NHDOT # IM-IR-0931(174), 10418-E
USACE PERMIT # NAE-2004-233
NHDES WETLANDS PERMIT # 2002-02033
2015 RESTORATION MONITORING REPORT

Monitoring Year 1 Report
Policy Brook Restoration
Haigh Avenue
Salem, NH

Prepared For:

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SRE # 15-041

NHDOT Project # IM-IR-0931(174), 10418-E
USACE Permit # NAE-2004-233
NHDES Wetlands Permit # 2002-02033

Year One Monitoring Report
New Hampshire Department of Transportation
Policy Brook Restoration
Haigh Avenue, Salem, NH

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I. Project Overview

The following mitigation monitoring report is pertinent to NHDOT project # IM-IR-0931(174), 10418-E, USACE Permit Number NAE-2004-233 and NHDES Permit Number 2004-2033. Specifically this report focuses on the constructed Haigh Avenue, Policy Brook channel restoration, floodplain storage and wetland mitigation site. Stoney Ridge Environmental, LLC (SRE) conducted monitoring year one (2015 growing season) wetland and stream mitigation monitoring on behalf of the New Hampshire Department Of Transportation (NHDOT). The Haigh Avenue mitigation site replaced the Salem Waste Water Treatment Plant (Salem WWTP) site originally outlined as one of five wetland creation sites in the Final Environmental Impact Statement (FEIS). The Haigh Avenue mitigation site provides compensatory mitigation of several resources through the restoration of approximately 2,200 linear feet of Policy Brook, approximately 26.3 acre-feet of floodplain storage and creation of approximately 1.71 acres of forested floodplain wetland.

The mitigation site is located at the southern terminus of Haigh Avenue in the town of Salem, New Hampshire just upstream of the confluence of Policy Brook and the Spickett River. Construction of the Haigh Avenue mitigation site began in 2014 and the final planting was completed in the early spring of 2015 before the onset of the growing season. Mitigation monitoring field work was conducted on August 26 and 27, and on October 16, 2015. All of the performance standards and success criteria for this site are either being met or are too early in establishment and development of vegetation and soil characteristics to indicate that success will not be met without corrective action. No corrective or maintenance activities occurred during monitoring year one.

SRE recommends implementing control of purple loosestrife during the second growing season within the stream side planting zone. Purple loosestrife areal coverage is above 40% of the entire planting type and does not meet the requirements of Performance Standards 4 (Native Species Cover) and 5 (Invasive Species Presence).

A stream bend and adjacent floodplains in August, 2015.

II. Requirements

A summary of the Performance Standards, Success Criteria and Achievement Status of each criteria at the Mitigation Site are shown in Table 1 below.

Table 1: Monitoring Year One Performance and Success Summary

#	Performance Standard	Success Criteria	Achievement Status Monitoring Year 1
1	Restored stream channel exhibits increasing stability, in stream grade control and habitat structures are stable and functioning.	A Bank Erosion Hazard Index (BEHI) of less than 35 in year 1, declining to less than 25 in year 5.	The BEHI scores for the outside meander bend bank at each cross section were less than 35 in monitoring year 1.
2	The site has the hydrology to support the designed wetland type.	Soils are saturated to the surface for at least two weeks during the growing season; ground water is within one foot of the soil surface during this period as demonstrated with well data collected March through June.	USGS gage data and soil characteristics indicate that soil saturation did not occur for two weeks during the 2015 growing season. This region of New Hampshire has been identified as abnormally dry to moderate drought from May through October.
3	500 Shrubs and trees per acre, and the minimum number of total species (planted and volunteer) as specified in *Army Corps of Engineers, New England District Mitigation Guidance, 2007* (*Guidance*).	At least 350 stems are species originally proposed for the forested zones, that are healthy and vigorous and > 18 inches tall. Also, total number of species shall meet the requirements as listed in *Guidance*.	All three planting zones have been planted at densities well above 500 stems pre-acre.
4	80% aerial cover of the entire site by non-invasives (excluding the open water or special bare soil areas, i.e., turtle nesting areas).	80% cover by non-invasives in emergent zones and 60% cover (of which 15% are woody species) in scrub shrub and forested zones.	Purple loosestrife has greater than 40% cover in the stream side shrub planting zone. Control during the second growing season is recommended to reduce its frequency onsite.
5	Common reed, purple loosestrife, Russian and autumn olive, and or multiflora rose are controlled.	Absence of these species on the site.	Purple loosestrife has been identified onsite. Control during the second growing season is recommended to reduce its frequency onsite.
6	All slopes, soils, substrates	No evidence of	No evidence of sedimentation

	and constructed features are stabilized.	sedimentation in runoff from the site during storms and all erosion control measures are in good condition.	in runoff from the site was observed. All erosion control measures were in good condition.
7	At least 75% successful establishment of wetlands vegetation after two (2) growing seasons.	Seventy-five percent (75%) cover of wetland species in the floodplain and streamside planting zones within 2 growing seasons.	This performance standard is not applicable to year one monitoring. However early observations indicate that this performance standard will likely be met next season.
8	NHDOT shall delineate the wetlands and flood storage volume within the mitigation site, document the delineation with ACOE data forms and depict the delineation as an overlay of the final as-built plans after at least five full growing seasons.	The areas proposed as floodplain and streamside wetlands meets the technical criteria contained within the 1987 Corps Manual for jurisdictional wetland after five years.	This performance standard is not applicable to year one monitoring.

III. Data Summary

1. Bank Erosion Hazard Index (BEHI)

BEHI is a stream bank site specific field measurement and method which documents the combined effects of erosion and deposition processes and assigns a numerical value to the risk for that stream bank site to erode. Generally, the higher the number the more susceptible the bank is to erosion. When repeated over time BEHI can be used to determine if the constructed form of the channel and channel materials are in balance with the fluvial processes present in the restoration reach. The annual cross section surveys were established near restoration reach thalweg stations 251+00, 256+00, 259+25 and 261+00 as shown on the Mitigation Monitoring Plan. The BEHI data forms are provided in appendix A. The BEHI scores, shown in Table 2, for the outside meander bend bank at each cross section were less than 35. This meets the success criteria and performance standard for monitoring year 1.

Table 2: Monitoring Year 1 BEHI Scores

Approximate Station	Cross Section	Monitoring Year 1 BEHI Score
251+00	4	20.5
256+00	3	24.5
259+25	2	20.5
261+00	1	24

2. Wetland Hydrology

The intended wetland type is a palustrine forested broad-leaved deciduous seasonally flooded / seasonally saturated (PFO1C/E) wetland on a floodplain landform. No groundwater monitoring well was installed on site. Policy Brook merges with the Spickett River at the end of the restoration reach. Since the Spickett River drains a larger watershed area than Policy Brook, the Spickett River can cause a backwater effect within the restoration reach. The watershed size of Policy Brook is roughly ¼ to 1/3 the size of the Spickett River watershed at the confluence. Hence the base flow level of the restoration reach channel is tied to the frequency, duration and seasonal timing of overbank flooding events associated the Spickett River. A United States Geological Survey (USGS) stream gage is located approximately 1000 feet off site on the Spickett River (Gage # 01100561) at Hampshire Road in Methuen, MA. Any gage height at this gage may be converted to elevation (NGVD29) by adding 100.91 feet.

Gage height data from this gage is pertinent to two aspects of this mitigation site. First, gage height records indicate if or when and for how long flooding occurs each growing season in the wetland, and when and for how long Policy Book flow levels contribute to the saturation of wetland soils. Second, gage data records the frequency and magnitude of peak flows which the restoration channel is exposed. The natural channel design method is based on the principle that channel pattern, profile and dimension are dependent on the frequency and magnitude of flows of water and sediment provided by the watershed and that these flows will access the floodplain on a semi-annual basis.

The design slope of the restoration reach (0.00047 ft./ft.) and the slope of the Spickett River are very similar near their confluence at the end of the restoration reach. This monitoring study assumes the slope of the Spickett River from the restoration reach to the USGS gage is very near 0.0005 ft. /ft. SRE visited the USGS gage and observed field indicators of bankfull, or the edge of channel and floodplain, near 5.7 – 5.8 in gage height or 106.61 to 106.71 in elevation (NGVD29). The floodplain elevation 1000 feet upstream at a slope of 0.0005 ft./ft. should be approximately 107.11 – 107.21 (NGVD29). The floodplain wetland elevation shown on the restoration plan is 107.00 feet. Using the approximations above, the water level frequency, duration and seasonal timing of flooding, (corresponding to a gage height of 5.7) and water within one foot of the soil surface, (corresponding to a gage height of 4.7) were examined for the restoration reach. The frequency and duration breakdown for all gage heights exceeding 4.7 and 5.7 are shown in Table 3.

Spickett River gage data (01100561) indicates that river water levels supportive of saturation through flooding (Gage Height $\geq$ 5.7) and through soil saturation within 12-inches of the soil surface (Gage Height $\geq$ 4.7) did not occur during the monitoring year one growing season. SRE observed that the growing season started the week of April 20, 2015 throughout most of south eastern New Hampshire. The Success Criteria in Table 1 states that at least 14 days (two weeks) of saturation is required during the growing season to produce the intended wetland type. Soil saturation determined through the level of Policy Brook would have only occurred for less than a seven days in April and for less than four days throughout the remainder of the growing season. Therefore, wetland hydrology was not met during the 2015 growing season.

Table 3: Monitoring Year One Wetland Hydroperiod per the USGS Spickett River Gage (01100561) near Methuen, MA

Time Start Exceeding (date, military time)		Time End Exceeding (date, military time)		Total Time (days, hours)	
Gage Height 4.7	Gage Height 5.7	Gage Height 4.7	Gage Height 5.7	Gage Height ≥ 4.7 (soil saturation)	Gage Height ≥ 5.7 (flood)
4/1/2015, 0:00	4/4/15, 9:45	4/24/15, 12:45	4/7/15, 11:15	24 days, 12.75 hours	3 days, 1.5 hours
6/2/15, 4:45		6/4/15, 20:50		2 days, 15.25 hours	
10/29/15, 6:45		10/29/15, 9:15		2.5 hours	
Total Time from April 1, 2015 through October 31, 20015				27 days, 6.5 hours	3 days, 1.5 hours

The United States Drought Monitor indicates that the southeastern portion of New Hampshire has been abnormally dry since April of 2015 and has been in a moderate drought since September 2015. United States Drought Monitor Data for the Nashua NH/MA urban area is provided in Appendix B. SRE completed two USACOE Wetland Determination Data Forms within the floodplain wetland to determine if soils had been exposed to saturation for a sufficient duration and frequency to produce hydric soil indicators within 12-inches of the soil surface. No redoximorphic features, depleted matrix or other hydric soil indicator was identified within 12-inches of the soil surface in monitoring year one. SRE observed 16 to 20 inches of loam topsoil (10YR3/1) were placed, during site construction, over sand (2.5 Y 7/1 matrix with frequent mottles 2.5 Y 6/6). USACOE Wetland Determination Data Forms are provided in Appendix C.

In summary the past growing season was abnormally dry and reflects the posibility that the channel and wetlands will experience flooding episodes in wetter years. SRE expects forested wetland hydrology to improve and meet target hydrology in average and wetter growing seasons. The gage data does document that the restored channel was subject to one flow above bankfull level and that the function of floodplain attenuation and storage of flood waters occurred on site in the first monitoring year.

3. Woody Stem Density

Woody stems were sampled using the methods outlined in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual Northcentral and Northeast Region (2012). The plot locations are shown on the Mitigation Monitoring Plan. The plot size was a 15-foot diameter circular plot for the Wet and Dry Floodplain Forest (PFO1) communities and a 6-foot wide belt transect for the stream side shrub (PSS1) community. The plot centers are identified in the field with orange flagging and the vegetation plot locations are shown on the Mitigation Monitoring Plan. The monitoring year one stem count plots for each planting type indicated on the restoration plans are show below in Table 4. The Performance Standard requires a density of 500 stems per-acre including planted and volunteer stems. The Success Criteria indicates a density of 350 stems originally planted and are healthy and at least 18-inches in height. All three planting zones have been planted at densities well above 500 stems pre-acre and no dead stems were encountered during the late August stem count.

Table 4: Monitoring Year One Woody Stem Density by Planting Type

Woody Plant Species (Scientific Name)	Woody Plant Species (Common Name)	Number of Stems in 706.5 ft.^{2} Plot		
		Stream Side Shrub (PSS1)	Wet Floodplain Forest (PFO1C/E)	Dry Floodplain Forest (PFO1J)
Alnus serrulata	Speckled Alder		5	
Betula nigra	River Birch		5	
Cornus amomum	Silky Dogwood	1	8	
Cornus alba	Red-Osier Dogwood	4		
Salix sericea	Silky Willow	7		
Acer rubrum	Red Maple		9	7
Nyssa sylvatica	Swamp Tupelo			1
Quercus bicolor	Swamp White Oak		4	
Ulmus americana	American Elm		2	
Vaccinum cormbossum	Highbush Blueberry		16	
Carpinus caroliniana	Ironwood			1
Pinus strobes	White Pine			3
Prunus serotina	Black Cherry			5
Quercus rubra	Red Oak			4
Stem Density (stems/acre) Based on Plot Stem Counts		740	3,021	1,294

Overall the woody stems appeared in good health and held leaves into October during a dry year indicating that dry conditions had not seriously stressed the planting as a whole. Approximately half the live stakes in the stream side planting area had sprouted small amounts of woody growth in addition to several leaves indicating that the base the live stakes had stayed saturated throughout the growing season.

4. Native Species Cover

SRE observed 90% aerial cover by native and non-invasive plant species during monitoring year one. The stream side shrub zone was the only planting zone with ≥ 40% cover by an invasive species, purple loosestrife (*Lythrum salicaria*). Purple loosestrife covers approximately half of this planting type. The loosestrife was largely emerging from beneath the erosion control blanket within several feet of the water line. The coverage is likely due to deposition of seed during high water from offsite sources. The floodplain wetland and floodplain upland were colonized by one or both of the *Agrostis* grass species from the herbaceous seed mixes applied in the fall of 2014. Herbaceous coverage typical of the site is shown in the photo below.

Herbaceous coverage on the floodplain wetland, October 2015.

5. Invasive Species Presence

Only purple loosestrife was observed onsite. Purple loosestrife became established along the stream side shrub zone in bare soils during the first growing season. This early in vegetative establishment and with little competition from other plants, purple loosestrife is colonizing the stream banks. Very little purple loosestrife onsite produced seed this year because of dry conditions in late summer. SRE recommends control of purple loosestrife next growing season. As native herbaceous and woody plantings should provide adequate competition in following growing seasons once they become established over purple loosestrife. Colonization of the stream bank by purple loosestrife typical on site is shown in the photo below.

Purple loosestrife established particularly well in the stream side zone.

SRE recommends implementing active control of purple loosestrife during growing season two. Successful control during year two should ensure that native species, in subsequent growing seasons, will provide more adequate competition to invasive pressures.

6. Soil and Slope Stabilization

No evidence of sedimentation or runoff from the site was observed. All erosion control measures were in good condition. Site photo locations are shown on the Mitigation Monitoring plan and a site photo log is provided in Appendix D.

During site construction an insitu pipe, crossing of the mitigation site from west to east, was uncovered and subsequently re-buried (near thalweg station 257+00). The crossing occurs where an outside meander bend of the restoration stream reach is close (approximately 70 feet) to an outside meander bend of the Spickett River. NHDOT has expressed concern over any soil instability or further migration of either meander bend towards the other in this locality. SRE did not observe any soil instability or accelerated erosion in either meander bend this monitoring year. The soil embankment which separates the floodplains of Policy Brook and the Spickett River was fully vegetated and intact. USGS gage data indicates that water levels were not high enough for moving flood water to access the embankment. A photo of the embankment is shown below.

The pipe crossing and embankment area between Policy Brook and the Spickett River.

7. Establish Wetland Vegetation to 75%

The Performance Standard: At least 75% successful establishment of wetlands vegetation after two (2) growing seasons. This success standard is not applicable to year one monitoring. However, herbaceous and woody vegetation became established throughout the site during year one. Stem count plots and general visual observations indicate that wetland vegetation and upland planting areas are becoming established. The grass components of the seed mixes established as a pioneer community in the first growing season. The *Agrostis* grass species from the seed mixes which became established and dominant on site are both FACW indicators.

8. Flood storage volume and wetland delineation

The Performance Standard: NHDOT shall delineate the wetlands and flood storage volume within the mitigation site, document the delineation with ACOE data forms and depict the delineation as an overlay of the final as-built plans after at least five full growing seasons.

This success standard is not applicable to year one monitoring.

9. Wildlife

The following wildlife species were observed onsite during monitoring year one: Largemouth bass, snapping turtle, blue jay, robin, red-winged black bird and common grackle. It is anticipated that as vegetation becomes more diverse and structurally complex a wider variety of wildlife will use the site.

IV. Conclusions

Herbaceous vegetation became established throughout the mitigation site during the monitoring year one growing season. The constructed stream channel banks showed no signs of erosion under the erosion control blanket and herbaceous vegetation and live stake plantings had take to root through the erosion control blanket by the end of the growing season. The BEHI scores for four monitored meander bends were all well below 35 which met the monitoring year one success criteria. The weather during the 2015 growing season was abnormally dry through the spring and summer and was in a moderate drought during the fall. Because this growing season was abnormally dry saturated wetland soils with 12 inches of the soil surface probably did not occur. However, woody stem health in October did not appear stressed by the dry conditions. The mitigation area was planted with initial stem densities exceeding the 500 stems pre-acre performance standard. Very little stem mortality was observed at the end of the growing season. Aerial coverage of 90% by native and non-invasive plant species was observed during monitoring year one. Purple loosestrife became established along the stream side shrub zone in bare soils beneath the erosion control blanket during the first growing season. No evidence of sedimentation or runoff from the site was observed. All erosion control measures were in good condition. No corrective or maintenance activities occurred during monitoring year one.

SRE recommends implementing control of purple loosestrife during the second growing season within the stream side planting type. Purple loosestrife areal coverage is above 40% of the entire planting type and fails the requirements of Performance Standards 4 (Native Species Cover) and 5 (Invasive Species Presence).

REVISIONS AFTER PROPOSAL

NUMBER	DATE	DESCRIPTION	STATION
1	08/2012	ADDED NOTE FOR EXISTING 12" RCP. LIMITED FILL NHDES OPTION & REVISED TOB	257+25
			257+00

STA. 250+00
BEGIN CHANNEL CONSTRUCTION

STA. 263+00
END CHANNEL CONSTRUCTION

I-93 NB

LEGEND
- CROSS SECTION
- DATA PLOT
- PHOTO LOCATION

PROTECT EXISTING TREES IN HATCHED AREA

ITEM 662.281
DECOMMISSION 4 WELLS

CONTRACTOR SHALL COORDINATE WITH NHDES FOR OPTION TO LIMIT FILL IN THIS AREA

LIMIT OF CLEARING (5 FT.)

SLOPE LINE (FILL)

75' NHDOT CHANNEL EASE.

POLICY BROOK

PHOTO POINT A
PHOTO POINT B
PHOTO POINT C
PHOTO POINT D
PHOTO POINT E
PHOTO POINT F
PHOTO POINT G
PHOTO POINT H

ITEM 304.45
24'x50' CRUSHED STONE (12") TURN-AROUND

ITEM 403.11
HOT BITUMINOUS PAVEMENT MACHINE METHOD (3")

ITEM 607.73610
10' WIDE GATE

10'R

HAIGH AVENUE

SAWCUT EXISTING PAVEMENT AND REMOVE EXCESS

ITEM 607.360
CHAIN LINK FENCE

SLOPE LINE (CUT)

CONSTRUCTION ℄

EXIST. 12" RCP TO BE REMOVED WITHIN LIMIT OF GRADING. ABANDON/PLUG REMAINING SECTION OUTSIDE GRADING.

SPICKET RIVER

GRID

Existing Ground
CONSTRUCTION ℄

FINISHED GRADE
CONSTRUCTION ℄

110
100
95

252 253 254 255 256 257 258 259 260 261 262 263

SCALE IN FEET
HORIZONTAL SCALE: 1"=50'
50 0 50 100

Mitigation Monitoring Plan

NHDOT PROJECT 10418-E
HAIGH AVENUE
SALEM, NEW HAMPSHIRE

Stoney Ridge Environmental LLC
229 Prospect Mountain Road, Alton, NH

VHB Vanasse Hangen Brustlin, Inc.

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION ◦ BUREAU OF HIGHWAY DESIGN

HAIGH AVENUE MITIGATION
CONTOUR PLAN & STREAM PROFILE

DATE PLOTTED | VHB PROJECT NO | DRAWING | STATE PROJECT NO | SHEET NO | TOTAL SHEETS

REVISIONS AFTER PROPOSAL

NUMBER	DATE	DESCRIPTION
1	08/2012	ADDED NOTE FOR EXISTING 12" RCP, LIMITED FILL NHDES OPTION & REVISED TOB

STATION	STATION	
257+00	257+25	

DATE
DATE
DATE
DATE

STA. 250+00
BEGIN CHANNEL CONSTRUCTION

STA. 263+00
END CHANNEL CONSTRUCTION

I-93 NB

PROTECT EXISTING TREES IN HATCHED AREA

CONTRACTOR SHALL COORDINATE WITH NHDES FOR OPTION TO LIMIT FILL IN THIS AREA

LIMIT OF CLEARING (5 FT.)

ITEM 662.281
DECOMMISSION 4 WELLS

SLOPE LINE (FILL)

75' NHDOT CHANNEL EASE

Approx. Exist.

LEGEND
- CROSS SECTION
- DATA PLOT
- PHOTO LOCATION

CROSS SECTION 1

STREAM SIDE PLOT

DRY FLOODPLAIN PLOT

WET FLOODPLAIN PLOT

CROSS SECTION 2

CROSS SECTION 3

CROSS SECTION 4

ITEM 304.45
24'x50' CRUSHED STONE (12") TURN-AROUND

ITEM 403.11
HOT BITUMINOUS PAVEMENT MACHINE METHOD (3")

ITEM 607.73610
10' WIDE GATE

10'R

HAIGH AVENUE

SAWCUT EXISTING PAVEMENT AND REMOVE EXCESS

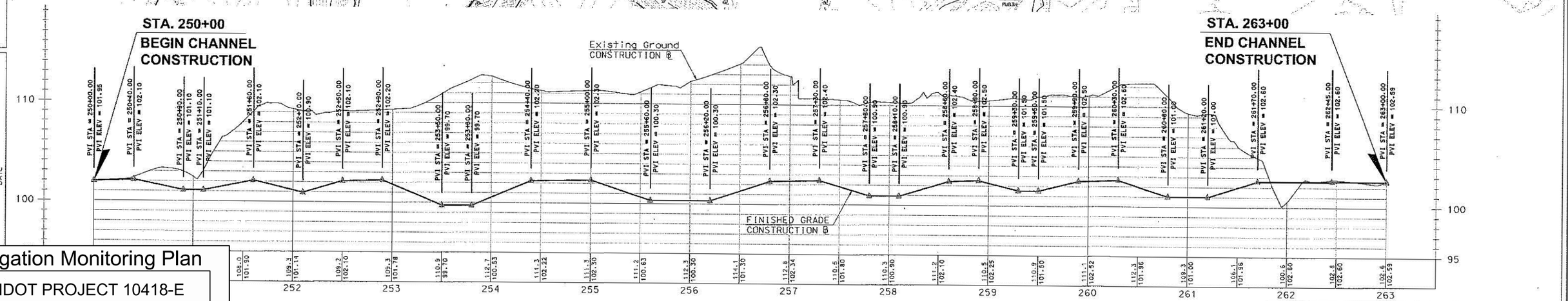
ITEM 607.360
CHAIN LINK FENCE

CONSTRUCTION ℄

EXIST. 12" RCP TO BE REMOVED WITHIN LIMIT OF GRADING. ABANDON/PLUG REMAINING SECTION OUTSIDE GRADING.

SPICKET RIVER

GRID



Mitigation Monitoring Plan

NHDOT PROJECT 10418-E
HAIGH AVENUE
SALEM, NEW HAMPSHIRE

Stoney Ridge Environmental LLC
229 Prospect Mountain Road, Alton, NH

Scale 1:100

50 0 50 100
SCALE IN FEET
HORIZONTAL SCALE: 1"=50'

VHB Vanasse Hangen Brustlin, Inc.

DATE PLOTTED | VHB PROJECT NO.

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION ◦ BUREAU OF HIGHWAY DESIGN

HAIGH AVENUE MITIGATION
CONTOUR PLAN & STREAM PROFILE

DRAWING | STATE PROJECT NO. | SHEET NO. | TOTAL SHEETS

Mitigation Monitoring Plan

NHDOT PROJECT 10418-E
HAIGH AVENUE
SALEM, NEW HAMPSHIRE

Stoney Ridge Environmental LLC
229 Prospect Mountain Road, Alton, NH

Scale 1:100

Mitigation Monitoring Plan

NHDOT PROJECT 10418-E
HAIGH AVENUE
SALEM, NEW HAMPSHIRE

Stoney Ridge Environmental LLC
229 Prospect Mountain Road, Alton, NH

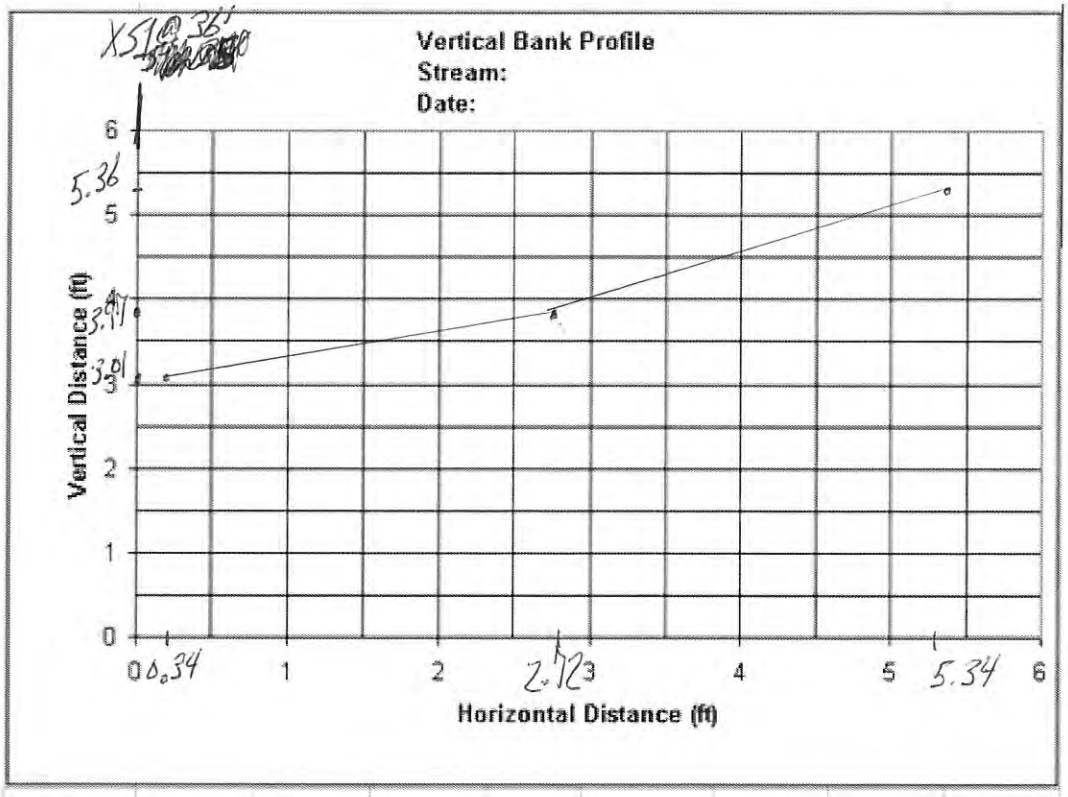
Scale 1:100

Worksheet 22. Bank profile worksheet

Stream: Policy Brook			Date: 8/27/15	Date:	
Cross Section: 1	BEHI Adjective:				
Bank: Right	Near Bank Stress Adjective:				
Toe Pin Station (ft):	Predicted Erosion (ft):				
Toe Pin Elevation (ft):	Measured Erosion (ft):				

Date: 8/27/15		
Horizontal	**Vertical**	**Notes**
5.34'	5.36'	Bankfull
2.72'	3.91'	Middle Bank
0.34'	3.01'	Water level

Date:		
Horizontal	**Vertical**	**Notes**



Worksheet 5-8. Form to calculate Bank Erosion Hazard Index (BEHI) variables and an overall BEHI rating (Rosgen, 1996, 2001a). Use **Figure 5-19** with BEHI variables to determine BEHI score.

Stream: Patty Brook Location: High Ave. Site

Station: ~ 261+00 Observers: R. Bolton

Date: 5/27/15 Stream Type: E Valley Type: VIII

						BEHI Score (Fig. 5-19)
Study Bank Height / Bankfull Height (C)						
Study Bank Height (ft) =	5.36 (A)	Bankfull Height (ft) =	5.36 (B)	(A) / (B) =	1 (C)	0
Root Depth / Study Bank Height (E)						
Root Depth (ft) =	1.39 (D)	Study Bank Height (ft) =	5.36 (A)	(D) / (A) =	0.259 (E)	6.5
Weighted Root Density (G)						
Root Density as % =	10% (F)			(F) x (E) =	2.59 (G)	9
Bank Angle (H)						
Bank Angle as *Degrees* =	30° (H)					2.5
Surface Protection (I)						
Surface Protection as % =	9% (I)					1

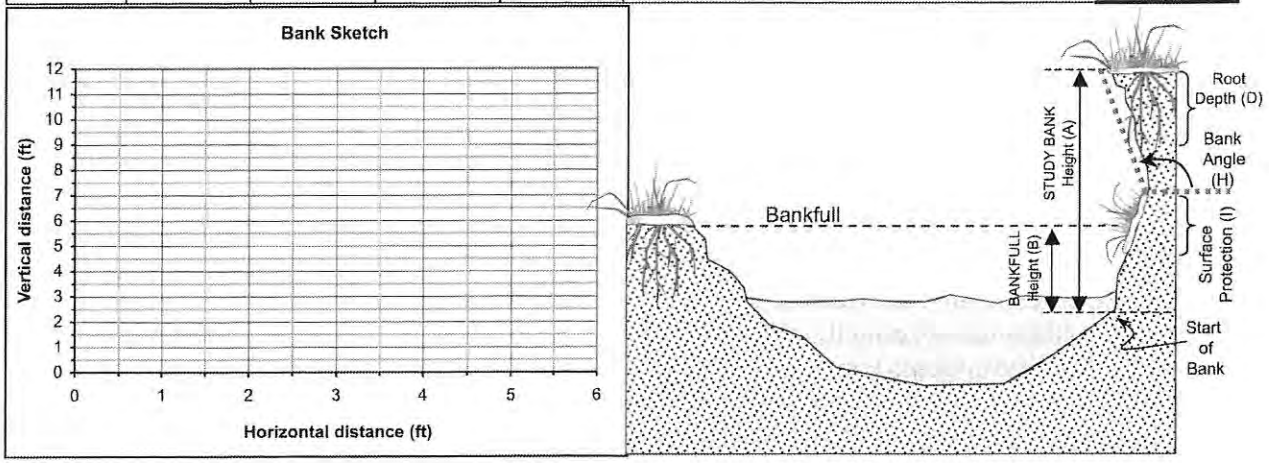
Bank Material Adjustment:

- **Bedrock** (Overall Very Low BEHI)
- **Boulders** (Overall Low BEHI)
- **Cobble** (Subtract 10 points if uniform medium to large cobble)
- ✓ **Gravel or Composite Matrix** (Add 5–10 points depending on percentage of bank material that is composed of sand)
- **Sand** (Add 10 points)
- **Silt/Clay** (no adjustment)

+5 **Bank Material Adjustment** → 5

Stratification Adjustment
Add 5–10 points, depending on position of unstable layers in relation to bankfull stage → 0

Very Low	Low	Moderate	High	Very High	Extreme	Adjective Rating and Total Score
5 – 9.5	10 – 19.5	20 – 29.5	30 – 39.5	40 – 45	46 – 50	24

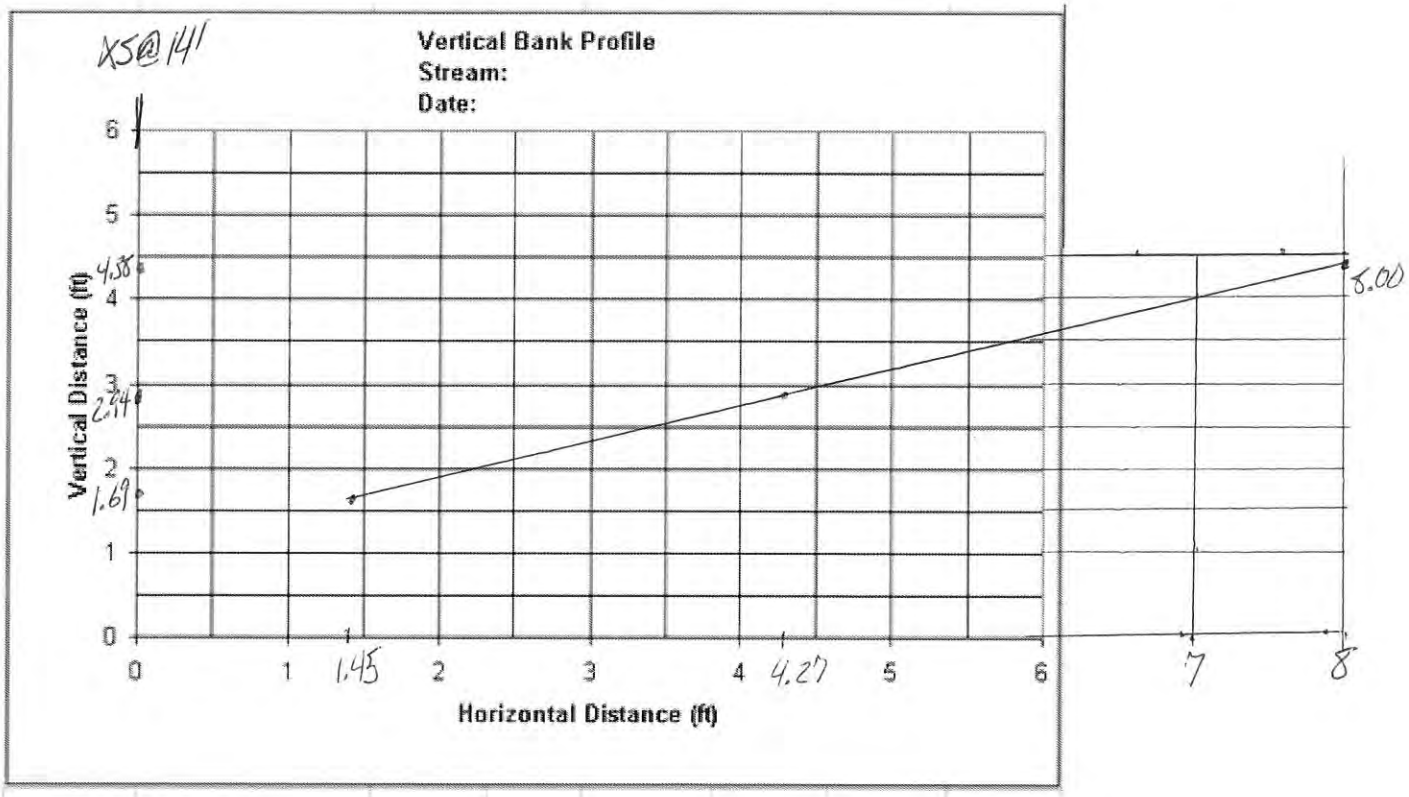


Worksheet 22. Bank profile worksheet

Stream: Policy Brook		Date: 8/27/15	Date:
Cross Section: 2	BEHI Adjective:		
Bank: Left	Near Bank Stress Adjective:		
Toe Pin Station (ft):	Predicted Erosion (ft):		
Toe Pin Elevation (ft):	Measured Erosion (ft):		

Date:		
Horizontal	**Vertical**	**Notes**
8'	4.38	Bank Full
4.27'	2.94	Middle Bank
1.45'	1.69	Water level

Date:		
Horizontal	**Vertical**	**Notes**



Worksheet 5-8. Form to calculate Bank Erosion Hazard Index (BEHI) variables and an overall BEHI rating (Rosgen, 1996, 2001a). Use **Figure 5-19** with BEHI variables to determine BEHI score.

Stream: Policy Brook Location: High Ave. site

Station: 259+25 Observers: R. Bolton

Date: 8/27/15 Stream Type: E Valley Type: VIII

						BEHI Score (Fig. 5-19)
Study Bank Height / Bankfull Height (C)						
Study Bank Height (ft) =	4.38 (A)	Bankfull Height (ft) =	4.38 (B)	(A) / (B) =	1 (C)	0
Root Depth / Study Bank Height (E)						
Root Depth (ft) =	1.44 (D)	Study Bank Height (ft) =	4.38 (A)	(D) / (A) =	0.328 (E)	5
Weighted Root Density (G)						
Root Density as % =	10 (F)			(F) x (E) =	3.28 (G)	7
Bank Angle (H)						
Bank Angle as *Degrees* =	30 (H)					2.5
Surface Protection (I)						
Surface Protection as % =	90 (I)					1

Bank Material Adjustment:

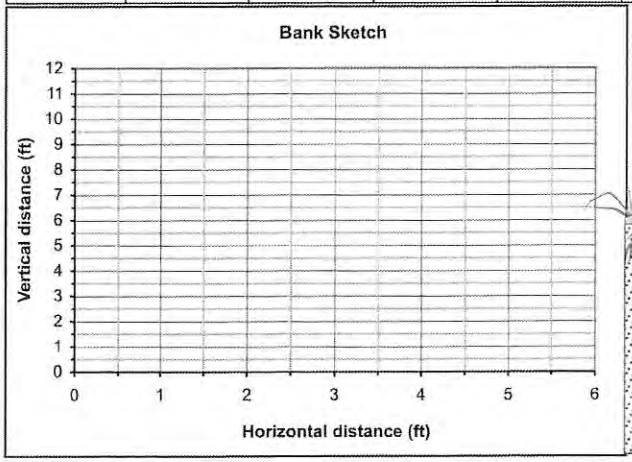
Bedrock (Overall Very Low BEHI)
Boulders (Overall Low BEHI)
Cobble (Subtract 10 points if uniform medium to large cobble)
Gravel or Composite Matrix (Add 5–10 points depending on percentage of bank material that is composed of sand)
Sand (Add 10 points)
Silt/Clay (no adjustment)

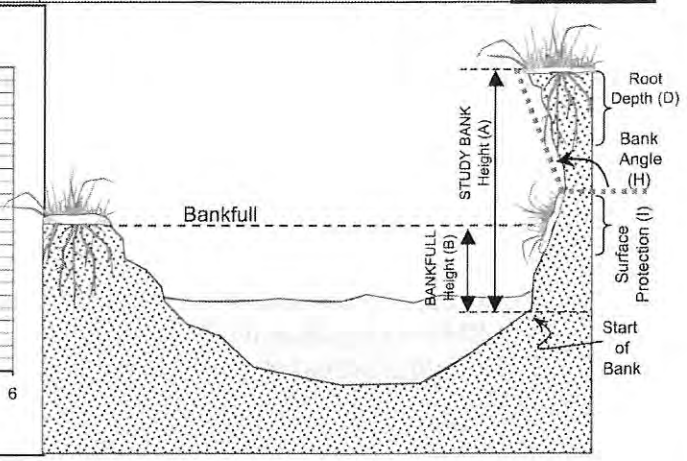
Bank Material Adjustment: 5

Stratification Adjustment
Add 5–10 points, depending on position of unstable layers in relation to bankfull stage: 0

Very Low	Low	Moderate	High	Very High	Extreme	Adjective Rating and Total Score
5 – 9.5	10 – 19.5	20 – 29.5	30 – 39.5	40 – 45	46 – 50	20.5

Bank Sketch





Worksheet 22. Bank profile worksheet

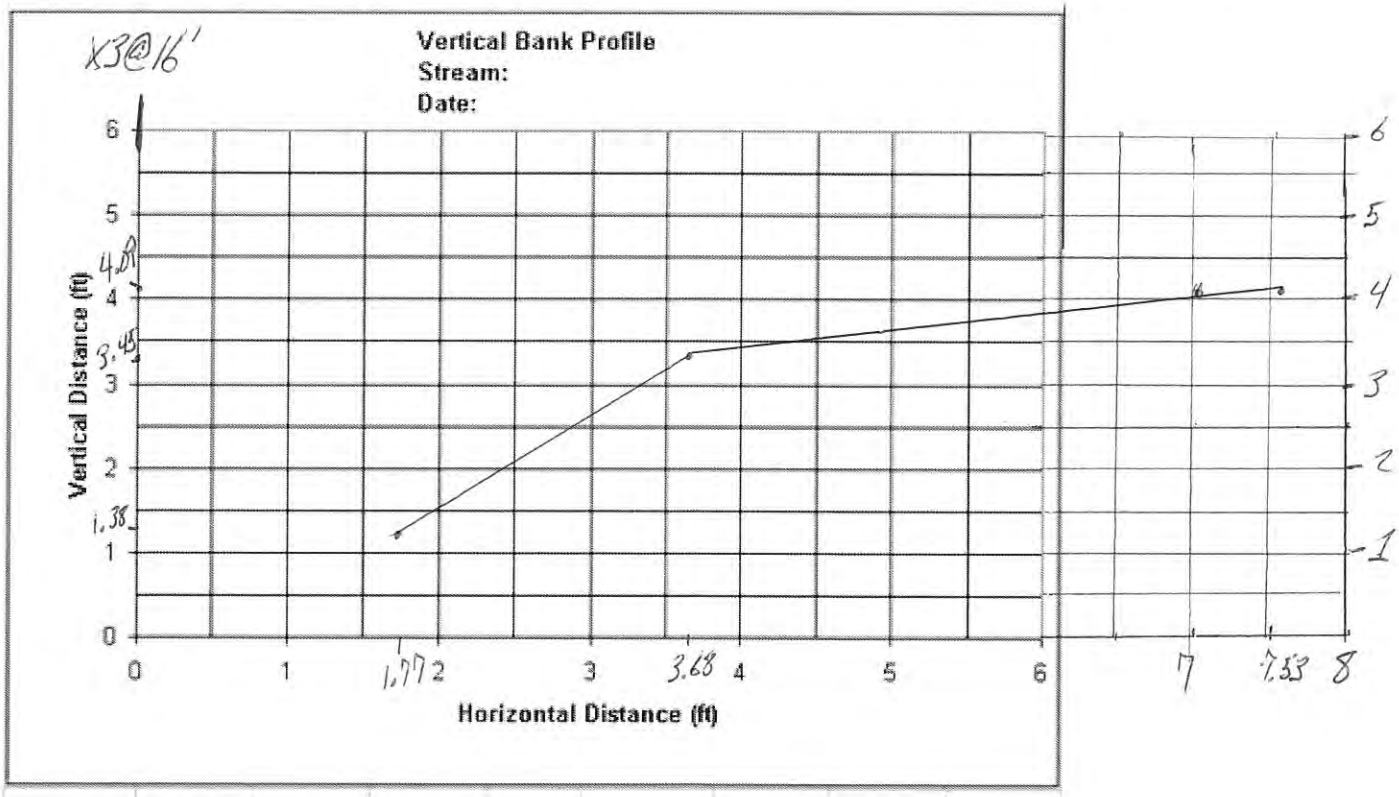
Stream: Policy Brook		Date: 8/27/15	Date:
Cross Section: 3	BEHI Adjective:		
Bank: Left	Near Bank Stress Adjective:		
Toe Pin Station (ft):	Predicted Erosion (ft):		
Toe Pin Elevation (ft):	Measured Erosion (ft):		

Date: 8/27/15

Horizontal	Vertical	Notes
7.53	4.09	Bankfull
3.68	3.45	MidBank
1.77	1.38	Waterlevel

Date:

Horizontal	Vertical	Notes



Worksheet 5-8. Form to calculate Bank Erosion Hazard Index (BEHI) variables and an overall BEHI rating (Rosgen, 1996, 2001a). Use **Figure 5-19** with BEHI variables to determine BEHI score.

Stream: Paisley Brook Location: Haigh Ave. site

Station: ~256400 Observers: L. Bolton

Date: 8/27/15 Stream Type: E Valley Type: VIII

						BEHI Score (Fig. 5-19)
Study Bank Height / Bankfull Height (C)						
Study Bank Height (ft) =	4.09 (A)	Bankfull Height (ft) =	4.09 (B)	(A) / (B) =	1 (C)	10
Root Depth / Study Bank Height (E)						
Root Depth (ft) =	0.64 (D)	Study Bank Height (ft) =	4.09 (A)	(D) / (A) =	0.156 (E)	8
Weighted Root Density (G)						
Root Density as % =	10% (F)			(F) x (E) =	1.56 (G)	8
Bank Angle (H)						
Bank Angle as *Degrees* =	30° (H)					2.5
Surface Protection (I)						
Surface Protection as % =	90% (I)					1

Bank Material Adjustment:

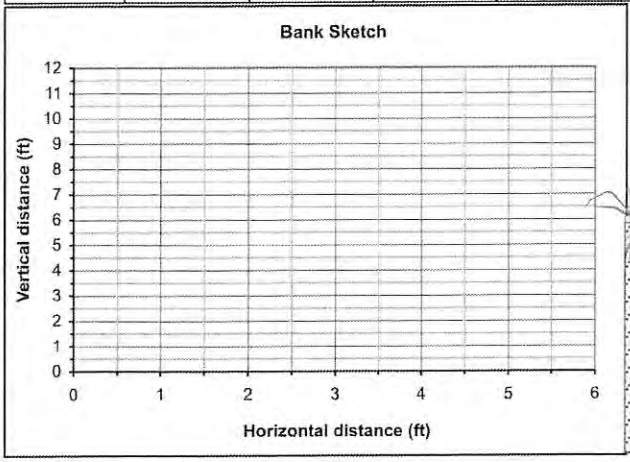
Bedrock (Overall Very Low BEHI)
Boulders (Overall Low BEHI)
Cobble (Subtract 10 points if uniform medium to large cobble)
Gravel or Composite Matrix (Add 5–10 points depending on percentage of bank material that is composed of sand)
Sand (Add 10 points)
Silt/Clay (no adjustment)

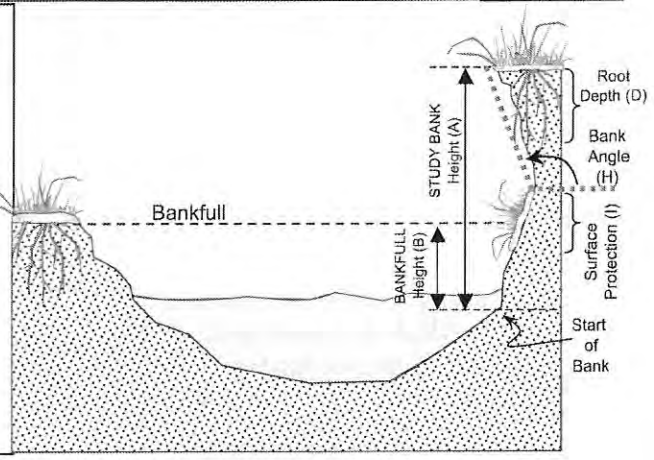
Bank Material Adjustment: 5

Stratification Adjustment
Add 5–10 points, depending on position of unstable layers in relation to bankfull stage: 0

Very Low	Low	Moderate	High	Very High	Extreme	Adjective Rating and Total Score
5 – 9.5	10 – 19.5	20 – 29.5	30 – 39.5	40 – 45	46 – 50	24.5

Bank Sketch





Worksheet 22. Bank profile worksheet

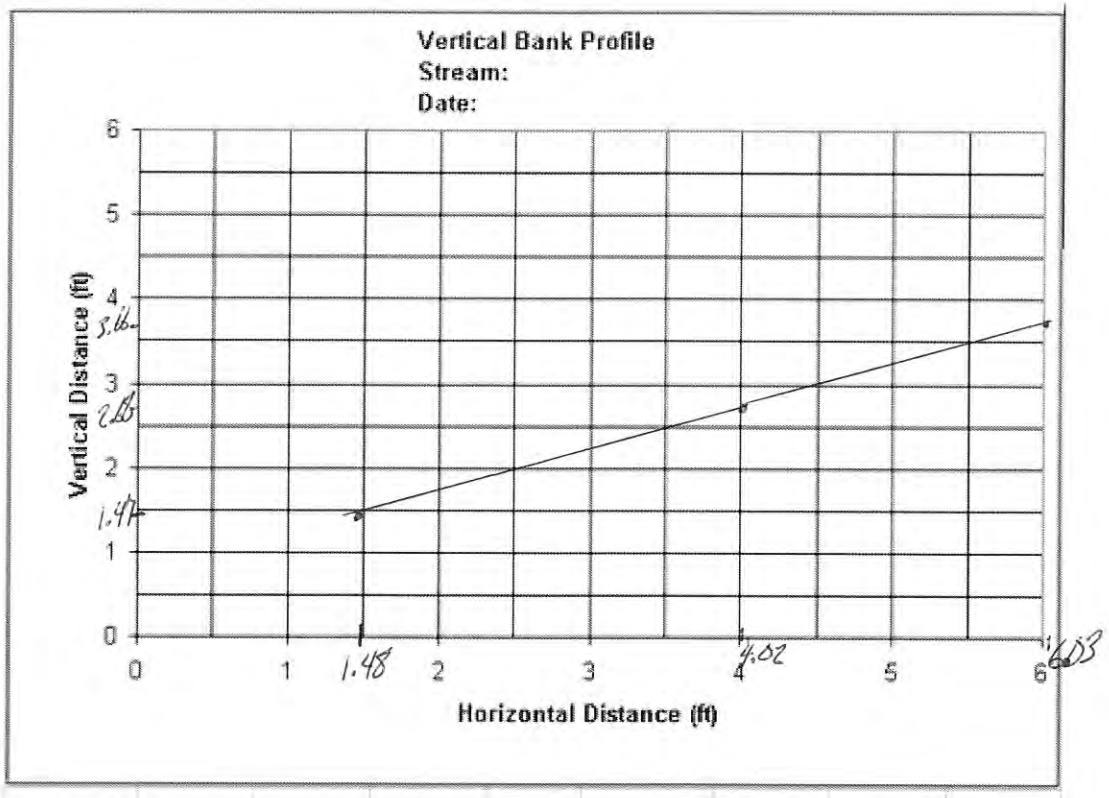
Stream: Policy Brook		Date: 8/27/15	Date:
Cross Section: 4	BEHI Adjective:		
Bank: Right	Near Bank Stress Adjective:		
Toe Pin Station (ft):	Predicted Erosion (ft):		
Toe Pin Elevation (ft):	Measured Erosion (ft):		

Date: 8/27/15

Horizontal	Vertical	Notes
6.03	3.66	Bankfull
4.02	2.68	Mid bank
1.48	1.47	Waterlevel

Date:

Horizontal	Vertical	Notes



Worksheet 5-8. Form to calculate Bank Erosion Hazard Index (BEHI) variables and an overall BEHI rating (Rosgen, 1996, 2001a). Use **Figure 5-19** with BEHI variables to determine BEHI score.

Stream: Policy Brook Location: High Ave. Site
Station: 25+00 Observers: R. Bolton
Date: 8/27/15 Stream Type: E Valley Type: VIII

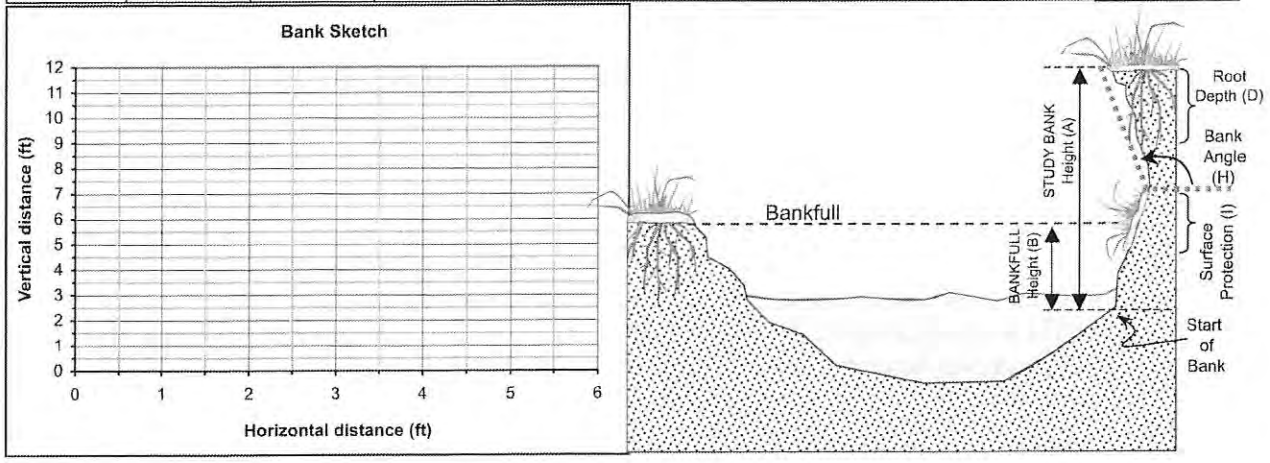
						BEHI Score (Fig. 5-19)
Study Bank Height / Bankfull Height (C)						
Study Bank Height (ft) =	6.03 (A)	Bankfull Height (ft) =	6.03 (B)	(A) / (B) =	1 (C)	0
Root Depth / Study Bank Height (E)						
Root Depth (ft) =	2.01 (D)	Study Bank Height (ft) =	6.03 (A)	(D) / (A) =	0.333 (E)	5.5
Weighted Root Density (G)						
Root Density as % =	10% (F)			(F) x (E) =	3.33 (G)	6.5
Bank Angle (H)						
Bank Angle as *Degrees* =	30° (H)					2.5
Surface Protection (I)						
Surface Protection as % =	90% (I)					1

Bank Material Adjustment:
Bedrock (Overall Very Low BEHI)
Boulders (Overall Low BEHI)
Cobble (Subtract 10 points if uniform medium to large cobble)
Gravel or Composite Matrix (Add 5–10 points depending on percentage of bank material that is composed of sand)
Sand (Add 10 points)
Silt/Clay (no adjustment)

Bank Material Adjustment 5

Stratification Adjustment
Add 5–10 points, depending on position of unstable layers in relation to bankfull stage: 0

Very Low	Low	Moderate	High	Very High	Extreme	Adjective Rating and Total Score
5 – 9.5	10 – 19.5	20 – 29.5	30 – 39.5	40 – 45	46 – 50	20.5



Tabular Data Archive

Urban Areas | Nashua, NH–MA | Statistics type: Traditional Percent Area | Legend

Percent Area in U.S. Drought Monitor Categories

Show 50 entries Search:

Week	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
2015-11-03	0.00	100.00	96.02	0.00	0.00	0.00
2015-10-27	0.00	100.00	96.02	0.00	0.00	0.00
2015-10-20	0.00	100.00	96.02	0.00	0.00	0.00
2015-10-13	0.00	100.00	96.02	0.00	0.00	0.00
2015-10-06	0.00	100.00	96.02	0.00	0.00	0.00
2015-09-29	0.00	100.00	99.94	0.00	0.00	0.00
2015-09-22	0.00	100.00	2.37	0.00	0.00	0.00
2015-09-15	0.00	100.00	2.37	0.00	0.00	0.00
2015-09-08	0.00	100.00	1.37	0.00	0.00	0.00
2015-09-01	0.00	100.00	1.37	0.00	0.00	0.00
2015-08-25	0.26	99.74	0.00	0.00	0.00	0.00
2015-08-18	0.26	99.74	0.00	0.00	0.00	0.00
2015-08-11	0.26	99.74	0.00	0.00	0.00	0.00
2015-08-04	3.06	96.94	0.00	0.00	0.00	0.00
2015-07-28	73.99	26.01	0.00	0.00	0.00	0.00
2015-07-21	73.99	26.01	0.00	0.00	0.00	0.00
2015-07-14	73.99	26.01	0.00	0.00	0.00	0.00
2015-07-07	45.30	54.70	0.00	0.00	0.00	0.00
2015-06-30	0.00	100.00	0.00	0.00	0.00	0.00
2015-06-23	0.00	100.00	100.00	0.00	0.00	0.00
2015-06-16	0.00	100.00	100.00	0.00	0.00	0.00
2015-06-09	0.00	100.00	100.00	0.00	0.00	0.00
2015-06-02	0.00	100.00	100.00	0.00	0.00	0.00
2015-05-26	0.00	100.00	100.00	0.00	0.00	0.00
2015-05-19	0.00	100.00	100.00	0.00	0.00	0.00
2015-05-12	0.00	100.00	0.00	0.00	0.00	0.00
2015-05-05	2.24	97.76	0.00	0.00	0.00	0.00
2015-04-28	90.53	9.47	0.00	0.00	0.00	0.00
2015-04-21	95.38	4.62	0.00	0.00	0.00	0.00
2015-04-14	95.38	4.62	0.00	0.00	0.00	0.00
2015-04-07	95.38	4.62	0.00	0.00	0.00	0.00
2015-03-31	100.00	0.00	0.00	0.00	0.00	0.00
2015-03-24	100.00	0.00	0.00	0.00	0.00	0.00
2015-03-17	100.00	0.00	0.00	0.00	0.00	0.00
2015-03-10	100.00	0.00	0.00	0.00	0.00	0.00
2015-03-03	100.00	0.00	0.00	0.00	0.00	0.00
2015-02-24	100.00	0.00	0.00	0.00	0.00	0.00
2015-02-17	100.00	0.00	0.00	0.00	0.00	0.00
2015-02-10	100.00	0.00	0.00	0.00	0.00	0.00
2015-02-03	100.00	0.00	0.00	0.00	0.00	0.00

2015-01-27	100.00	0.00	0.00	0.00	0.00	0.00
2015-01-20	100.00	0.00	0.00	0.00	0.00	0.00
2015-01-13	100.00	0.00	0.00	0.00	0.00	0.00
2015-01-06	100.00	0.00	0.00	0.00	0.00	0.00
2014-12-30	100.00	0.00	0.00	0.00	0.00	0.00
2014-12-23	100.00	0.00	0.00	0.00	0.00	0.00
2014-12-16	100.00	0.00	0.00	0.00	0.00	0.00
2014-12-09	63.40	36.60	0.00	0.00	0.00	0.00
2014-12-02	63.40	36.60	0.00	0.00	0.00	0.00
2014-11-25	63.40	36.60	0.00	0.00	0.00	0.00

Showing 1 to 50 of 827 entries

First Previous 1 2 3 4 5 … 17 Next Last

The National Drought Mitigation Center | 3310 Holdrege Street | P.O. Box 830988 | Lincoln, NE 68583–0988
phone: (402) 472–6707 | fax: (402) 472–2946 | Contact Us

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Policy Brook Mitigation site City/County: Salem, Rockingham Sampling Date: 8/27/15
Applicant/Owner: NHDOT State: NH Sampling Point: WP351
Investigator(s): R. Bolton Section, Township, Range: _____
Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): _____ Slope (%): _____
Subregion (LRR or MLRA): _____ Lat: _____ Long: _____ Datum: _____
Soil Map Unit Name: _____ NWI classification: _____
Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)
Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____
Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes _____ No _____	**Is the Sampled Area within a Wetland?** Yes _____ No _____
Hydric Soil Present?	Yes _____ No _____	
Wetland Hydrology Present?	Yes _____ No _____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

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

Wetland Hydrology Present? Yes _____ No _____

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

Remarks:
No signs of Hydrology observed

VEGETATION (Five Strata) – Use scientific names of plants. Sampling Point: P551

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 5' diameter)			
1. Acer rubrum	2		FAC
2. Quercus bicolor	2		FACW
3. Vaccinium corymbosum	10		FACW
4. Cornus amomum	5		FACW
5. Alnus serrulata	2		FACW
6. Agrostis sp.	80	yes	FAC*
7. Agrostis alba + stolonifera in seed mix (*FAC) (*FACW)			
8.			
9.			
10.			
11.			
	121 = Total Cover		

50% of total cover: _____ 20% of total cover: _____

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 1 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	
FACW species	98	x 2 =	169
FAC species	2	x 3 =	6
FACU species	0	x 4 =	
UPL species	0	x 5 =	
Column Totals:	100 (A)		202 (B)

Prevalence Index = B/A = 2.02

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

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

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes _____ No _____

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

SOIL Sampling Point: P551

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/1						Loam	Top Layer of Soil over subgrade
16-24	2.5Y 7/1		2.5Y 6/6	10	D	M	Sand	Subgrade - original soils
24+								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

No redox within 12" of surface

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Policy Brook Mitigation Site City/County: Salem, Rockingham Sampling Date: 8/27/15
Applicant/Owner: NHDOT State: NH Sampling Point: PFO1E
Investigator(s): R. Bolton Section, Township, Range: ______
Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): ______ Slope (%): ______
Subregion (LRR or MLRA): ______ Lat: ______ Long: ______ Datum: ______
Soil Map Unit Name: ______ NWI classification: ______
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No ______ (If no, explain in Remarks.)
Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ______ No ______
Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes ______ No ______	Is the Sampled Area within a Wetland?	Yes ______ No ______
Hydric Soil Present? Yes ______ No ______		
Wetland Hydrology Present? Yes ______ No ______		

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

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

Wetland Hydrology Present? Yes ______ No ______

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

Remarks: No signs of Hydrology observed

VEGETATION (Five Strata) – Use scientific names of plants. Sampling Point: #PD1E

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 5')			
1. Vaccinium corymbosum	5		FACU
2. Cornus amomum	2		FACU
3. Alnus serrulata	5		FACU
4. Nyssa sylvatica	1		FAC
5. Onoclea sensibilis	2		FACU
6. Acer rubrum	1		FAC
7. Ulmus americana	1		FAC
8. Agrostis sp. either alba or stolonifera	75	yes	FACU
9.			
10.			
11.			
	92 = Total Cover		

50% of total cover: _____ 20% of total cover: _____

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	94	x 2 =	188
FAC species	6	x 3 =	18
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		206 (B)

Prevalence Index = B/A = 2.06

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes _____ No _____

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

SOIL Sampling Point: PP01E

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-20	10YR 3/1						loam	Topsoil added to site
20-24	2.5Y 6/1						sand	Subgrade or original soils

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** _____

Remarks:

No signs of water table in upper 12"

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Policy Brook Mitigation Site City/County: Salem, Rockingham Sampling Date: 8/27/15

Applicant/Owner: NHDOT State: NH Sampling Point: PFO1J

Investigator(s): K. Bolton Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Floodplain (dry) Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR or MLRA): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

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

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

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

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

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

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

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches):

Water Table Present? Yes _____ No _____ Depth (inches):

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches):

Wetland Hydrology Present? Yes _____ No

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

Remarks:

No signs of Hydrology

VEGETATION – Use scientific names of plants.

Sampling Point: PTO15

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		

Sapling/Shrub Stratum (Plot size: 15 radius from plot)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		

Herb Stratum (Plot size: 5' radius)			
1. ~~Poaceae sp.~~	25		
2. Lotus corniculatus	1		
3. Lythrum salicaria	1		
4. Dryopteris carthusiana	2		
5. Typha latifolia	1		
6. Agrostis sp.	25		
7.			
8.			
9.			
10.			
11.			
12.			
	30 = Total Cover		

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

Dominance Test worksheet:

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

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

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

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

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

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? **Yes** _____ **No**

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

less than 50% cover after seeding, not sufficient time to establish living cover. 75% coverage of living + dead plants or precip

SOIL

Sampling Point: PSD

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR3/1						Loam	Top layer of Soil from Const.

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L, M**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type:_____

Depth (inches):_____

Hydric Soil Present? **Yes** _____ **No** _____

Remarks:

No signs of redox or water saturation in upper 18 inches

SRE # 15-041

PHOTO LOG
Policy Brook Restoration
Haigh Avenue
Salem, New Hampshire
August 27, 2015

PHOTO 1:
Looking upstream from photo point A.

PHOTO 2:
Looking downstream from photo point A.

Stoney Ridge ENVIRONMENTAL LLC

PHOTO LOG
Policy Brook Restoration
Haigh Avenue
Salem, New Hampshire
August 27, 2015

PHOTO 3:
Looking at the outside bank from photo point B.

PHOTO 4:
Looking at the outside bank from photo point C.

PHOTO LOG
Policy Brook Restoration
Haigh Avenue
Salem, New Hampshire
August 27, 2015

PHOTO 5:
Looking upstream from photo point D.

PHOTO 6:
Looking downstream from photo point D.

PHOTO LOG
Policy Brook Restoration
Haigh Avenue
Salem, New Hampshire
August 27, 2015

PHOTO 7:
Looking at the outside bank from photo point E.

PHOTO 8:
Looking upstream from photo point F.

PHOTO LOG
Policy Brook Restoration
Haigh Avenue
Salem, New Hampshire
August 27, 2015

PHOTO 9:
Looking downstream from photo point F.

PHOTO 10:
Looking upstream from photo point G.

PHOTO LOG
Policy Brook Restoration
Haigh Avenue
Salem, New Hampshire
August 27, 2015

PHOTO 11:
Looking downstream from photo point G.

PHOTO 12:
Looking at the outside bank from photo point H.

PHOTO LOG
Policy Brook Restoration
Haigh Avenue
Salem, New Hampshire
October 16, 2015

PHOTO 13:
Looking upstream from photo point A.

PHOTO 14:
Looking downstream from photo point A.

PHOTO LOG
Policy Brook Restoration
Haigh Avenue
Salem, New Hampshire
October 16, 2015

PHOTO 15:
Looking at the outside bank from photo point B.

PHOTO 16:
Looking at the outside bank from photo point C

PHOTO LOG
Policy Brook Restoration
Haigh Avenue
Salem, New Hampshire
October 16, 2015

PHOTO 17:
Looking upstream from photo point D.

PHOTO 18:
Looking downstream from photo point D.

PHOTO LOG
Policy Brook Restoration
Haigh Avenue
Salem, New Hampshire
October 16, 2015

PHOTO 19:
Looking at the outside bank from photo point E.

PHOTO 20:
Looking upstream from photo point F.

PHOTO LOG
Policy Brook Restoration
Haigh Avenue
Salem, New Hampshire
October 16, 2015

PHOTO 21:
Looking downstream from photo point F.

PHOTO 22:
Looking upstream from photo point G.

PHOTO LOG
Policy Brook Restoration
Haigh Avenue
Salem, New Hampshire
October 16, 2015

PHOTO 23:
Looking downstream from photo point G.

PHOTO 24:
Looking at the outside bank from photo point H.

DEPARTMENT OF THE ARMY PERMIT

Permittee New Hampshire Department of Transportation

Permit No. 199201232/NAE-2004-233

Issuing Office New England District

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description:

discharge fill material into approximately 77 acres of wetlands and waters within the Spickett River watershed, the Golden Brook watershed, the Beaver Brook watershed, the Little Cohas Brook watershed, and the Cohas Brook watershed in the Merrimack River Basin, to improve the Interstate Route 93 between Salem and Manchester, New Hampshire. The project involves a combination of highway and related infrastructure improvements for the 19.8 mile segment. The main element of the improvement involves widening I 93 from the existing limited access two – lane highway in each direction to a limited access four – lane highway in each direction. The project begins in the town of Salem, near the New Hampshire/Massachusetts state line and extends northerly through Salem, Windham, Derry, Londonderry, and into Manchester, ending at the I 93/I 293 interchange. The layout also includes the reconstruction and reconfiguration of the interchanges along I 93 at Exit 1 (Rockingham Boulevard), Exit 2 (Pelham Road), Exit 3 (NH Route 111), Exit 4 (NH Route 102) and Exit 5 (NH Route 28.) The project is further described on the attached plans entitled "Interstate 93 Improvements Salem To Manchester IM-IR-93-1(174)0,10418-C, in sheets 1 through 8, 1 through 6 and 1 through 29, and dated 8 June 2004.

Project Location:

Merrimack River Basin, Salem to Manchester, New Hampshire

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on 29 MAR 2012. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

1. The permit-tee shall ensure that a copy of this permit is at the work site whenever work is being performed and that all personnel performing work at the site of the work authorized by this permit are fully aware of the terms and conditions of the permit. This permit, including its drawings and any appendices and other attachments, shall be made a part of any and all contracts and sub-contracts for work which affects areas of Corps of Engineers jurisdiction at the site of the work authorized by this permit. This shall be achieved by including the entire permit in the specifications for work.

(Special Conditions continued on Page 4)

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

( ) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

(X) Section 404 of the Clean Water Act (33 U.S.C. 1344).

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

William Lam — 5/2/07

(PERMITTEE) Asst. Director of Project Development — *(DATE)*

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

Christie Godfrey — 3-29-07

(DISTRICT ENGINEER) — *(DATE)*

for Curtis L. Thalken
Colonel, Corps of Engineers
District Engineer

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(TRANSFEREE) — *(DATE)*

☆U.S. GOVERNMENT PRINTING OFFICE: 1988 — 717-425

(Special Conditions continued from Page 2)

If the permit is issued after the construction specifications but before receipt of bids or quotes, the entire permit shall be included as an addendum to the specifications. If the permit is issued after receipt of bids or quotes, the entire permit shall be included in the contract or sub-contract as a change order. The term "entire permit" includes permit amendments. Although the permit-tee may assign various aspects of the work to different contractors or sub-contractors, all contractors and sub-contractors shall be obligated by contract to comply with all environmental protection provisions of the entire permit, and no contract or sub-contract shall require or allow unauthorized work in areas of Corps jurisdiction.

2. All areas of wetlands and/or waters, which are disturbed during construction, except those authorized herein for permanent impact, shall be restored to their approximate original elevation (but not higher) and condition by careful protection, and/or removal and replacement, of existing soil and vegetation. In addition, if upland clearing, grubbing, or other construction activity results in, or may result in, soil erosion with transport and deposition into a wetland or waterway, devices such as geotextile silt fences, sediment trenches, etc., shall be installed and properly maintained to minimize such impacts during construction. These devices must be removed upon completion of work and stabilization of disturbed areas. The sediment collected by these devices must also be removed and placed upland, in a manner that will prevent its later erosion and transport to a waterway or wetland.

3. Adequate sedimentation and erosion control devices, such as geotextile silt fences or other devices capable of filtering the fines involved, shall be installed and properly maintained to minimize adverse impacts on waters and wetlands during construction. These devices must be removed upon completion of work and stabilization of disturbed areas. The sediment collected by these devices must also be removed and placed upland, in a manner that will prevent its later erosion and transport to a waterway or wetland.

4. No temporary fill (e.g., access roads, cofferdams) may be placed in waters or wetlands unless specifically authorized by this permit. If temporary fill is used, it shall be disposed of at an upland site and suitably contained to prevent its subsequent erosion into a water of the U.S., and the area shall be restored to its original contours (but not higher). During use, such temporary fill must be stabilized to prevent erosion or, in the case of flowing water (rivers or streams), clean washed stone should be used. When temporary fill is placed in wetlands or waters for the purpose of supporting excavation equipment which will perform trenching operations, protective geotextile fabric shall first be placed in two parallel strips, separated by the location and width of the future trench. This does not apply to mats.
No temporary fill (e.g. access roads, cofferdams) in any waters or wetlands is authorized by this permit.

5. Mitigation shall be performed in accordance with the attached mitigation plan entitled, "Wetland Mitigation Technical Reports and Plans, NH Interstate 93 Improvement Project Salem-Manchester 10418-C. "

Your responsibility to complete the required compensatory mitigation as set forth in Special Condition 5 will not be considered fulfilled until you have demonstrated mitigation success and have received written verification from the U.S. Army Corps of Engineers. The term 'mitigation success' means success as defined in the mitigation plan this permit requires you to implement. Demonstration of success under this permit shall consist of the required

mitigation monitoring, corrective measures, submittal of mitigation monitoring reports, and a final wetland assessment.

6. The MOA on historic properties between the New Hampshire Department of Transportation, the Federal Highway Administration, and the State Historical Preservation Officer and date signed August 8, 2002 is a special condition of this permit and shall be faithfully executed.

7. To demonstrate compliance with condition E-10 of the Water Quality Certification, WQC# 2002-007, approved May 2, 2006 (attached), the permit-tee shall record the levels of road salt used on I-93 and its interchanges between the Massachusetts border and Exit 6 on a monthly basis and shall report such monthly load information to the Corps, EPA and NHDES on a quarterly basis. The permittee shall include in each quarterly report a description of the adaptive management strategies it has implemented for the preceding quarter to optimize the use of de-icing compounds and/or anti-icing compounds and to maximize salt application efficiency.

8. Except where stated otherwise, reports, drawings, correspondence and any other submittals required by this permit shall be marked with the words "**199201232/NAE-2004-233** and shall be addressed to "Policy Analysis and Technical Support Branch, CENAE-R-PT", U.S. Army Corps of Engineers, 696 Virginia Road, Concord, MA 01742-2751." Documents which are not marked and addressed in this manner may not reach their intended destination and do not comply with the requirements of this permit.

9. Special condition regarding areas to be protected from development: The NH DOT with the concurrence of the FHWA has agreed to protect approximately 1,000 acres of undeveloped land as part of the mitigation package for the proposed project and both have committed to this course of action in the FEIS and the FHWA ROD. The parcels proposed for protection are enumerated in Section 4.7 of the FHWA ROD at pp.14-15 and 11-12 respectively and depicted in the FEIS at table 4.6-5. The faithful implementation of these commitments is a condition of this authorization and failure to acquire and record conservation easements or restrictive covenants on the enumerated parcels shall be considered a violation of the conditions of this permit and subject the permittee to the enforcement provisions of our regulations. The NH DOT has already acquired interests in some of the parcels enumerated above but there are several remaining parcels yet to be acquired. The NH DOT shall comply with the following conditions:

A. For those parcels already acquired in fee simple, the NH DOT shall place restrictive covenants on the land. For all other interests in land the NH DOT shall ensure that a conservation easement is placed on the parcel with the NH DOT as the grantee. The restrictive covenants or conservation easements shall be recorded in the Rockingham or Hillsborough County Registry of Deeds, as appropriate, and a copy of the recordation shall be sent to the Corps of Engineers within thirty (30) days. The language of the restrictive covenants or conservation easements shall be approved by the Corps, the FHWA and the NH DES before the restrictive covenants or conservation easements are recorded.

B. The conservation easements or restrictive covenants shall enable the site or sites to be protected in perpetuity from future use or development. The conservation easement or restrictive covenants shall expressly allow for the creation, restoration, remediation and monitoring activities required by this permit on the site or sites. It shall prohibit all other filling, clearing, development and other disturbances (including unauthorized motorized vehicle access) on these sites except for activities consistent with the purposes of the conservation easements or restrictive covenants.

C. There shall be no discharges pursuant to this permit until the restrictive covenants or conservation easements on the already acquired parcels have been recorded.

D. Within five (5) years of the issuance of this permit, the NH DOT shall place restrictive covenants or conservation easements on the remaining parcels enumerated in the above referenced documents. A copy of the executed documents shall be provided to the Corps of Engineers within (30) day of recording.

E. All subsequent property transfers are to be made subject to said restrictions or easements. The NH DOT shall reference the restrictive covenants or easements in all transfer deeds. The NH DOT shall provide a copy of the transfer deeds to the Corps of Engineers within thirty (30) days of recording.

F. The NH DOT shall not transfer any fee owned property to another person or entity unless a conservation easement is placed on the property prior to transfer and made subject to the existing restrictive covenant. The Corps of Engineers shall approve the language of the conservation easement.

G. All copies of the executed and recorded easements or restrictive covenants and any subsequent transfer deeds shall be sent to the Corps of Engineers, Regulatory Division, attn: Chief, Policy Analysis and Technical Support Branch, 696 Virginia Road, Concord, MA 01742-2751.

The State of New Hampshire

Department of Environmental Services

Michael P. Nolin
Commissioner

NOTE - - CONDITIONS

WETLANDS AND NON-SITE SPECIFIC PERMIT 2002-02033

Permittee: NH Dept of Transportation, PO Box 483,Concord, NH 03302-0488
Project Location: Rte I-93, /Salem / Manchester /Windham/Derry/Londonderry
Salem Tax Map/Lot No. /
Waterbody: Unnamed Wetland **Page 1 of 5**

APPROVAL DATE: 05/2/2006 **EXPIRATION DATE: 05/2/2011**

Based upon review of the above referenced application, in accordance with RSA 482-A and RSA 485-A:17, a Wetlands Permit and Non-Site Specific Permit was issued. This permit shall not be considered valid unless signed as specified below.

PERMIT DESCRIPTION: Dredge and /or fill approximately 76 acres of mostly palustrine and riverine wetlands to improve the capacity, efficiency and safety along 19.8 miles of Interstate 93. The existing limited access, two lane highway will be widened to create a limited access four lane highway starting at the Massachusetts/New Hampshire state line in Salem and ending just north of the I-93/I-293 interchange in Manchester. The project includes improvements to five existing interchanges and cross roads, construction of three new Park and Ride facilities at Exit 2, 3 and 5, expanded bus service at Exit 4, and space to accommodate a future rail corridor between the Massachusetts/New Hampshire state line northerly to the Exit 5 interchange.

Compensation for wetland impacts includes: construction of approximately 31 acres of wetlands at five sites; preservation of approximately 1,000 acres of upland and wetland habitat; construction of detention basins and extended treatment swales; a $3 million contribution to the NHDES Drinking Water Supply Land Grant Program or to a comparable program for funding aquatic resource protection in the Massabesic Lake watershed; and establishment of a $3.5 million fund for the Community Technical Assistance Program to help area communities plan for growth as a result of the project.
NHDOT project #10418-C.

THIS APPROVAL IS SUBJECT TO THE FOLLOWING PROJECT SPECIFIC CONDITIONS:

1. The wetland impacts associated with this approval are based on the Amended New Hampshire Department of Environmental Services Wetlands Bureau (hereinafter "NHDES")/Army Corps of Engineers permit application received on August 12, 2004 (hereinafter "the Application").
2. During final design and construction work, wetland impacts that exceed 76 acres as represented in the Application and materials contained in NHDES file, shall require submittal of a permit amendment request to be reviewed and approved by NHDES after consultation with the appropriate local Conservation Commission(s).
3. During final design of the roadway construction plans, a joint review shall be conducted by state and federal resource agencies regarding proposed water quality treatment features such as grass swales or detention basins that may cause additional jurisdictional impacts for construction to confirm need, location, and necessity for a permit amendment.
4. Final design plans for roadway construction shall be submitted to NHDES and appropriate local Conservation Commission(s) for each construction contract with a summary of wetland impacts for the associated contract work Review and comments from NHDES and Conservation Commissions shall be considered by the NH Department of Transportation (hereinafter "NHDOT") and incorporated into the design where appropriate.
5. During final design, efforts to avoid or minimize wetland and surface water impacts shall be maximized by constructing steepened side slopes, retaining walls, and accommodations for wildlife passage.
6. NHDOT will study the feasibility of reconstructing existing culverts at Policy Brook and Porcupine Brook in Salem, Beaver Brook in Derry, and Cohas Brook in Manchester, to address wildlife passage issues. These measures will be fully evaluated as part of the final design and incorporated into plans where practical.
7. This permit shall not be effective until it has been recorded with the county Registry of Deeds office by NHDOT. A copy of the registered permit shall be submitted to NHDES prior to construction.

P.O. Box 95, 29 Hazen Drive, Concord, New Hampshire 03302-0095
Telephone: (603) 271-2147 • Fax: (603) 271-6588 • TDD Access: Relay NH 1-800-735-2964
DES Web site: **www.des.nh.gov**

8. This permit is contingent on approval by the NHDES Dam Safety Program.
9. NHDOT will comply with the provisions of the Section 401 Water Quality certification upon its issuance and noncompliance shall be considered a violation of the conditions of this permit.
10. A water quality monitoring program will be developed and implemented in accordance with requirements established by NHDES, Watershed Management Bureau.
11. This permit is contingent on NHDOT providing funding for establishment of an additional Environmentalist IV position within DES to provide for construction monitoring, minor modifications during final design and minor permitting changes due to unanticipated obstacles and conflicts during construction. This position shall be funded continuously through the completion of the project to ensure that all permit conditions are satisfied, including monitoring of all mitigation areas. The details for funding this position will be fully detailed in a memorandum of agreement to be negotiated and executed between NHDOT and NHDES no later than September 1, 2006.
12. Measures to mitigate impacts to the perennial wildflower wild lupine listed by the NH Natural Heritage Bureau (hereinafter "NHB") as a state threatened species will be addressed by completing a written mitigation plan specific to the population in the project area in consultation with NHB. The plan shall focus on efforts to relocate the individual plants by means of re-seeding or transplantation.
13. Potential habitat areas for the eastern hognose snake shall be determined using GIS-level analysis prior to construction to determine if the species will be impacted by the project in coordination with the NH Fish and Game Department (hereinafter "NHF&G").
14. Dredged material shall be placed out of NHDES jurisdiction unless otherwise specified.
15. This permit is contingent upon the submission of project specific stream diversion and erosion control plans to the NHDES for review and approval. Those plans shall detail the timing and method of stream flow diversion during construction, and the temporary siltation, erosion and turbidity control measures to be implemented.
16. At least 48 hours prior to the start of each construction contract, a pre-construction meeting shall be held with NHDES Land Resources Management Program staff at the project site or at the NHDES or NHDOT Offices in Concord, N.H. to review the conditions of this permit, the NHDES Water Quality Certificate, and any other environmental commitments stated in other approved documents such as the Interstate 93 Improvements Salem to Manchester Final Environmental Impact Statement (hereinafter "FEIS"). It shall be the responsibility of NHDOT to schedule the pre-construction meeting, and the meeting shall be attended by NHDOT, the contract administrator(s), wetlands scientist(s), wildlife professional(s), and the contractor(s) responsible for performing the work.
17. Appropriate siltation/erosion/turbidity controls shall be in place prior to construction, shall be maintained during construction, and shall remain until the area is stabilized.
18. The project engineer shall oversee installation of erosion controls and periodically verify that the controls are properly maintained during construction and until all areas are fully stabilized.
19. Appropriate storm water management and erosion control Best Management Practices (BMPs) shall be implemented to ensure turbidity is minimized and water quality standards are not violated. If the BMPs conflict with the terms or conditions of this permit, the terms and conditions of this permit shall control.
20. Construction equipment shall not be located within surface waters.
21. There shall be no further alteration of wetlands or surface waters without amendment of this permit.
22. Within three days of the last activity in an area, all exposed soil areas, where construction activities are complete or have been temporarily suspended, shall be stabilized by seeding and mulching during the growing season, or if not within the growing season, by mulching with tack or netting and pinning on slopes steeper than 2:1.
23. Where construction activities have been temporarily suspended within the growing season, all exposed soil areas shall be stabilized within 14 days by seeding and mulching.
24. Where construction activities have been temporarily suspended outside the growing season, all exposed areas shall be stabilized within 14 days by mulching and tack. Slopes steeper than 3:1 shall be stabilized by matting and pinning.
25. Discharge from dewatering of work areas shall be to sediment basins that are: a) located in uplands; b) lined with hay bales or other acceptable sediment trapping liners; c) set back as far as possible from wetlands and surface waters and, wherever possible, with a minimum of 20 feet of undisturbed vegetated buffer.
26. The contractor responsible for completion of the work shall utilize techniques described in the NHDES Best Management Practices for Urban Stormwater Runoff Manual (January, 1996) and the Stormwater and Erosion and Sediment Control Handbook for Urban and Developing Areas in New Hampshire (August, 1992).

27. NHDOT shall limit unnecessary removal of vegetation within riparian areas during road construction and areas cleared of vegetation shall be re-vegetated as quickly as soon after construction as possible so as to minimize erosion and restore wildlife habitat.
28. Land clearing in wetland areas during highway construction is to be kept to a minimum to reduce impacts on wildlife habitat.
29. Precautions shall be taken to prevent import or transport of soil or seed stock containing nuisance, invasive species such as purple loosestrife or Phragmites.
30. NHDOT shall provide a yearly progress report to NHDES relative to the efforts and progress achieved in studying transit issues in coordination with the Commonwealth of Massachusetts.
31. All activity shall be in accordance with the Comprehensive Shoreland Protection Act, RSA 483-B.
32. This permit is contingent on the execution of the mitigation components specified in the Wetland Mitigation Report dated July 2004 and received by NHDES on August 12, 2004.
33. Compensation for wetland and surface water impacts includes the advance mitigation project as approved by NHDES (permit #2000-00455) at the Pelham Road site in Salem for the creation of 4 acres of wetlands and the preservation of an additional 21 acres.
34. Remedial measures that remain uncompleted for the Pelham Road advance mitigation site shall be incorporated into a construction contract for this project. The NHDOT shall submit a copy of the contract to the NHDES Wetlands Bureau specifying such remedial measures.
35. The mitigation proposal as detailed in amended application materials dated July, 2004 and materials submitted on August 12, 2004 shall be followed for compensating impacts associated with the proposed project.
36. Modifications to the mitigation proposal may be required if changes to the project result in an increase in wetland impacts beyond that specified in this permit.
37. The proposed mitigation package includes providing $3 million to the NHDES Drinking Water Supply Land Grant Program or to a comparable program to be approved by NHDES that can utilize the funds for aquatic resource protection in the area of Massabesic Lake.
38. NHDOT shall provide specific, detailed parcel information to NHDES, and all other resource agencies, for review and approval for disbursement of the $3 million for funding aquatic resource protection within three years of the start of construction.
39. NHDOT shall provide annual progress reports relative to the status and disbursement of the $3.5 million fund for the Community Technical Assistance Program to help area communities plan for growth as a result of the project. The following communities have been identified for potential assistance: Concord, Bow, Pembroke, Dunbarton, Allenstown, Deerfield, Goffstown, Hooksett, Candia, Raymond, Bedford, Manchester, Auburn, Chester, Fremont, Litchfield, Londonderry, Derry, Hampstead, Sandown, Danville, Hudson, Windham, Salem, Atkinson, and Pelham.
40. The schedule for the construction of the South Road (site 14 and 15) creation site shall coincide with the highway-widening contract so that salvaged wetland soils and other materials can be used at the South Road site.
41. The schedule for the construction of the three additional wetland creation areas shall coincide with the highway-widening contract for the particular area unless otherwise authorized by NHDES.
42. NHDOT and NHDES shall form an Interdisciplinary Oversight Team to provide technical assistance on the construction and completion of the wetland creation sites.
43. The wetland creation areas shall be properly constructed, monitored, and managed in accordance with final mitigation plans approved by NHDES.
44. Wetland creation and flood storage replacement areas shall be properly constructed, landscaped, and monitored. Remedial actions may be necessary to create functioning wetland and floodplain areas similar to those destroyed by the project. Remedial measures may include replanting, relocating plantings, removal of invasive species, changing soil composition and depth, changing the elevation of the wetland surface, and changing the hydrologic regime.
45. NHDOT shall designate a qualified professional who will be responsible for monitoring and ensuring that the mitigation areas are constructed in accordance with the mitigation plans. Monitoring shall be accomplished in a timely fashion and remedial measures taken if necessary. NHDES shall be notified in writing of the designated professional prior to the start of work and if there is a change of status during the project.

46. The NHDOT shall notify, in writing, NHDES and the local conservation commission(s) in the municipality(ies) where the construction is to take place of their intention to commence construction no less than 5 business days prior to construction.
47. A post-construction report, including a narrative and photographs, documenting the status of the completed mitigation projects shall be submitted to NHDES within 60 days of the completion of construction.
48. NHDOT or the designated qualified professional shall conduct a follow-up inspection after the first growing season, to review the success of the mitigation area and schedule remedial actions if necessary. A report outlining these follow-up measures and a schedule for completing the remedial work shall be submitted by December 1 of that year. Similar inspections, reports and remedial actions shall be undertaken in at least the second, third and fifth years following the completion of each mitigation site.
49. Wetland creation areas shall have at least 75% successful establishment of wetlands vegetation after two (2) growing seasons, or shall be replanted and re-established until a functional wetland is replicated in a manner satisfactory to NHDES.
50. NHDOT shall delineate the wetlands and flood storage volume within the mitigation sites, document the delineation with US Army Corps of Engineers' data forms, and depict the delineation as an overlay of the final as-built plans after at least five full growing seasons.
51. Wetland soils from areas vegetated with purple loosestrife shall not be used in the wetland creation sites. The potential for the establishment of the invasive species should be considered in other areas where spoils may be spread to limit its further establishment.
52. NHDOT shall attempt to control invasive, weedy species such as purple loosestrife (Lythrum salicaria) and common reed (Phragmites australis) by measures approved by NHDES if the species is found in the mitigation areas during construction and during the early stages of vegetative establishment.
53. Baseline documentation reports for all lands to be protected shall be completed and submitted to NHDES within one year following NHDOT securing the parcels. The reports shall contain photographic documentation of the areas, and shall be submitted to NHDES to serve as a baseline for future monitoring of the areas.
54. NHDOT shall provide information for review and approval by NHDES relative to the mechanisms to be used for preservation of the parcels in perpetuity. The use of a conservation easement for long-term protection of the properties is preferred and should be pursued where possible.
55. NHDOT shall provide NHDES a status report on the properties to be protected as part of the second and third year monitoring reports to insure compliance with the preservation requirements. If the preservation of the properties has not been completed after three years, yearly reports shall be submitted following the third year as to the status of protection.
56. Conservation easements that are placed on the preservation areas shall be written to run with the land, and both existing and future property owners shall be subject to this easement. The conservation easements shall be executed and recorded within five years of the permit issuance.
57. Conservation easements that are placed on the preservation areas relative to the $3 million contribution to the NHDES Drinking Water Supply Land Grant Program shall not preclude use of the property for public water supply purposes.
58. The plan depicting the conservation easement along with a copy of the final easement language shall be recorded with the Registry of Deeds Office for each property. A copy of the recording from the County Registry of Deeds Office shall be submitted to NHDES.
59. The boundaries of the protected properties shall be surveyed by a licensed surveyor, and marked by permanent markers/signs for purposes of identification and monitoring.
60. NHDES shall be notified of the placement of the permanent markers/signs to coordinate on-site review of their location.
61. There shall be no removal of the existing vegetative undergrowth within the preservation areas and the placement of fill, construction of structures, and storage of vehicles or hazardous materials is prohibited.
62. NHDES shall be notified in writing of the transfer of any preservation lands and mitigation sites to another organization that has been retained for management purposes and the notification shall state the name of the entity responsible for continuing long-term management and/or stewardship of the lands.
63. Activities in contravention of the conservation easement shall be construed as a violation of RSA 482-A, and those activities shall be subject to the enforcement powers of NHDES, including remediation and fines.

GENERAL CONDITIONS WHICH APPLY TO ALL DES WETLANDS PERMITS:

1. A copy of this permit shall be posted on site during construction in a prominent location visible to inspecting personnel;
2. This permit does not convey a property right, nor authorize any injury to property of others, nor invasion of rights of others;
3. The Wetlands Bureau shall be notified upon completion of work;
4. This permit does not relieve the applicant from the obligation to obtain other local, state or federal permits that may be required (see attached form for status of federal wetlands permit);
5. Transfer of this permit to a new owner shall require notification to and approval by the Department;
6. This permit shall not be extended beyond the current expiration date.
7. This project has been screened for potential impacts to **known** occurrences of rare species and exemplary natural communities in the immediate area. Since many areas have never been surveyed, or have received only cursory inventories, unidentified sensitive species or communities may be present. This permit does not absolve the permittee from due diligence in regard to state, local or federal laws regarding such communities or species.
8. The permittee shall coordinate with the NH Division of Historic Resources to assess and mitigate the project's effect on historic resources.

APPROVED: _____
DES Wetlands Bureau

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BY SIGNING BELOW I HEREBY CERTIFY THAT I HAVE FULLY READ THIS PERMIT AND AGREE TO ABIDE BY ALL PERMIT CONDITIONS.

_____ _____
OWNER'S SIGNATURE (required) CONTRACTOR'S SIGNATURE (required)

WILLIAM CASS