dam is at the same elevation as the top of the center of the downstream check dam.

Maintenance:

- For permanent stone check dams, inspect and maintain the check dam in accordance with the standards and specifications provided in the design for the site.
- For temporary check dams, inspect at least once per week and within 24 hours of the end of a precipitation event of 0.5 inches or more to determine maintenance needs.
- Maintenance may include, but are not limited to, the replacement of stone, repair of erosion around or under the structure, and/or the removal and proper disposal of accumulated sediment.

Problem	Solution/Explanation
Stone displaced from face of dam	Stone size too small and/or face too steep
Erosion downstream from dam	Install stone lined apron
Erosion of abutments during high flow	Rock abutment height too low
Sediment loss through dam	Inadequate layer of stone on inside face or stone too coarse to restrict flow through dam



Stone check dams at construction site.



Stone check dam at construction site.

1.15 Temporary and Permanent Diversions

Applications: Stormwater management, erosion control

Limitations:

- Need to be adequately sized based on expected rain events and the contributing drainage area.

Overview:

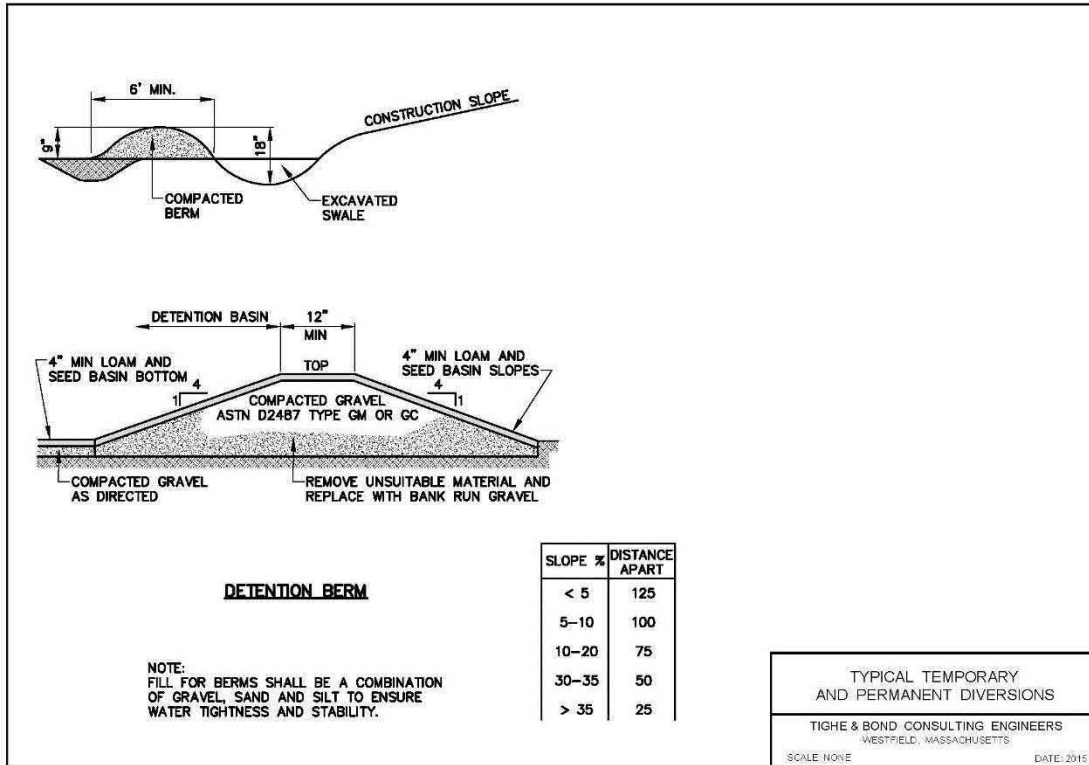
Temporary and permanent diversions are ridges or channels constructed across steep slopes that convey the runoff to a stable outlet at a non-erosive velocity. Use permanent diversions on slopes with high runoff velocities to break up concentrated flow. They can be installed as temporary diversion and completed as permanent when the site is stabilized or can be installed in the final form initially.

Installation:

- Remove woody vegetation and fill and compact the ditches and gullies that must be crossed before construction.
- Remove vegetation around the proposed location of the base of the diversion ridge to form a strong bond between the ground and fill material.
- Stabilize the outlet of the diversion channel using sediment traps, natural or constructed vegetated outlets, or level spreaders.
- Stabilize the diversion channel with riprap, vegetation, paving, or stone.
- Install a filter strip of close growing grass above the channel to prevent sediment accumulation.
- Seed and mulch diversions that are intended for use for more than 30 days.
- After the area has been permanently stabilized, remove the ridge and channel to blend with the natural ground level.

Maintenance:

- Inspect bi-weekly and repair any erosion problems.
- Remove accumulated sediment and debris.



1.16 Temporary and Permanent Trench Breakers (Trench Plugs)

Applications: Keeping work areas dry, long-term stabilization of soil (prevents sinkholes)

Limitations:

- Water that accumulates behind the trench breaker requires pumping to a filtering device, preferable in a well-vegetated, upland area.

Overview:

Trench breakers (trench plugs) are temporary or permanent measures used to slow the movement of groundwater and surface runoff within a trench. They are often used when runoff draining to downgradient work areas causes problems within the trench. Trench breakers may be placed adjacent to waterways and wetlands to prevent water from seeping into work areas or disrupting the hydrology of the resource areas. They can be used on slopes throughout all types of land uses (including agricultural and residential). Trench breakers should be installed upslope of each permanent slope breaker or waterbar.

Temporary Trench Breakers (Trench Plugs)

Temporary trench plugs may consist of hard or soft plugs. Hard plugs leave small portions of the ditch unexcavated at certain intervals. Soft plugs involve placing compacted subsoil or sandbags into the ditch following excavation.

Installation:

- Install temporary trench plugs at the same intervals as temporary slope breakers or water bars (see table).

Maintenance:

- Inspect trench breakers regularly for signs of any instability, and repair any erosion problems.
- If water accumulates behind the trench breaker, pump to a filtering device, preferably in a well-vegetated, upland area.

Permanent Trench Breakers

Permanent trench breakers are left in the trench and backfilled to slow the movement of subsurface water along the trench. This helps prevent undermining the stability of the right of way that may lead to sinkholes or erosion.

Installation:

- Trench breakers can be composed of sandbags or polyurethane foam. Do not use topsoil to construct trench breakers.
- Build the trench breaker under and around the pipeline at intervals specified by the local soil conservation service or as shown in the table below.
- Install temporary trench plugs at the same intervals as temporary slope breakers or water bars (see table).
- When using sandbags, construct the trench breakers to be a minimum of two bags wide.
- Backfill the top of the trench breakers along with the rest of the trench. Grade the entire area to the original contours and stabilize.

Maintenance:

- Inspect trench breakers for stability and effectiveness before the trench is backfilled.
- During future inspections of the completed right of way, observe the ditch line for any unusual settling or erosion.
- Inspect wetlands and waterways for any change to their original hydrology.

Additional Comments:

Recommended Spacing	
Land Slope	Spacing (ft)
5-15%	300
>15-30%	200
>30%	100

