2013 ANNUAL MONITORING REPORT
(REPORT 1)
for
BAGGETT MITIGATION SITE

New Hampshire Department of Transportation
Salem-Manchester A000(124), 13933D
[Related to Federal Project No. IM-IR-93-1(174)0]
Interstate 93 Improvements
Salem, New Hampshire

Project Permits:

United States Army Corps of Engineers Permit No. 199201232/NAE-2004-233
New Hampshire Department of Environmental Services Permit No. 2002-02033

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1.0 PROJECT OVERVIEW:

The Baggett Property is one of five wetland creation sites identified in the 2004 Final Environmental Impact Statement (FEIS), along with an extensive package of land preservation and other mitigation that is intended to compensate for wetland impacts related to the New Hampshire Department of Transportation (NHDOT) Salem-Manchester Interstate 93 Widening project.

The Baggett Property, known as wetland mitigation site #38, is approximately 6.2 acres in size and included 1.3 acres of wetland creation that was completed in June 2013. The site is located adjacent to the southbound Interstate 93 (I-93) barrel and to the southwest of the overpass that carries I-93 over NH Route 38 (Lowell Road). The approximate site location is shown on the enclosed Figure 1 - Site Location Map.

The existing site was primarily forested, except for a small residential dwelling site on the north end abutting Lowell Road that was previously demolished. The remaining property consisted of forested areas with mixed evergreen and deciduous trees and some underbrush, though the eastern portion of the site was somewhat disturbed during recent construction on the I-93 southbound barrel. The site is bounded by Lowell Road on the north, an existing mobile home park on the west and the I-93 southbound roadway embankment on the east. The area to the south of the site is relatively undisturbed and consists of tall stands of mature maple and pine trees and dense underbrush, with many low-lying forested wetland areas. This area to the south is part of a larger floodplain related to a perennial stream located approximately 1,000 feet south of the site that flows generally to the east and ultimately into Porcupine Brook on the east side of I-93. There is also an existing drainage channel on the east side of the site along the toe of the I-93 embankment that directs runoff from the site through an existing 24-inch culvert outlet that discharges into the I-93 median area. The site was acquired by the NHDOT for reconstruction of the I-93 bridge over Lowell Road and was reserved for wetland creation and floodplain storage as part of the larger project.

The wetland creation activities on the Baggett Mitigation Site were completed on June 20, 2013, and are the subject of this mitigation monitoring report. Despite some previous disturbances on the site, the subject property was considered a good candidate for wetland creation due to availability of the property and the close proximity to the forested wetlands and floodplains to the south. The general intent of the mitigation plan was to provide additional flood storage, provide for flood flow alteration and create wetland habitat on the mitigation site.

The wetland creation activities at the Baggett Mitigation Site were monitored in accordance with the regulatory requirements, permit conditions, and success standards established for the project during the design and permitting phases. This monitoring report summarizes the data collected, and it documents the site conditions at the end of the first full growing season (2013) following construction. This report also fulfills the first-year monitoring and reporting requirements for the mitigation site in accordance with the United States Army Corps of Engineers (USACE) Permit No. 199201232/NAE-2004-233 (USACE Permit) and the NH Department of Environmental Services (NHDES) Permit No. 2002-02033 (NHDES Wetland Permit). Copies of the permits are included in Appendix B. Mitigation monitoring inspections and reporting are required according to condition #48 of the NHDES Wetland Permit (see Appendix B) for the first, second, and third years following construction, including a wetland delineation (condition #50) after

the fifth year following construction. Other conditions of the NHDES Wetland Permit and the USACE Permit also reinforce related monitoring requirements such as scope, timing, content, and reporting (see Appendix B).

The information was collected for this report on October 21 and 26, 2013 for the end of the first growing season (fall) by Timothy F. McCormick, NH Certified Wetland Scientist and Certified Soil Scientist (CWS #81/CSS #78) of Pathways Consulting, LLC (Pathways), in conjunction with Brendan J. Quigley (CWS #249) of Gove Environmental Services, Inc. (GES). Pathways, on behalf of the NHDOT, also completed extensive monitoring and reporting during the construction period from January to June 2013, in accordance with the permit requirements. Results of this construction review were presented in periodic observation reports that are available from the NHDOT. Since the project was not completed until the middle of the growing season, the fall monitoring period was our first opportunity to review the site following completion of construction.

2.0 MITIGATION DESIGN GOALS:

2.1 General Mitigation Design Goals

The wetland creation activities at the Baggett Mitigation Site were intended to replace lost functions and values of the previously existing wetlands impacted during the 19.8 mile Salem-Manchester I-93 Widening project, including flood storage and flood flow alteration, sediment/toxicant retention, nutrient removal, and wildlife habitat restoration. This general intent was described in the Wetland Mitigation Technical Report entitled "Wetland Mitigation Baggett Property, Salem to Manchester, IM-IR-93-1(174)0, 13933D, NH," (Wetland Mitigation Technical Report), prepared by Louis Berger Group, Inc. (LBG) in July 2010 for the NHDOT and the Federal Highway Administration. The preliminary site analysis and design information was utilized by the NHDOT in 2010 to complete the final design and permitting for the specific wetland mitigation activities on the referenced site as part of the NHDOT Salem-Manchester A000(124), 13933D Corridor Widening project.

According to the LBG Wetland Mitigation Technical Report (LBG, 2010), the general goal of the wetland creation design and construction was to provide a number of important benefits to the surrounding natural environment and communities. The specific functions and values provided by the Baggett Mitigation Site include the following:

- Flood Flow Alteration (Flood Storage) - create basin-like morphology to increase available flood flow storage, runoff attenuation, and peak flow desynchronization within the localized areas that are part of the broader Spicket River watershed;
- Water Quality Treatment - establish basin with constricted outlet and dense wetland vegetation to facilitate removal of suspended solids and nutrients in runoff by increasing runoff detention or retention (promote settling), attenuating peak flows, increasing nutrient uptake through vegetation, and encouraging pollutant breakdown with organic soils and microbial activity; and
- Enhance Biological Productivity (including Wildlife Habitat) - enhance biological productivity within areas near NH Route 38 previously

impacted by development by creating a variable shaped wetland with a range of cover types, wetland zones, vegetation diversity, and habitat that will enhance vegetation diversity and health, increase wildlife habitat, and encourage wildlife diversity.

2.2 Final Design and Construction Constraints

The final design of the Baggett Mitigation Site represented in the NHDOT Project Plans incorporated many specific design constraints outlined in the LBG Wetland Mitigation Technical Report, as well as those identified during the design and permitting process. These design constraints were intended to address many site-specific factors and guide the site construction in a manner that would maximize the potential for the site to achieve the overall wetland functions and values. The following is a listing of these important design constraints that were part of the final design and construction:

- Grading designed to intercept groundwater at elevations based on previous monitoring and capture surface runoff from surrounding areas;
- Redirect runoff from the existing drainage channel along I-93 embankment through the created wetlands to an existing culvert outlet and naturalize the drainage channel;
- Grade the site to appropriate elevations to achieve the intended upland, wetland, and transition zones, including three wetland zones (emergent, scrub-shrub, and forested wetland areas);
- Minimize longitudinal slopes to encourage runoff storage;
- Minimize side slopes to 1:10 or less, where possible, to preserve the integrity of wetland zones;
- Phase the wetland creation in the mitigation area concurrently with the highway construction to facilitate excavation and salvage of wetland humus and topsoil for use on the mitigation site;
- Minimize compaction of underlying soils during construction;
- Sequence construction activities to facilitate appropriate timing of site stabilization and planting, limit sedimentation and erosion, and reduce the need for dewatering;
- Establish mound-and-pool microtopography to replicate natural wetland;
- For wetland zones, utilize wetland topsoil of adequate depth (12 inches) and composition to meet minimum organic requirements (9-21 percent) per the USACE guidelines;
- Minimize clearing and the removal of mature trees around the site perimeter to preserve existing vegetation buffers and supplement buffers with additional screening plantings, where possible;
- Utilize appropriate plantings from the list of suitable species with preference for native plant species and those found in nearby wetland habitats;
- Utilize appropriate seed mixes for wetland and upland zones;
- Seed immediately after topsoil application to facilitate rapid vegetative growth;
- Salvage topsoil and wetland humus from appropriate areas for restoration of the wetland and upland areas of the site;
- Salvage coarse woody debris (e.g., stumps and logs) and rocks from the site and utilize in wetland zones;

- Follow NHDOT standards for erosion and sediment control;
- Prevent invasive species from being brought to the site by screening wetland soils and other materials imported to the site;
- Minimize the spread of invasive species already present on the site by preventing disturbance in these areas, where possible, and remediating areas where disturbances are necessary; and
- Install adequate barriers, gates, and/or signage to limit site access.

2.3 Construction Process

The wetland creation on the Baggett site was constructed by The Middlesex Corporation under contract with the NHDOT, utilizing the NHDOT Project Plans entitled "NHDOT Construction Plans, I-93 Salem-Manchester Corridor Widening, A000(124), NH Project No. 13933D, I-93 Mainline (Exit 1 Area) Including Ramps Reconstruction, Volume I of II, Town of Salem, County of Rockingham" dated September 17, 2010. Copies of these plans are provided in Appendix C for reference. The NHDOT Project Plans included all work required for construction of the Baggett wetland creation project, such as clearing, invasive plant remediation, excavation, grading, filling, special wetland soil placement, upland and wetland seeding and planting, erosion and sediment control, site restoration, and other incidental work.

As mentioned in Section 1.0 of this report, Pathways was retained in November 2012 by the NHDOT to review the final design and perform extensive monitoring and reporting during the construction period from January to June 2013, to assist the NHDOT with implementing the design and construction in accordance with the permit requirements. According to the permit requirements, a pre-construction meeting was held on November 7, 2012 with the Interdisciplinary Oversite Team (IOT), consisting of NHDOT representatives and regulatory agency representatives (USACE, NHDES and others), to review the mitigation site prior to the start of the construction phase. During our review, several noteworthy changes, as described below, were incorporated into the mitigation construction to address NHDOT, regulatory agency, and contractor input; varying and/or unexpected site conditions; material and plant availability; and construction methodologies:

- The upland area on the west side of the property, consisting of mature trees and underbrush was overcut beyond the proposed clearing limits. The contractor was directed to not stump this area or clear any additional underbrush to give the existing vegetation a chance to recover. Screening plantings proposed for the northwest border between the mitigation site and the abutting mobile home park were moved further south to provide additional screening. Additional plantings were recommended for this area but were not installed;
- Additional invasive Glossy Buckthorn plants were found throughout the site and beyond the previously delineated invasive limits depicted on the NHDOT Project Plans, especially over the southern half of the site. The contractor was directed to keep stumps intact and avoid removing strip soil containing invasive plants from these stumps to limit spreading of invasive species as the stumps were relocated on the site as woody debris;

- Although not specifically detailed on the NHDOT Project Plans, the contractor was directed to create the mound-and-pool microtopography within the subgrade soils prior to placement of the wetland humus, and this was done to the extent possible. Additional grade variation was created in the wetland humus layer by excavating pools and using the material to build up adjacent mounds. The spacing of adjacent mounds was also adjusted from 30 feet to 40 feet apart in the narrow southern portion of the wetland areas, to between 10 feet and 20 feet apart in the wider northern wetland areas. This approach provided an acceptable microtopography over the wetland areas, as intended in the design;
- No substitutions were necessary for the specified plant species. However, 50 additional Speckled Alders were planted on the northern end of the site. The additional plantings were necessary to fill in the northern portion of the site completed last due to the presence of a construction trailer and soil stockpile that delayed installation of plantings for several weeks after all other landscaping on the site had been completed;
- Although not specified on the NHDOT Project Plans, plant species were planted within the appropriate wetland zones according to our field direction. Root stock was planted only within the planned emergent wetland zones. Container plant stock was installed within the transitional areas between the planned emergent and scrub-shrub wetland zones according to the moisture tolerance for each species. Species appropriate for wetter conditions, such as Speckled Alder and Red Osier Dogwood, were planted in the lower saturated areas of the mound-and-pool microtopography. Higher "hummocks" were generally planted with shrub species, such as Highbush Blueberry, Northern Arrowwood, or Winterberry, and tree species, such as Red Maple, Swamp White Oak, or Green Ash, to increase survivability. Other species more appropriate to drier areas, such as Witch Hazel, Eastern White Pine, and Nannyberry were planted in the planned forested wetland and upland areas; and
- New England Erosion Control/Restoration Mix for Detention Basins and Moist Sites was substituted for the NHDOT Item 644.77 Wetland Seed Mix and NHDOT Item 644.74 Upland Seed Mix specified in the NHDOT Project Plans (Sheet 651). The substitution was recommended because of limited availability for the specified wetland seed mix, the relatively small upland area intended for the upland seed mix, and the quickly germinating erosion control component of the replacement seed.

3.0 MONITORING REQUIREMENTS AND SUCCESS STANDARDS:

During the preliminary environmental review, design, and permitting phases of the project, a number of general requirements, protocols, and success standards were developed for monitoring of the wetland creation activities at the Baggett Mitigation Site. Many of these requirements have been outlined in the LBG Wetland Mitigation Technical Report, as well as the USACE and NHDES permit conditions.

In general, the LBG Wetland Mitigation Technical Report contained guidance on the long-term monitoring requirements, including timing, regulatory requirements, performance standards, reporting requirements, and contingency planning for remedial actions. Most of the critical monitoring guidance has been incorporated into the USACE

and NHDES permit conditions, with the exception of the success standards, which are outlined below for the purpose of this report.

The following specific standards of success and performance criteria were proposed in the LBG Wetland Mitigation Technical Report, and are very similar to the five success standards established by the USACE for mitigation sites, which are, therefore, appropriate for this evaluation:

1. *Does the site have at least 500 trees and shrubs per acre, of which at least 350 per acre are trees for the proposed forested cover types, that are healthy and vigorous and are at least 18 inches tall in 75% of each planned woody zone AND at least the following number of non-exotic species, including planted and volunteer species? Volunteer species should support functions consistent with the design goals. To count a species, it should be well represented on the site (e.g., at least 50 individuals of that species per acre).*

# Species Planted	*Minimum # Species Present*
2	*2*
3	*3*
4	*3*
5	*4*
6	*4*
7	*5*
8	*5*
9 or more	*6*

Vegetative zones consist of areas proposed for various types of wetlands (shrub swamp, forested swamp, etc.). The performance standards for density can be assessed using either total inventory or quadrat sampling methods, depending upon the size and complexity of the site.

2. *Does each mitigation site have at least 80% areal cover, excluding planned open water or planned bare soil areas (such as turtle nesting), by noninvasive species? Do planned emergent areas on each mitigation site have at least 80% cover by noninvasive hydrophytes? Do planned scrub-shrub and forested cover types have at least 60% cover by noninvasive hydrophytes, of which at least 15% are woody species? For the purpose of this success standard, invasive species of hydrophytes are:*

   *Cattails – **Typha latifolia, Typha angustifolia, Typha glauca**;*
   *Common Reed – **Phragmites australis**;*
   *Purple Loosestrife – **Lythrum salicaria**;*
   *Reed Canary Grass – **Phalaris arundinacea**; and*
   *Buckthorn – **Rhamnus frangula**.*

3. *Are Common reed (**Phragmites australis**), Purple Loosestrife (**Lythrum salicaria**), Russian and Autumn Olive (**Elaeagnus spp.**), Buckhorn (**Rhamnus spp.**), Japanese knotweed (**Polygonum cuspidatum**), and/or Multiflora rose (**Rosa multiflora**) plants at the mitigation site are being controlled?*

4. *Are all slopes, soils, substrates, and constructed features within and adjacent to the mitigation site stabilized?*

Since this report represents the first year following construction, it was too early in the long-term monitoring period to provide definitive conclusions relative to the success and performance criteria. However, these criteria were used during the current monitoring period as a basis for evaluating our latest field observations, data, conclusions, and recommendations for the mitigation site relative to the overall success and mitigation goals. These criteria shall also continue to be used during future monitoring periods as a basis for evaluating the overall success of the mitigation site, observing and documenting changes from previously observed conditions, identifying trends, and determining the need for future remedial and/or corrective actions.

4.0 SUMMARY DATA:

There were two visits to the mitigation site for this first year monitoring report, October 21 and 26, 2013. The following sections describe our observations during these visits.

4.1 Fall (October 21 and 26, 2013) Observations

During our October 2013 site visits, we reviewed the mitigation site to collect information and observations on the general site conditions, the overall mitigation design goals, and success standards set forth herein. We also conducted plant counts, vegetation observations, and soil evaluations at three (3) vegetation plots (specifically abbreviated as VEG-1, VEG-2, and VEG-3, respectively, in this report) established within the three separate planned wetland zones on the mitigation site. We also performed a general review of the health and diversity of vegetation present on the site within each planned wetland and upland zone; identifying general limits of and changes to various zones; documenting the extent of standing water and saturated soils in each wetland zone; reviewing the general stability of soils, slopes, and other constructed features of the site; recording evidence of wildlife on the site; and observing new and existing invasive species areas.

The three (3) vegetation plots were located as necessary to evaluate vegetation at one plot within each planned emergent, scrub-shrub and forested wetland zone on the site. The vegetation plot locations were identified in the field with wooden stakes, wetland flagging and metal tags with corresponding labels, to assist with future use. Location ties were also measured and recorded from each vegetation plot to known points in the field, and these measurements are depicted on Figure 2 - 2013 Baggett Mitigation Site Monitoring Plan included at the end of this report for reference.

Results of the vegetation and soil evaluations from the fall of 2013, as well as observations regarding site hydrology, limits of planned wetland zones, and other general conditions are discussed in more detail in the following sections.

Photographs were also obtained from various viewpoints on the site that can be used to track progress during each future monitoring period. These photographs have been included in Appendix A at the end of this report.

4.2 Vegetation

This was the first comprehensive review following construction, and also the first opportunity to collect detailed data from the three (3) vegetation plots established during the fall 2013 monitoring efforts. All three vegetation plots were accessible due to reasonable water levels within the site. The vegetation plots were initially evaluated using the methodology in the USACE "1987 Wetlands Delineation Manual, Technical Report Y-87-1," dated January 1987 (1987 Wetland Manual) and the subsequent USACE "Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0)," dated January 2012 (2012 Regional Supplement) for determining plant composition and hydrophytic vegetation, and then evaluated relative to the defined success standards.

The three (3) vegetative plots (VEG-1, VEG-2 and VEG-3) were established to obtain data from at least one plot within each of the planned wetland zones on the mitigation site. Plant counts, species composition, and other vegetation observations were recorded on data sheets for each vegetation plot in accordance with the aforementioned USACE documents. Shrub vegetation was counted within a 15-foot radius, while herbaceous vegetation was counted within a 5-foot radius at the three vegetation plots. Table 1 - Summary of Vegetation Plot Data (2013) provides the results of the vegetation observations for each of the three vegetation plots reviewed. No formal wetland delineation or determination of wetland limits was required during this monitoring period, but may be required in the future.

The following is a summary of the specific vegetation observations at each plot:

Vegetation Plot No. 1 (VEG-1): VEG-1 is located on the west side of the widest portion of the planned palustrine emergent (PEM) wetland zone (see Site Photograph No. 13 in Appendix A). The vegetation at this PEM plot included a substantial herbaceous layer with no shrubs or trees, dominated by Cattails (*Typha latifolia*)(OBL) and Burreed (*Sparganium eurycarpum*)(OBL), with some Pickerel Weed (*Pontederia cordata*) and Green Bulrush (*Scirpus atrovirens*)(OBL). All of the vegetation observed at this plot (except for the Cattails) was part of the proposed planting list and/or specified seed mix.

Vegetation Plot No. 2 (VEG-2): VEG-2 is located on the west side of the planned palustrine scrub-shrub (PSS) wetland zone (see Site Photograph No. 13 in Appendix A). The vegetation at this PSS plot included a substantial herbaceous layer, dominated by Cattails (*Typha latifolia*)(OBL), Green Bulrush (*Scirpus atrovirens*)(OBL) and Soft Rush (*Juncus effuses*)(FACW+), with some shrubs, dominated by Highbush Blueberry (*Vaccinium corybosum*)(FACW-), and no trees. Most of the vegetation observed at this plot (except for the Cattails) was part of the proposed planting list and/or specified seed mix.

Vegetation Plot No. 3 (VEG-3): VEG-3 is located on the southeast side of the planned palustrine forested (PFO) wetland zone (see Site Photograph No. 17 in Appendix A). The vegetation at this PFO plot included a substantial herbaceous layer, dominated by Barnyard Grass (*Echinochloa muricata*)(FACW+), Switchgrass (*Panicum vigatum*)(FAC), and Pennsylvania Smartweed (*Polygonum*

pennsylvanicum)(FACW), with some trees and shrubs, dominated by Green Ash (*Fraxinus pennsylvanica*)(FACW). While all of the shrubs and trees observed at this plot were part of the proposed planting list, none of the herbaceous species were part of the plant list or specified seed mix.

The following Table A, based on detailed data in Table 1 - Summary of Vegetation Plot Data (2013) located at the end of this Report, summarizes the density for woody plant species and areal coverage calculated for each vegetation plot we observed in 2013:

Table A - Plant Density and Areal Coverage at Vegetation Plots (2013)

Vegetation Plot No.	Planned Wetland Cover Type	Density of Woody Stems Per Acre	Density of Trees Per Acre	Overall Areal Coverage of Herbaceous Layer (%)	Areal Coverage of Non-Invasive Hydrophytes in Herbaceous Layer (%)
VEG-1	Emergent Wetland (PEM)	-	-	100	60
VEG-2	Scrub-Shrub Wetland (PSS)	493	0	100	70
VEG-3	Forested Wetland (PFO)	431	308	102	101
AVERAGE FOR ALL PLOTS		**462 stems/acre***	**154 trees/acre ***	**101%**	**77%**

**Note: Woody stem density calculations only include PSS and PFO wetlands at VEG-2 and VEG-3. VEG-1 data was not included since it is a PEM wetland.*

In general, the vegetation plot results indicated that hydrophytic vegetation (i.e. plants with a FAC wetland status or drier, according to the 1988 U.S. Fish and Wildlife Services' National List of Plants that Occur in Wetlands: Northeast Region 1) was dominant at each of the three vegetation plots observed, and this result was anticipated for each planned wetland zone.

It should be noted that the planned forested (PFO) wetland areas represented by VEG-3 should ultimately become PFO wetlands, but the current observations are more indicative of PSS wetlands, despite the presence of tree species typical of PFO wetlands. The continued survival and growth of these tree species will ultimately determine whether this trend toward PFO is realized.

As summarized in Table A above and the detailed plot data included in Table 1 - Summary of Vegetation Plot Data (2013) located at the end of this Report, all three of the vegetation plots exhibited substantial herbaceous layers, while the wetlands represented by VEG-2 and VEG-3 also contained many woody stem plants and some juvenile trees, comparable to what would be expected in these planned PSS and PFO wetland areas. On an overall basis, many of the planted shrubs and trees have survived and appeared to be healthy, and many of the herb species included in either the proposed planting list or wetland seed mix were also observed at the time of our review.

The average areal cover of the herbaceous layer for all vegetation plots observed was approximately 101%. While the areal herbaceous cover for vegetation plots VEG-1 and VEG-2 contained a substantial percentage of invasive/undesirable

vegetation, the average areal cover of non-invasive hydrophytic vegetation in the herbaceous layer was still approximately 77% for all plots, which is a positive sign of continued wetland development at this early stage. The herbaceous coverage is generally expected to decrease as the shrubs and trees mature in the PSS and PFO zones (VEG-2 and VEG-3), but future monitoring will be critical in reviewing this trend on the site.

The density of the woody stems was calculated for the PSS (VEG-2) and PFO (VEG-3) plots. The average density of woody plants for these two vegetation plots observed was approximately 462 stems/acre. Woody stem counts were not calculated for VEG-1 because it is within the planned PEM wetland, and there were also no shrubs or trees observed at this plot.

Trees were only observed at the VEG-3 plot, and this result was consistent with the fact that this plot is located within the planned PFO wetland zone. While the average density of trees at VEG-3 was approximately 308 trees/acre, the average for VEG-2 and VEG-3 was only approximately 154 trees/acre, since no trees were observed at VEG-2. Although the tree component of the woody plant density is only critical for the planned PFO wetland areas relative to the success standards, this factor will ultimately determine the type of wetland that develops in each zone, and the establishment of trees within the overall site will be a factor in meeting the goal for overall naturalization and habitat development on the site. [Please note that the defined standard of success for this mitigation site requires counting all trees that are greater than 18" tall. Also, to maintain consistency with the methodology used in this report, it is recommended that Willow (*Salix spp.*), Red-Osier Dogwood (*Cornus sericea)* and Speckled Alder (*Alnus rugosa),* or other similar species are excluded from future tree counts when calculating trees/acre densities, since all these species typically have many stems, as opposed to a single stem, or trunk, that is more characteristic of a tree.]

In addition to the specific observations and plant counts provided above for each vegetation plot location, the following general vegetation observations were noted at the mitigation site, relative to general species composition, presence of volunteer species, and invasive species:

- The mitigation site contained a reasonable amount of vegetation diversity, including over thirty-six (36) total species, observed during the fall 2013 monitoring period. We observed over thirty-four (34) desirable and non-invasive plant species (excluding Cattails and Purple Loosestrife) on the mitigation site, including nineteen (19) species within the three vegetation plots (VEG-1, VEG-2, and VEG-3). Species composition for individual vegetation plots are listed in Table 1 - Summary of Vegetation Plot Data (2013) located at the end of this Report. The overall species observed on the mitigation site are listed in Table 2 – List of Observed and Volunteer Species (2013) at the end of this report. Approximately 82% of the observed non-exotic and non-invasive species within the overall site, and 67% within the vegetation plot areas were included on the proposed planting schedule on the NHDOT Project Plans (Appendix C) or part of the seed mix utilized on the mitigation site, while the remaining species (18% overall and 33% at plots) were believed to be volunteer species. Within the herbaceous

layer, a majority (55%) of the observed plants appeared to be volunteer species not on the proposed planting schedule or listed in the seed mix. At VEG-1, Cattails were the only volunteer species observed, though seven (7) non-invasive volunteer species were observed at VEG-2 and VEG-3. All of the trees and shrubs observed at VEG-2 and VEG-3 were part of the proposed planting schedule.

- Nodding Beggar-ticks (*Bidens cernua*) are currently very prevalent throughout the site, though only a small concentration of this species (10%) was observed at the PSS plot (VEG 2). As the other vegetation on the site matures, the population of this species should decrease.

- As mentioned above, substantial populations of invasive/undesirable species were noted vegetation plots VEG-1 and VEG-2, including Cattails (*Typha angustifolia*) and limited Purple Loosestrife (*Lythrum salicaria*) (see Site Photograph No. 13 in Appendix A). The average areal coverage of invasive/undesirable species within the herbaceous layer was calculated for each vegetation plot and summarized in Table B below. Outside the vegetation plots, high concentrations of Cattails (*Typha latifolia*) were observed in large portions of the planned PEM and PSS wetland areas (see Site Photograph Nos. 6, 7, 8, and 12). Also, minimal populations of Purple Loosestrife were noted at VEG-3. Outside of the vegetation plots, we also observed a significant number of Glossy Buckthorn (*Rhamnus frangula*) plants along the southern limit of the site (see Site Photograph Nos. 6 and 8), and this invasive species was observed in high densities on the southern portion of the site prior to construction. This species was also found within the existing wooded area in the middle of the site and in one isolated area on the eastern side of the site near the existing culvert outlet (see Site Photograph Nos. 7 and 17).

The following Table B summarizes the invasive/undesirable species and approximate percentage of herbaceous cover observed at each vegetation plot in 2013:

Table B - Invasive Species Areal Coverage at Vegetation Plots (2013)

Vegetation Plot No.	Invasive/Undesirable Species Type	Areal Coverage of Herbaceous Layer (%)
VEG-1	Cattails	40
VEG-2	Cattails/Purple Loosestrife	30/trace
VEG-3	-	-

4.3 Soil

During the fall monitoring period (October 2013), soil observations were made at the three (3) vegetation plots. Soil profile descriptions were also recorded at each vegetation plot in accordance with standard wetland delineation techniques and the Regional Supplement. Preliminary determinations were made regarding the presence of hydric soils according to the New England Hydric Soils Technical Committee "Field Indicators for Identifying Hydric Soils in New England," dated

2004, 3rd Edition (Field Indicators for Identifying Hydric Soils in New England) and the US Department of Agriculture, Natural Resource Conservation Service "Field Indicators of Hydric Soils in the United States," dated 2010, Version 7.0 (Field Indicators of Hydric Soils in the United States) documents.

The following soil observations were made at the three (3) vegetation plots, VEG-1, VEG-2, and VEG-3:

Soil observations for VEG-1:

Depth	Horizon/Description
0" - 20"	**Ap;** Dark Grayish Brown; 10YR 3/2 Sandy loam with organics; massive; friable
20" - 30"	**C;** Olive Brown 2.5Y 4/3 medium sand; single grain; loose, with common medium prominent dark brown (7.5YR 3/4) redoximorphic concentrations
	Note: No water in the hole at the time of the investigation; Soil is expected to exhibit stronger hydric conditions in the future.

Soil observations for VEG-2:

Depth	Horizon/Description
0" - 15"	**Ap;** Very Dark Brown 10YR 2/2 fine sandy loam and organics; weak granular; friable
15" - 16"	**Bs;** Dark brown 7.5YR 4/4; loamy sand; single grain; loose
16" - 20"	**Bw;** Olive Brown 2.5Y 4/3 loamy sand; single grain; loose, with few large prominent (7.5 YR ¾) redoximorphic concentrations, sand moist at the time of the investigation
	Note: No water in the hole at the time of the investigation; Soil is expected to exhibit stronger hydric conditions in the future.

Soil observations for VEG-3:

Depth	Horizon/Description
0" - 13"	**Ap;** Very Dark Brown 10YR 2/2 fine sandy loam and organics; massive; friable.
13" - 15"	**Bs;** Dark brown 7.5YR 3/4; loamy sand; single grain; loose
15" - 20"	**Bw;** Dark Yellowish Brown 10YR4/6 loamy sand; single grain; loose. No redoximorphic features to 20 inches.
	Note: No water in the hole at the time of the investigation.

Based on the design and construction of the mitigation site, it was anticipated that hydric soils would develop at all three plots within the planned wetland zones. While no standing water was found in the three test holes during our visit, the high groundwater level and consistent runoff input from off-site areas anticipated for the mitigation site will have a significant impact on the development of hydric soils in the wetland areas.

Our soil data collected from test holes at the three vegetation plots supported the general trends described above, though varying stages of development were noted at each plot. Soil profiles observed at VEG-1 (see Site Photograph No. 14 in Appendix A) within the planned PEM zone, and VEG-2 (see Site Photograph No. 15 in Appendix A) within the planned PSS zone, exhibited a Chroma 3 soil color and prominent redoximorphic features in the lower horizon, both indicative of hydric soils. Though it is expected that the matrix color will become more reduced over time, this is dependent on the presence of consistent hydrologic influence in these areas. The soil profile at VEG-3 (see Site Photograph No. 16 in Appendix A) within the planned PFO zone, did not exhibit any prominent redoximorphic features or a hydric regime in the lower horizon, but future monitoring is necessary to determine whether hydrologic conditions are adequate for hydric soils to develop in this area.

There was not enough organic material in the upper soil horizon for any of the three vegetation plots to classify the soil as histic epipedons or mucky A horizons. The upper horizons at VEG-1 and VEG-2 consisted of predominantly organic-rich mineral soils.

If similar soil observations are obtained in the future, additional soil test holes may be needed in other areas of each planned wetland zone to confirm the extent of hydric soils, especially within the PFO wetland zone.

4.4 Hydrology

According to the LBG Wetland Mitigation Technical Report, the hydrology for this site is provided through a combination of high groundwater and surface runoff entering the site from surrounding areas and through the existing drainage channel south of the site limits. Groundwater levels were monitored over a three-year period from 2006-2009 at three observation wells installed on the site during the early design phase of the project. These observation well locations are labeled as “OW1-B01,” “OW1-B02,” and “WM1-B03(OW)” on Sheet 648 of the NHDOT Project Plans, and additional soil logs for each of these observation wells are depicted on Sheet 647. Over this three-year period of monitoring, the early season groundwater table was determined to be approximately 1.5 feet below the ground surface, corresponding to an elevation of approximately 127.5±. Although it would have been helpful to utilize these observation wells to track groundwater elevation during post-construction review, the wells were decommissioned at some point during the I-93 construction period and were not available during our fall 2013 monitoring visits.

During our post-construction site review on July 12, 2013, the water level was at a consistent elevation of approximately 126.7, equivalent to the invert of the existing culvert outlet. At this time, standing water was observed at this elevation over most of the lower depressional wetland areas of the site, including all of the planned PEM and most of the planned PSS areas. During our October 2013 review, the site was much drier and standing water was only present in the lowest portion of the planned PEM areas (see Site Photograph Nos. 3-6 and 11).

In general, the lower water condition observed in October 2013 seemed to be consistent with the amount of precipitation that occurred in the surrounding areas

prior to our site visits. In fact, we verified the recorded precipitation amounts for several local weather sources and found that, while the monthly rainfall amounts for August and September were near normal monthly averages, October 2013 was considerably less than the normal monthly averages recorded by the NH State Climate Office (NHSCO) for the historical period of 1981 to 2012. The NHSCO recorded historical monthly averages of 4.50, 3.39, and 4.67 inches for August, September, and October, respectively, compared to actual rainfall amounts recorded in 2013 of 4.50, 3.39, and 0.95 inches during these respective months at the local Salem weather station "KNHSALEM12." Furthermore, the majority of the rainfall recorded in the period from mid-September to mid-October prior to our monitoring visits occurred during storm events on September 22, 2013 (0.77 inches of precipitation) and October 6 to 7, 2013 (0.63 inches). For reference, the actual monthly rainfall amounts for the summer months were near the recorded historical monthly averages, which would explain why the water levels at the site were much higher in July 2013 than in October 2013.

Based on these observations, it appeared that wetland zones on the mitigation site were providing at least a minimal amount of storage capacity for stormwater runoff and were allowing the slow movement of flow through the site as intended in the design. The site grading and microtopography were also functioning to maintain an adequate level of inundation within the depressions to support the planned wetlands throughout the site. The observed water levels and soil saturation appeared to be consistent with the expected levels relative to the planned wetland types.

4.5 Wetland Zones

The mitigation site primarily included three planned wetland zones that were specifically designed as palustrine emergent (PEM), palustrine scrub-shrub (PSS), and palustrine forested (PFO) wetlands. The planned wetland zone areas on the mitigation site were identical, according to the LBG Wetland Mitigation Technical Report, NHDOT Project Plans and permits for the mitigation site, and there did not appear to be any changes made during the design or permitting process that affected the wetland areas or limits on the site. Furthermore, no changes were made during construction that would impact the wetland areas or limits. As such, the actual long-term development of each wetland zone will be greatly dependent on the trends observed in vegetation, soil, and hydrology over the extended monitoring period.

Since no formal wetland delineation or mapping of wetland limits was required during the 2013 review, we did not determine accurate limits for the wetland zones. Regardless, we did not observe any significant trends or changes that would alter the wetland zone areas or limits as designed or constructed.

The following Table C provides a preliminary comparison of the estimated wetland zone areas that currently exist on the site to the planned and designed wetland zone areas that will be used during future monitoring:

Table C - Preliminary Comparison of Planned Versus Estimated Wetland Cover Areas

Area Comparison				
Wetland Cover Type	**Elevation Range**	**2010 Concept Design Per LBG Wetland Mitigation Technical Report (acres)**	**2010 Final Design Per NHDOT Plans and Permits (acres)**	**2013 Fall Monitoring Estimate (acres)**
Palustrine emergent (PEM)	125-126	0.2	0.2	0.2**
Palustrine scrub-shrub (PSS)	126-127	0.3	0.3	1.1**
Palustrine forested (PFO)	127-128	0.8	0.8	0.0
Total Wetland Area (PEM+PSS+PFO)		**1.3**	**1.3**	**1.3**
Upland Cover (within work limits)	Above 128	-	0.72	0.8***
Total Site Area* (within work limits)		**-**	**2.02 acres***	**2.1 acres***

(Table based on Figure 2 - 2013 Baggett Mitigation Site Monitoring Plan)

**Note: Total site area includes only areas of the overall 6.2-acre property within the clearing /work limits per NHDOT Project Plans.*

***Note: No site areas currently meet criteria as PFO wetlands due to presence of only limited juvenile trees, but PSS wetlands expected to become PFO as trees develop and mature.*

****Note: 2013 upland cover includes additional 0.08 acres where overcutting took place beyond proposed clearing/work limits.*

The following additional information was based on the latest fall 2013 review and observations contained in other sections of this report, and provides a general assessment of the development and classification of the planned wetland areas on the mitigation site:

- Emergent Wetlands (PEM): This zone represents the lowest portion of the basin of the constructed mitigation site. Based on the limited site review and observations, these areas would likely be classified as palustrine emergent wetlands (PEM). The graded mound-and-pool topography incorporated into this zone has stabilized well, and it has continued to support some diversity in wetland vegetation expected for this type of wetlands, despite the high concentration of Cattails.
- Scrub-Shrub Wetlands (PSS): This zone represents the transitional slopes between the lower basin and the broad forested wetland zones around the basin, and a portion of the graded inlet and outlet drainage channels that extend south and southeast of the basin. Based on the limited site review and observations, these areas would likely be classified as palustrine scrub-shrub wetlands (PSS) with some potentially emergent wetlands (PEM) in the isolated depressions associated with the mound-and-pool microtopography. The graded mound-and-pool topography incorporated into this zone has stabilized well, and it has continued to support substantial diversity in wetland vegetation, including herbaceous cover and shrubs, expected for these wetlands.

- Forested Wetlands (PFO): This zone represents the gentle sloping forested wetland areas above the PSS zone slopes and lower PEM wetland basin. This zone was not constructed with mound-and-pool microtopography. Based on the limited site review and observations, most of the area within this zone would likely be classified as PSS wetlands due to the lack of tree development noted to date. These areas are supporting substantial diversity in wetland vegetation, including herbaceous cover, shrubs and trees, expected for these wetlands. Although many trees were present in this zone, it appeared that tree development was not adequate to meet the criteria for a PFO classification yet. As previously discussed in Section 4.3, the continued development of hydric soil conditions will also be a factor in determining whether these areas are even classified as wetlands in the future.

4.6 Other Observations

Other observations were made during our site visits regarding the general site conditions, wildlife evidence, and human usage of the mitigation site, as follows:

- We observed some evidence of wildlife usage on the mitigation site, including unidentified tracks of small mammals and deer within the lower PEM zone (see Site Photograph Nos. 3 to 6 in Appendix A). We also noted some evidence of avian species on the site. We did not see any animals while on-site, but this was not unexpected since the site is located in a fairly populated area and will not provide much cover until the vegetation matures and becomes more dense.
- All areas of the site appeared to be stable, with no evidence of erosion or sediment deposits.
- The chain link fence around the perimeter seemed to be functioning as intended and limits access to the site.
- There was no evidence of adverse human intrusion on the site.

5.0 CONCLUSIONS AND RECOMMENDATIONS:

5.1 Conclusions

Based on the data collected and observations made during our recent 2013 site visits, the following conclusions are provided relative to the current conditions and previously defined standards of success for the mitigation site:

- Based on the first year observations, the planned wetland areas appear to be achieving the intended functions and values in accordance with the mitigation design goals.
- The wetland areas are generally functioning as designed. The hummocky microtopography created by the mound-and-pool grading was encouraging hydrophytic vegetation and varying degrees of saturation for a diverse wetland population. The grading design of the mitigation site appears to provide adequate flood storage and temporary detention to accommodate treatment of surface flows that pass through the site. Flow from areas south of the site appeared to be flowing unimpeded into the mitigation site. The low gradient positive drainage across the site also allows slow

migration of flow toward the release point into the existing culvert outlet on the east side of the site, while preventing excessive ponding in the wetlands that would impact vegetation and overall wetland diversity.

- The water levels observed during October 2013 were much lower than previously observed during construction, but they appeared to be within the range that could be expected for this time of year, considering the lower than average precipitation that occurred leading up to the monitoring period. Water levels and the degree of soil saturation appeared to be ideal for supporting the PEM and PSS wetland areas developing on the site, though consistent hydrology in the future will dictate whether hydric soils continue to develop in the planned PFO areas, and whether these areas ultimately become wetlands or uplands.
- The vegetation, soil, and hydrologic observations at VEG-1 indicated that this area is developing as PEM wetlands, as planned for this area. The observations at VEG-2 indicated that this area is developing as PSS wetlands, with some isolated areas of potential PEM wetlands in the lower depressions of the mound-and-pool microtopography, as expected. The observations at VEG-3 indicated that this area would be currently classified as PSS wetlands due to the limited tree development noted in this zone, despite the fact that this zone was planned as PFO wetlands. The presence of some trees in this area does suggest a trend toward PFO.
- The general wetland limits appeared to match the planned wetland design areas and boundaries closely, and no significant changes were noted since the end of construction. The total wetland area of 1.3 acres (including PEM, PSS and PEM areas) that appeared to exist on the site during the 2013 review matched the design wetland area. As long as the site conditions continue to support the wetland development, this overall wetland area should not change substantially in the future.
- While none of the three (3) vegetation plots established on the site exceeded the standards for success criteria of 500 stems per acre for woody plant stem densities, VEG-2 (493 stems per acre) and VEG-3 (431 stems per acre) were very close to meeting this criteria. We did not observe any woody stem plants at VEG-1, but this was anticipated since it is within a planned PEM area. The average woody stem counts for the two PSS/PFO wetland plots, 462 stems per acre, was also slightly below the success standard.
- The calculation methodology for the tree portion of woody stem counts excluded several plant species (Willow, Red Osier Dogwood and Speckled Alder), and this methodology should be replicated during future monitoring to ensure consistency in comparison of the tree calculations. Regarding the tree portion of the woody stem counts, trees were only observed at vegetation plot VEG-3 within the planned PFO area, but this plot contained approximately 308 trees per acre, slightly below the success standard of 350 trees per acre. The average tree density for the two PSS/PFO plots was calculated at 154 trees per acre, well under the standard. Despite not meeting the success standard, our observations indicated that trees were, at a minimum, healthy and surviving within these areas. Although the trees counted on each plot were not large enough to be considered “trees” according to the Regional Supplement (i.e. greater than 3" diameter at the breast height and greater than 3.28 feet

tall), they appeared to be surviving and growing enough to meet the tree size defined in the success standards.

- While we did note the presence of some healthy and thriving trees at the VEG-3 plot, the current observations are more indicative of PSS wetlands. The current PSS wetland classification is an expected interim condition for PFO wetlands until tree species fully develop. Consequently, the continued development of the tree component will ultimately determine whether these wetland areas achieve a PFO classification. In fact, due to the expected slow growth rate of trees, the conditions of a PFO wetland may not actually be realized within the monitoring period. This distinction should be identified in future monitoring efforts.
- Identifying future trends in the densities of woody stem and tree species as plants grow, mature, and spread at the wetland plots will be an important factor in determining the type of wetlands developing on the mitigation site, whether the mitigation goals are met, and whether the vegetation is healthy and flourishing.
- The average areal cover of the herbaceous layer for the three (3) vegetation plots on the mitigation site was approximately 101% and exceeded the overall success of a minimum of 80% areal cover. While the average areal cover of the herbaceous layer for the three (3) plots exceeded the overall success standard, VEG-1 and VEG-2 plots also contained a notable percentage of invasive hydrophytic vegetation in the herbaceous layer in the range of 30-40%. When considering only non-invasive hydrophytic vegetation, the reduced areal cover of 60% at VEG-1 did not meet the success standard of at least 80% areal cover for non-invasive hydrophytes in planned PEM cover types. The two PSS/PFO plots, VEG-2 and VEG-3, contained 70% and 101% herbaceous cover of non-invasive hydrophytes, respectively, and both plots exceeded the success standard of at least 60% areal cover for planned PSS/PFO cover types.
- On a longer-term basis for planned PSS and/or PFO wetlands, herbaceous coverage is expected to decrease as planted shrubs and trees mature and form a canopy over ground cover. Since this is only the first year of monitoring, it was not clear from our observations whether this trend has started, and future monitoring will be instrumental in tracking this development.
- As a general note, the 2013 observations did not indicate any substantial changes in the general design limits for any of the planned wetland zones, although there is some potential that the exterior wetland limits (i.e., between PFO and upland areas) could change according to future hydrologic, soil, and vegetation influences. Similarly, other minor shifts could also occur in other areas of the site (e.g., decrease in PFO area due to lack of hydric soils, upslope/downslope migration of PEM or PSS limits), but it was too early in the site development to identify such changes. Future monitoring during the growing season may help define the trends of the wetland areas and provide a more definitive limit of various wetland cover types. As long as the potential shifts do not decrease the overall area of wetlands, no substantive impact on the overall functions and values of the mitigation site would be expected.
- Although the site appeared to have at least 75% establishment of wetland vegetation with each zone, and is functioning as intended in accordance

with condition #30 of the NHDES Wetland Permit, more detailed future monitoring is still needed to confirm that this condition is met by the end of the second growing season, as stated in the permit.

- High concentrations of invasive/undesirable Cattails (*Typha latifolia*) and some Purple Loosestrife (*Lythrum salicaria*) was noted at two (2) of the three (3) of the wetland plots. Invasive/undesirable species accounted for a large percentage of the herbaceous cover observed at VEG-1 (40%) and VEG-2 (30%), and the dense populations of Cattails appeared to be impacting the development and diversity of other types of vegetation in these PEM and PSS wetland areas. These areas should be monitored closely and corrective action taken as necessary to limit spreading. Glossy Buckthorn (*Rhamnus frangula*) was also noted in several areas of the site. Since this invasive species was found on large portions of the site prior to construction, this invasive species also warrants close monitoring in future years to ensure that it doesn't spread and/or impact the site.
- A significant amount of vegetation diversity was noted on the mitigation site. The highest percentage of volunteer species appeared to be within the herbaceous layer at VEG-2 and VEG-3, while all of the shrubs and trees noted at each plot were part of the proposed planting and/or seeding schedules. While greater diversity in the shrub and tree species on the site would be desirable, it may take multiple growing seasons to develop. In the interim, the level of diversity observed on the site, at a minimum, appeared to meet the general goals of the mitigation site at this stage of development.
- All areas appeared to be stabilized, and there was no evidence of erosion or sediment deposits on the mitigation site.
- Based on our limited site visits, there was no indication of human usage of the site for either passive or active recreation, and the fencing appeared to be serving its intended purpose. While this is a good sign, the site should continue to be monitored in the future to identify and address usage of the site to prevent potential negative impacts.
- Various forms of wildlife appeared to be using the mitigation site.

5.2 Recommendations

Based on our observations and conclusions in this report, we provide the following recommendations:

- Monitoring should continue in accordance with the project permits in order to document the development of the plant communities, hydric soil development, identify trends in wetland zones, and gauging the overall mitigation site conditions relative to the same standards of success. Monitoring should be done in the late spring and early fall, and it should use the same vegetation plot locations, soil observation points, photograph locations, and reporting format so that future data can be compared with the data collected in 2013. According to the permits, the next required monitoring period would be in the second year following construction, or 2014.
- In order to reach more definitive conclusions on the boundary between the various wetland zones, future monitoring should include several visits throughout the growing season, and/or properly timed site visits, in order

to review these transitional areas more thoroughly during several phases of vegetation growth and hydrologic conditions. It may also be appropriate to review additional vegetation plots and soil test holes specifically located along this boundary where a potential shift in wetland/upland limits has been observed, and map the limits to determine the change in wetland area.

- We recommend that future monitoring include mapping of the wetland zones on the mitigation site for comparison of actual to planned wetland cover types and areas to the 2013 Baggett Mitigation Site Monitoring Plan provided with this report, and to track subsequent changes.
- Future monitoring, data collection, and calculations should utilize similar criteria established in this report, including the tables for data comparison, calculation of vegetation stem counts, and herbaceous cover data and convention for the tree portion of woody stem counts to ensure consistency in assessment of various vegetation measures that could impact the potential tracking of wetland development.
- The high concentrations of invasive/undesirable species within the wetland areas, including primarily Cattails (*Typha latifolia*) and Glossy Buckthorn (*Rhamnus frangula*), may already be impacting the development and diversity of vegetation on the site. These areas should be monitored closely to determine whether corrective actions should be undertaken in the near future to help control the spread (i.e. hand-pulling, mechanical, and/or biological, etc.). We also recommend that the site be periodically monitored to gauge the density of invasive plants and identify any longer-term trends (e.g., increase or decrease) relative to invasive plant density and location, which may dictate whether additional measures are critical for controlling invasive plants. If future impacts are evident, an invasive species control plan should also be developed and implemented on an annual basis to target those species found at the mitigation site.
- Future monitoring should also investigate any bare spots or areas prone to erosion and/or sediment deposits, since the ability of the site to pass runoff flows is critical to its function and value as a wetland.
- Although human usage of the site did not appear to be a problem during 2013, the mitigation site should be monitored closely to identify any increase in usage and related impacts. Any future corrective actions to curb human usage should be discussed with the IOT before implementation.

6.0 REFERENCES:

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TABLE 1
SUMMARY OF VEGETATION PLOT DATA (2013) - THREE SHEETS

TABLE 1

SUMMARY OF VEGETATION PLOT DATA

Baggett Mitigation Site
Monitoring 2013 (Year 1)
NHDOT Salem-Manchester A000(124), 13933D
Salem, New Hampshire

December 17, 2013
[Pathways Project No. 12317]

VEGETATION PLOT ID	PROPOSED COVER TYPE	% OF AREAL VEGETATION COVER	COMPOSITION OF PLANTS		INDICATOR STATUS	COMMENTS
			COMMON NAME	SCIENTIFIC NAME		
1	Emergent Wetland	**100**	**HERBS**			
	(PEM)	40	Cattails	*Typha latifolia*	OBL	
		40	Burreed	*Sparganium eurycarpum*	OBL	
		10	Pickerel Weed	*Pontederia cordata*	OBL	
		10	Green Bulrush	*Scirpus atrovirens*	OBL	
			SHRUBS/TREES			
			None			**0 Woody Stems/acres**
						0 Tree species (T = tree)

TABLE 1
SUMMARY OF VEGETATION PLOT DATA

Baggett Mitigation Site
Monitoring 2013 (Year 1)
NHDOT Salem-Manchester A000(124), 13933D
Salem, New Hampshire

December 17, 2013
[Pathways Project No. 12317]

VEGETATION PLOT ID	PROPOSED COVER TYPE	% OF AREAL VEGETATION COVER	COMPOSITION OF PLANTS		INDICATOR STATUS	COMMENTS
			COMMON NAME	SCIENTIFIC NAME		
2	Scrub-Shrub Wetland	**100**	**HERBS**			
	(PSS)	30	Cattails	*Typha latifolia*	OBL	
		30	Green Bulrush	*Scirpus atrovirens*	OBL	
		20	Soft Rush	*Juncus effuses*	FACW+	
		10	Nodding Beggarticks	*Bidens cernva*	OBL	
		5	Canada Rush	*Juncus canadensis*	OBL	
		5	Barnyard Grass	*Echinochloa muricata*	FACW+	
		Trace	Purple Loosestrife	*Lythrum salicaria*	FACW+	
			SHRUBS/TREES			
		5	Highbush Blueberry	*Vaccinium corybosum*	FACW-	**493 Woody Stems/acres**
		1	Northern Arrowwood	*Viburnum recognitum*	FACW	**0 Tree species (T = tree)**
		1	Speckled Alder	*Alnus rugosa*	FACW+	
		1	Winterberry Holly	*Ilex verticillata*	FACW+	

TABLE 1

SUMMARY OF VEGETATION PLOT DATA

Baggett Mitigation Site
Monitoring 2013 (Year 1)
NHDOT Salem-Manchester A000(124), 13933D
Salem, New Hampshire

December 17, 2013
[Pathways Project No. 12317]

VEGETATION PLOT ID	PROPOSED COVER TYPE	% OF AREAL VEGETATION COVER	COMPOSITION OF PLANTS		INDICATOR STATUS	COMMENTS
			COMMON NAME	SCIENTIFIC NAME		
3	Forested Wetland	**102**	**HERBS**			
	(PFO)	50	Barnyard Grass	*Echinochloa muricata*	FACW+	
		40	Switchgrass	*Panicum vigatum*	FAC	
		10	Pennsylvania Smartweed	*Polygonum pennsylvanicum*	FACW	
		1	Birdsfoot Trefoil	*Lotus corniculatus*	FACU-	
		1	Meadow Foxtail	*Alopecurus pratensis*	FACW	
			SHRUBS/TREES			
		4	Green Ash (T)	*Fraxinus pennsylvanica*	FACW	**431 Woody Stems/acres**
		1	Red Osier Dogwood	*Cornus sericea*	FACW	**308 Tree species (T = tree)**
		1	Red Maple (T)	*Acer rubrum*	FAC	
		1	Northern Arrowwood	*Viburnum recognitum*	FACW	

TABLE 2
LIST OF OBSERVED AND VOLUNTEER SPECIES (2013)

TABLE 2
LIST OF OBSERVED AND VOLUNTEER SPECIES

Baggett Mitigation Site
Monitoring 2013 (Year 1)
NHDOT Salem-Manchester A000(124), 13933D
Salem, New Hampshire

December 17, 2013
[Pathways Project No. 12317]

HERBS	
COMMON NAME	**SCIENTIFIC NAME**
Arrow Arrum*	*Peltandra virginica*
Arrowhead*	*Sagittaria latifolia*
Barnyard Grass	*Echinochloa muricata*
Blue Flag*	*Iris versicolor*
Birdsfoot Trefoil	*Lotus corniculatus*
Burreed*	*Sparganium eurycarpum*
Canada Rush	*Juncus canadensis*
Cattail	*Typha latifolia*
Green Bulrush*	*Scirpus atrovirens*
Meadow Foxtail	*Alopecurus pratensis*
Nodding Beggarticks	*Bidens cernva*
Pennsylvania Smartweed	*Polygonum pennsylvanicum*
Pickerel Weed*	*Pontederia cordata*
Purple Loosestrife	*Lythrum salicaria*
Soft Rush*	*Juncus effuses*
Switchgrass*	*Panicum vigatum*
Tussock Sedge*	*Carex stricta*
SHRUBS/TREES	
COMMON NAME	**SCIENTIFIC NAME**
American Cranberry*	*Viburnum trilobum*
American Hazelnut (T)*	*Corylus americana*
Arrowwood*	*Viburnum dentatum*
Black Chokeberry*	*Aronia melanocarpa*
Chokecherry (T)*	*Prunus virginiana*
Eastern White Pine (T)*	*Pinus strobus*
Green Ash (T)*	*Fraxinus pennsylvanica*
Highbush Blueberry*	*Vaccinium corymbosum*
Meadowsweet*	*Spiraea latifolia*
Nannyberry*	*Viburnum lentago*
Northern Arrowwood*	*Viburnum recognitum*
Red Osier Dogwood*	*Cornus stolonifera*
Red Maple (T)*	*Acer rubrum*
Red Oak (T)*	*Quercus rubra*
Speckled Alder*	*Alnus rugosa*
Swamp White Oak (T)*	*Quercus bicolor*
Pussy Willow*	*Salix discolor*
Winterberry Holly*	*Ilex verticillata*
Witch Hazel*	*Hamamelis virginiana*

**** Species believed to have been planted (per proposed planting plan or seed mix) during construction and not "volunteer" species.***

FIGURE 1
SITE LOCATION MAP

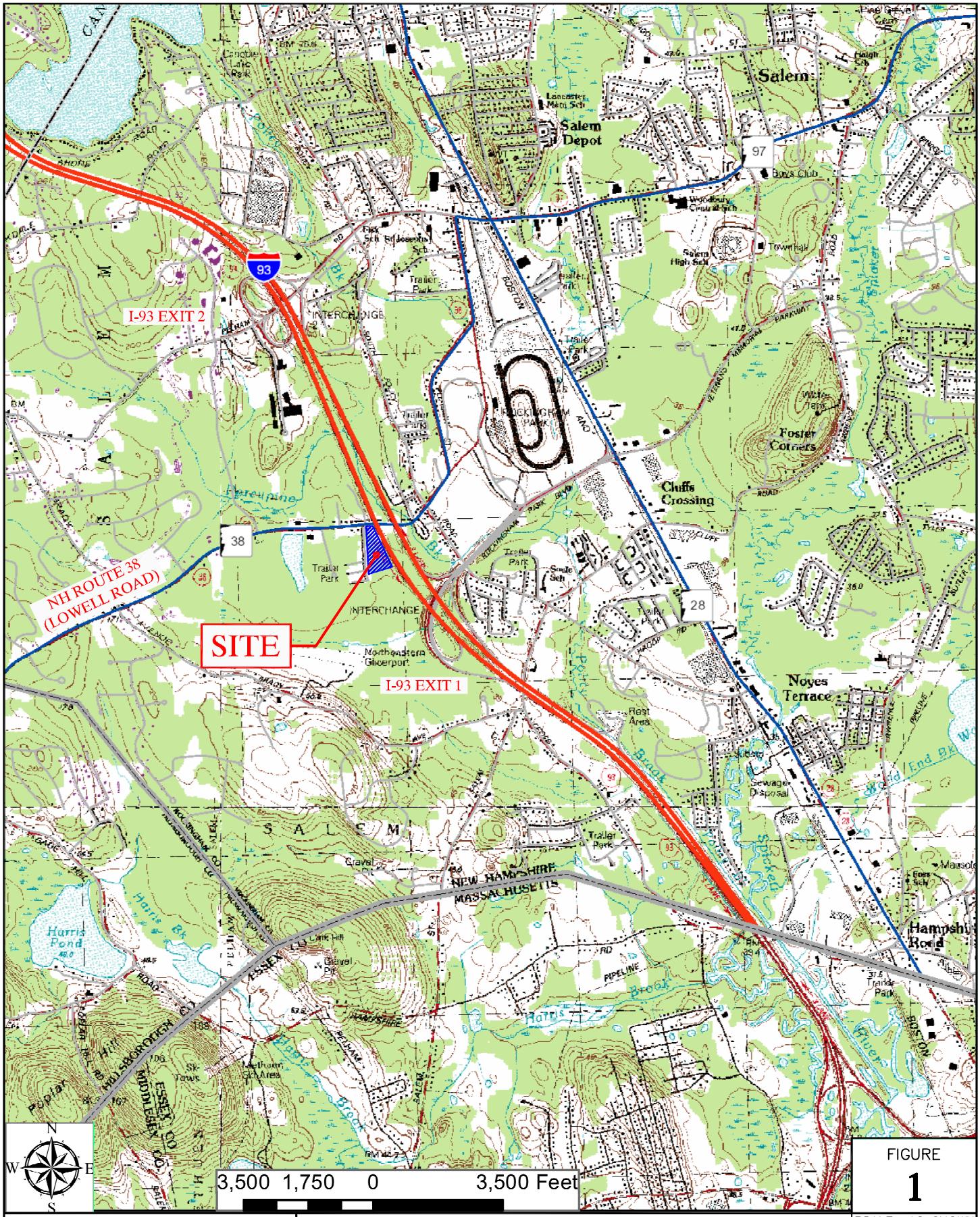
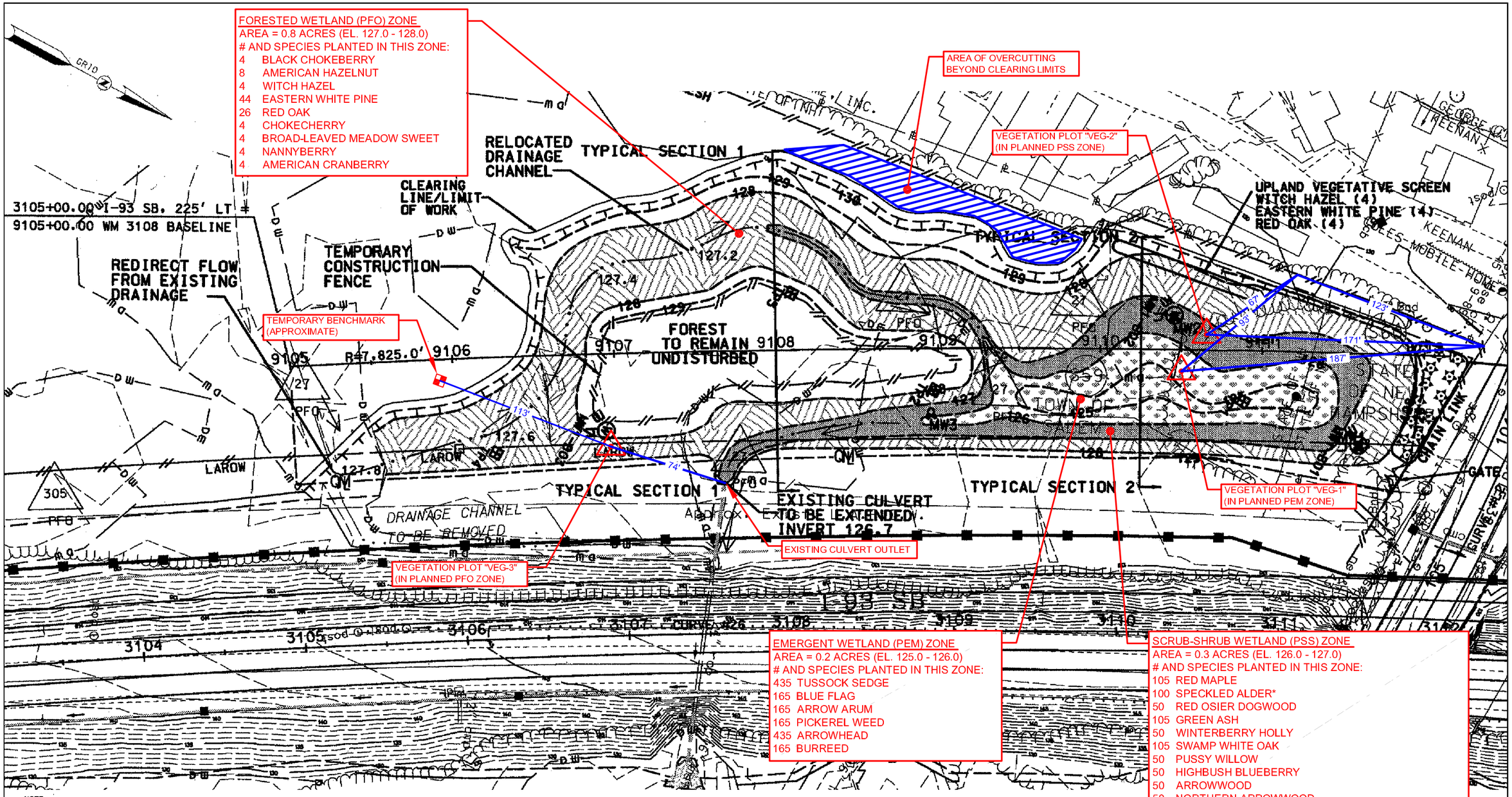


FIGURE
1

Pathways Consulting, LLC	SITE LOCATION MAP FOR
240 Mechanic Street, Suite 100 Lebanon, New Hampshire 03766 (603) 448-2200 FAX: (603) 448-1221	NHDOT SALEM-MANCHESTER A000(124), 13933D BAGGETT MITIGATION SITE SALEM, NEW HAMPSHIRE

SCALE:	AS SHOWN
DESIGNED BY:	SAW
DRAWN BY:	SAW
CHECKED BY:	SAW
DATE:	12/13/13
PROJ. NO.	12317

FIGURE 2
2013 BAGGETT MITIGATION SITE MONITORING PLAN



NOTE:

1. THE DESIRED WETLAND CLASSES ASSUMED THE FOLLOWING ELEVATIONS:

CLASS	ELEVATION	ACRES
EMERGENT MARSH	125-126	0.2
SCRUB-SHRUB	126-127	0.3
FORESTED WETLAND	127-128	0.8
		1.3 TOTAL

2. SEE PLANTING DETAILS FOR ADDITIONAL PLANTING AND SEEDING NOTES.

NOTE:

1. REFERENCE IS MADE TO A PLAN ENTITLED "WETLAND MITIGATION 3108 PLANTING PLAN" PREPARED BY THE LOUIS BERGER GROUP, INC., DATED 09/17/2010, FOR NHDOT I-93 SALEM-MANCHESTER CORRIDOR WIDENING, NHDOT PROJECT NO. 13933D, SHEET 650.

REVISION NO.	DATE	DESCRIPTION	MADE BY	CHECKED BY	APPROVED BY

2013 BAGGETT MITIGATION SITE MONITORING PLAN FOR

NHDOT SALEM-MANCHESTER A000(124), 13933D

BAGGETT MITIGATION SITE, I-93 & NH ROUTE 38, SALEM, NEW HAMPSHIRE

PATHWAYS CONSULTING, LLC
240 MECHANIC STREET, SUITE 100
LEBANON, NEW HAMPSHIRE 03766
(603) 448-2200

SCALE: 1"= 60'	FIGURE 2
DESIGNED BY: SAW	
DRAWN BY: SAW	
CHECKED BY: SAW	
DATE: 12/13/13	
PROJ. NO. 12317	SHEET 1 OF 1

APPENDIX A
SITE PHOTOGRAPHS

Photograph No. 1 (taken 10/21/13): View from the northwest corner of the site near NH Route 38 looking southeast.

Photograph No. 2 (taken 10/21/13): View from the northeast corner of the site near NH Route 38 looking southwest across the northern portion of the emergent wetland.

Photograph No. 3 (taken 10/21/13): View of animal tracks in the drier portion of the emergent wetland area.

Photograph No. 4 (taken 10/21/13): View of animal tracks in the drier portion of the emergent wetland area.

Photograph No. 5 (taken 10/21/13): View of animal tracks in the drier portion of the emergent wetland area.

Photograph No. 6 (taken 10/21/13): View from the east side of the site near the existing culvert outlet looking to the northwest across the emergent wetland area dominated by Cattails. Note the Glossy Buckthorn in the background.

Photograph No. 7 (taken 10/21/13): View from the east side of the site near the existing culvert outlet looking to the west across the scrub-shrub wetland and the existing forested area in the central portion of the site.

Photograph No. 8 (taken 10/21/13): View from the east side of the site south of the existing culvert outlet looking north. Note the stand of invasive Buckthorn.

Photograph No. 9 (taken 10/21/13): View from the northwest corner of the site looking south along the planted tree buffer.

Photograph No. 10 (taken 10/21/13): View from the north portion of the site looking to the east across the northern portion of the site and the planted tree buffer.

Photograph No. 11 (taken 10/21/13): View near Vegetation Plot #1 showing saturation in a low spot filled with tadpoles within the emergent wetland.

Photograph No. 12 (taken 10/21/13): View near the north end of the existing forested area in the central portion of the site looking south across the scrub-shrub wetland area.

Photograph No. 13 (taken 10/26/13): View at Vegetation Plot #1 in the emergent wetland area looking west toward Vegetation Plot #2 in the scrub-shrub wetland.

Photograph No. 14 (taken 10/26/13): View of the soil test hole at Vegetation Plot #1.

Photograph No. 15 (taken 10/26/13): View of the soil test hole at Vegetation Plot #2.

Photograph No. 16 (taken 10/26/13): View of the soil test hole at Vegetation Plot #3.

Photograph No. 17 (taken 10/26/13): View at Vegetation Plot #3 in the planned forested wetland area looking south. Note the invasive Buckthorn to the south.

APPENDIX B
PROJECT PERMITS

The State of New Hampshire

DEPARTMENT OF ENVIRONMENTAL SERVICES

Thomas S. Burack, Commissioner

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
Waterbody: Unnamed Wetland

NOTE--
CONDITIONS

APPROVAL DATE: 05/02/2011 **EXPIRATION DATE: 05/02/2016**

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.

TIME EXTENSION

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 practicable.
7. This permit shall not be effective until it has been recorded with the county Registry of Deeds offices by NHDOT. A copy of the registered permit shall be submitted to NHDES prior to construction.

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 adjacent to a wetland resource, 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 New Hampshire Stormwater Manual, Volume 3, Erosion and Sediment Controls During Construction (December 2008).

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 THAT 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, and/or consult with other agencies as may be required (including US EPA, US Army Corps of Engineers, NH Department of Transportation, NH Division of Historical Resources (NH Department of Cultural Resources), NHDES-Alteration of Terrain, etc.);
5. Transfer of this permit to a new owner shall require notification to and approval by DES;
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. Review enclosed sheet for status of the US Army Corps of Engineers' federal wetlands permit.

APPROVED: _____
Collis G. Adams
Bureau Administrator
DES Wetlands Bureau

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

William J. Cass, P.E.
Director of Project Development
NHDOT

OWNER'S SIGNATURE (required)

CONTRACTOR'S SIGNATURE (required)

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 Lee — 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: 1986 — 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.

APPENDIX C
NHDOT PROJECT PLANS

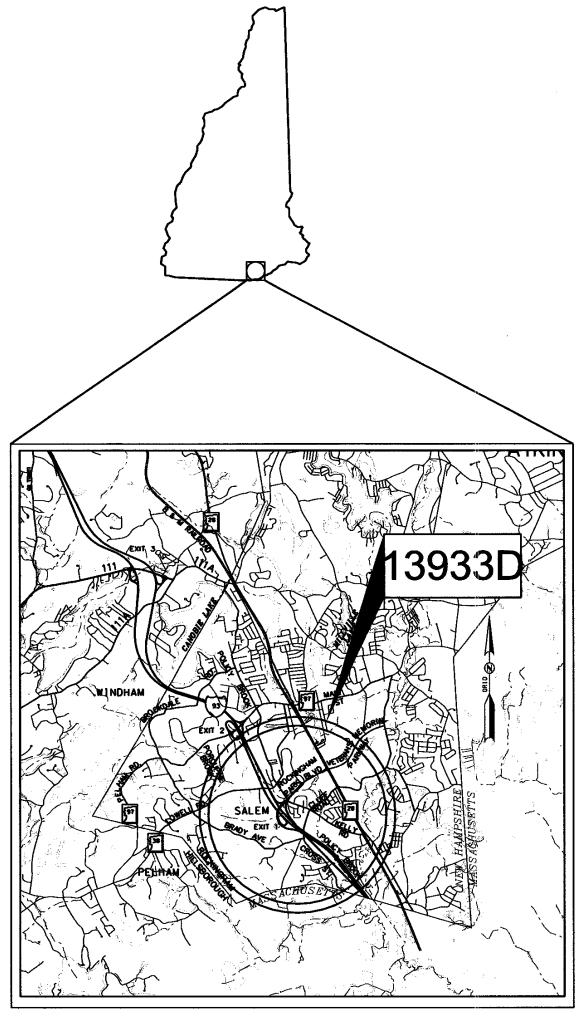
STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION

CONSTRUCTION PLANS
I93 SALEM-MANCHESTER
CORRIDOR WIDENING

A000(124)
N.H. PROJECT NO. 13933D
I-93 MAINLINE (EXIT 1 AREA)
INCLUDING RAMPS RECONSTRUCTION
VOLUME I OF II

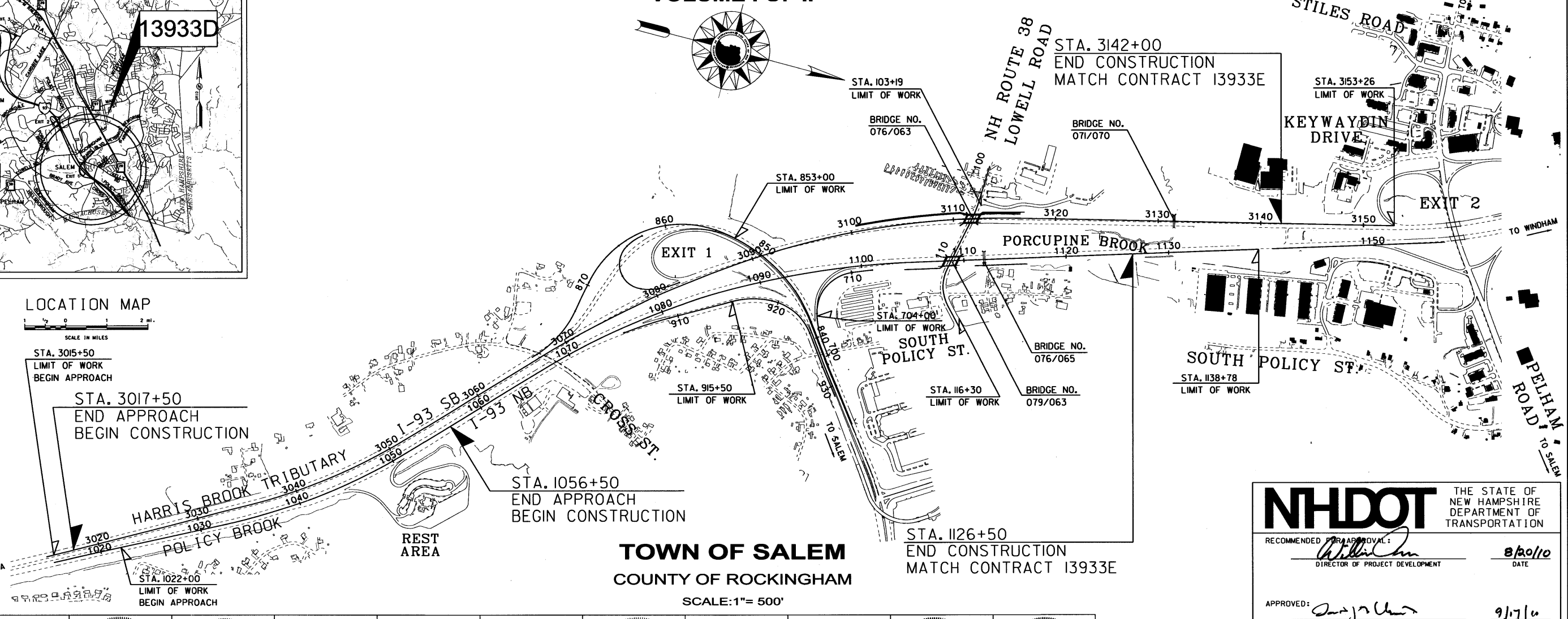
DESIGN DATA

NB		SB	
AVERAGE DAILY TRAFFIC 2007	55,600	AVERAGE DAILY TRAFFIC 2007	55,600
AVERAGE DAILY TRAFFIC 2025	71,800	AVERAGE DAILY TRAFFIC 2025	71,800
PERCENT TRUCKS	8%	PERCENT TRUCKS	6%
DESIGN SPEED	70 MPH	DESIGN SPEED	70 MPH
LENGTH OF PROJECT	11,620 LF	LENGTH OF PROJECT	13,750 LF
NB ON-RAMP		**SB ON-RAMP**	
AVERAGE DAILY TRAFFIC 2007	3,450	AVERAGE DAILY TRAFFIC 2007	15,600
AVERAGE DAILY TRAFFIC 2025	4,500	AVERAGE DAILY TRAFFIC 2025	20,400
PERCENT TRUCKS	---	PERCENT TRUCKS	---
DESIGN SPEED	35 MPH	DESIGN SPEED	50 MPH
LENGTH OF PROJECT	804 LF	LENGTH OF PROJECT	2,606 LF
NB OFF-RAMP		**SB OFF-RAMP**	
AVERAGE DAILY TRAFFIC 2007	16,500	AVERAGE DAILY TRAFFIC 2007	3,600
AVERAGE DAILY TRAFFIC 2025	21,600	AVERAGE DAILY TRAFFIC 2025	4,750
PERCENT TRUCKS	---	PERCENT TRUCKS	---
DESIGN SPEED	40 MPH	DESIGN SPEED	30 MPH
LENGTH OF PROJECT	1,103 LF	LENGTH OF PROJECT	1,114 LF



LOCATION MAP

SCALE IN MILES



TOWN OF SALEM
COUNTY OF ROCKINGHAM

SCALE:1"= 500'

DRAWN BY KAJ DATE 07/08
CHECKED BY J. HILTON DATE 2/10

JASON M. HILTON No. 12199 LICENSED PROFESSIONAL ENGINEER	TODD M. CLARK No. 10256 LICENSED PROFESSIONAL ENGINEER	STEVEN M. HODGDON No. 10276 LICENSED PROFESSIONAL ENGINEER	JOHN G. STOCKTON No. 9141 LICENSED PROFESSIONAL ENGINEER	BRIAN A. VINCENT NO. 8956 LICENSED PROFESSIONAL ENGINEER	MARK R. RICHARDSON LICENSED PROFESSIONAL ENGINEER	TODD M. CLARK No. 10256 LICENSED PROFESSIONAL ENGINEER	MARK D. SUSMANN No. 11808 LICENSED PROFESSIONAL ENGINEER	ROBERT JACOB SAUNDERS No. 11837 LICENSED PROFESSIONAL ENGINEER	JASON M. HILTON No. 12199 LICENSED PROFESSIONAL ENGINEER	ROBERT JACOB SAUNDERS No. 11837 LICENSED PROFESSIONAL ENGINEER
HIGHWAY DESIGN I-93 NB, SB & LOWELL ROAD (VHB)	HIGHWAY DESIGN EXIT 1 RAMPS (HTA)	BRIDGE DESIGN BRIDGE NO: 076/063 & 079/063 (VHB)	BRIDGE DESIGN BRIDGE NO: 076/065 & 071/070 (LBG)	SOUND WALLS (NOBIS)	SOUND WALL FOOTING NORTH OF LOWELL ROAD (NHDOT)	RETAINING WALLS (HTA)	I.T.S. & VARIABLE SPEED LIMIT (VHB)	STORMWATER QUALITY DESIGN NB 1095, DE 3082 & VEGETATED TREATMENT SWALE (LBG)	STORMWATER QUALITY DESIGN BMP 1060, BMP 3129 & DRY SWALE (VHB)	WETLAND MITIGATION (LBG)

NHDOT THE STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

RECOMMENDED FOR APPROVAL:
DIRECTOR OF PROJECT DEVELOPMENT — DATE 8/20/10

APPROVED:
ASSISTANT COMMISSIONER AND CHIEF ENGINEER — DATE 9/7/10

FEDERAL PROJECT NO.	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
A000(124)	13933D	1	658

SITE WORK			
ITEM NUMBER	DESCRIPTION	UNIT	QUANTITY
*201.1	CLEARING AND GRUBBING STA 3105+00 TO STA 3111+50	AC	1.6
*203.1	COMMON EXCAVATION	CY	6,111
*203.6	EMBANKMENT IN PLACE	CY	5
*304.399	TEMPORARY CRUSHED GRAVEL	CY	22
*607.1	WOVEN WIRE FENCE	LF	1,098
*607.41	POST ASSEMBLIES FOR WOVEN WIRE FENCE	EA	4
*607.655	CHAIN LINK FENCE WITH VINYL-COATED STEEL FABRIC, 5 FEET HIGH	LF	146
*607.659	POST ASSEMBLIES FOR CHAIN LINK FENCE, 5 FT. HIGH	EA	4
*607.82052	20 FT. OPENING CHAIN LINK DOUBLE GATE W/ALUM-CTD. STEEL FABRIC, 5 FT. HIGH	EA	1
643.12	FERTILIZER FOR INITIAL APPLICATION	TON	0.2
644.74	UPLAND SEED MIX	LB	12
644.77	WETLAND SEED MIX	LB	31
*645.119	MULCH WITH TACKIFIERS	AC	1.8
*645.52	RYEGRASS FOR TEMPORARY EROSION CONTROL	LB	75
*645.512	BIO-DEGRABLE FILTRATION SOCK FOR EROSION CONTROL	LF	500
647.16	HUMUS, 6" DEEP	CY	340
*647.29	WETLAND HUMUS	CY	2,200
650.2	LANDSCAPING	EA	1
659.401	LANDSCAPE ESTABLISHMENT CREW (4 MEN - 8 HOUR DAY)	DAY	20
670.95	TEMPORARY SAFETY FENCE	LF	130
1008.5	ALTERATIONS AND ADDITIONS AS NEEDED - MOUND AND POOL MICROTOPOGRAPHY	$	10,000
*1008.52	ALTERATIONS AND ADDITIONS AS NEEDED - DEWATERING	$	10,000
* NOT ITEM TOTAL			

ITEM 650.2: LANDSCAPING					
DESCRIPTION					
BOTANICAL NAME	COMMON NAME	STOCK	SIZE	UNIT	QUANTITY
ACER RUBRUM	RED MAPLE	P.C	2 GAL	EA	105
ALNUS RUGOSA	SPECKLED ALDER	P.C	1 GAL	EA	50
ARONIA MELANOCARPA	BLACK CHOKEBERRY	P.C	1 GAL	EA	4
CAREX STRICTA	TUSSOCK SEDGE	R.S.	N.A.	EA	435
CORNUS SERICACEA	RED OSIER DOGWOOD	P.C	1 GAL	EA	50
CORYLUS AMERICANA	AMERICAN HAZELNUT	P.C	1 GAL	EA	8
FRAXINUS PENNSYLVANICA	GREEN ASH	P.C	2 GAL	EA	105
HAMAMELIS VIRGINIANA	WITCH HAZEL	P.C	1 GAL	EA	4
ILEX VERTICILLATA	WINTERBERRY HOLLY	P.C	1 GAL	EA	50
IRIS VERSICOLOR	BLUE FLAG	R.S.	N.A.	EA	165
PELTANDRA VIRGINICA	ARROW ARRUM	R.S.	N.A.	EA	165
PINUS STROBUS	EASTERN WHITE PINE	B&B	4 FT	EA	44
PONTEDERIA CORDATA	PICKERELWEED	R.S.	N.A.	EA	165
QUERCUS BICOLOR	SWAMP WHITE OAK	P.C	2 GAL	EA	105
QUERCUS RUBRA	RED OAK	P.C	2 GAL	EA	26
PRUNUS VIRGINIANA	CHOKECHERRY	P.C	1 GAL	EA	4
SAGITTARIA LATIFOLIA	ARROWHEAD	R.S.	N.A.	EA	435
SALIX DISCOLOR	PUSSY WILLOW	P.C	1 GAL	EA	50
SPARGANIUM EURYCARPUM	BURREED	R.S.	N.A.	EA	165
SPIREA LATIFOLIA	BROAD-LEAVED MEADOW SWEET	P.C	1 GAL	EA	4
VACCINIUM CORYMBOSUM	HIGHBUSH BLUEBERRY	P.C	2 GAL	EA	50
VIBURNUM DENTATUM	ARROWWOOD	P.C	1 GAL	EA	50
VIBURNUM LENTAGO	NANNYBERRY	P.C	1 GAL	EA	4
VIBURNUM RECOGNITUM	NORTHERN ARROWWOOD	P.C	1 GAL	EA	50
VIBURNUM TRILOBUM	AMERICAN CRANBERRY	P.C	2 GAL	EA	4

PLANT NOTES

SUBSTITUTIONS:

DUE TO THE IMPORTANCE OF ESTABLISHING THE NATIVE SPECIES' PLANT COMMUNITIES SHOWN ON THE PLANS, SUBSTITUTION IN QUANTITIES, SIZE, KIND OR QUALITY OF PLANTS FROM THESE SPECIFICATIONS WILL BE PERMITTED ONLY BY APPROVAL OF THE WETLAND SCIENTIST.

LEGEND

P.C. POTTED CONTAINER

B&B BALLED AND BURLAP

R.S. ROOT STOCK

REVISIONS AFTER PROPOSAL

NUMBER	DESCRIPTION	STATION	STATION	DATE

		DATE
SDR PROCESSED		
NEW DESIGN	RJS-CJG	DATE 7-09-2010
SHEET CHECKED	FLD	DATE 7-09-2010
AS BUILT DETAILS		DATE

THE Louis Berger Group, INC.
Manchester, New Hampshire
(603) 644 5200

STATE OF NEW HAMPSHIRE

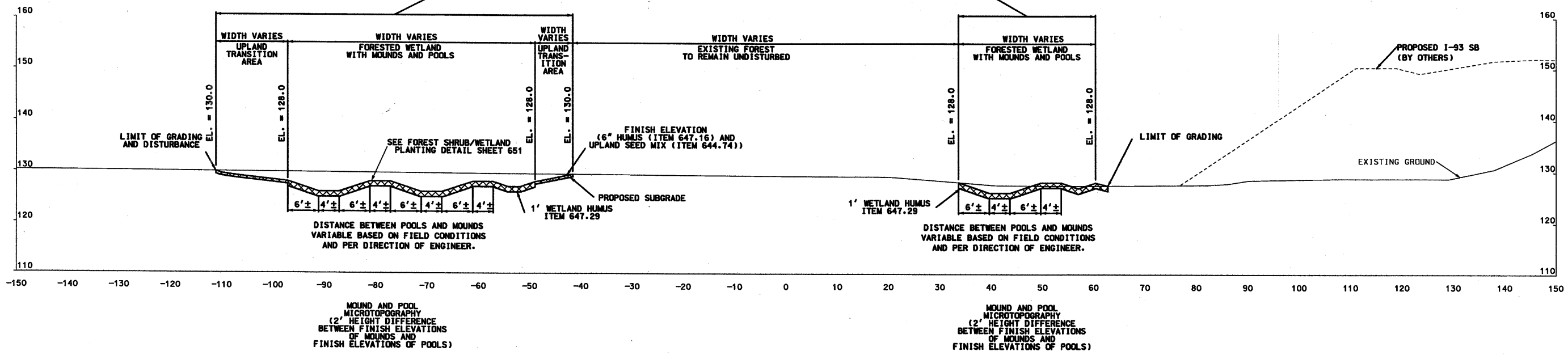
DEPARTMENT OF TRANSPORTATION ◦ BUREAU OF HIGHWAY DESIGN

WETLAND MITIGATION 3108
SUMMARY OF QUANTITIES

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
13933DSS01LBG	13933-D	644	658

VARIABLE WILDLIFE COVER
HETEROGENEOUS DISTRIBUTION OF THE FOLLOWING
3 FEATURES AS SPECIFIED AT 15' ON CENTER

- LOG (12'L x 16"DIA.)
- BRANCH (12' x 14')
- STUMP (3-4' AT BASE, ROOTS TO EXTEND 8-12')



MOUND AND POOL MICROTOPOGRAPHY (2' HEIGHT DIFFERENCE BETWEEN FINISH ELEVATIONS OF MOUNDS AND FINISH ELEVATIONS OF POOLS)

MOUND AND POOL MICROTOPOGRAPHY (2' HEIGHT DIFFERENCE BETWEEN FINISH ELEVATIONS OF MOUNDS AND FINISH ELEVATIONS OF POOLS)

TYPICAL SECTION 1
N.T.S.

REVISIONS AFTER PROPOSAL

DESCRIPTION	STATION	STATION	NUMBER	DATE

SDR PROCESSED		DATE
NEW DESIGN	RJS-CJG	DATE 7-09-2010
SHEET CHECKED	FLD	DATE 7-09-2010
AS BUILT DETAILS		DATE

THE Louis Berger Group, INC.
Manchester, New Hampshire
(603) 644 5200

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

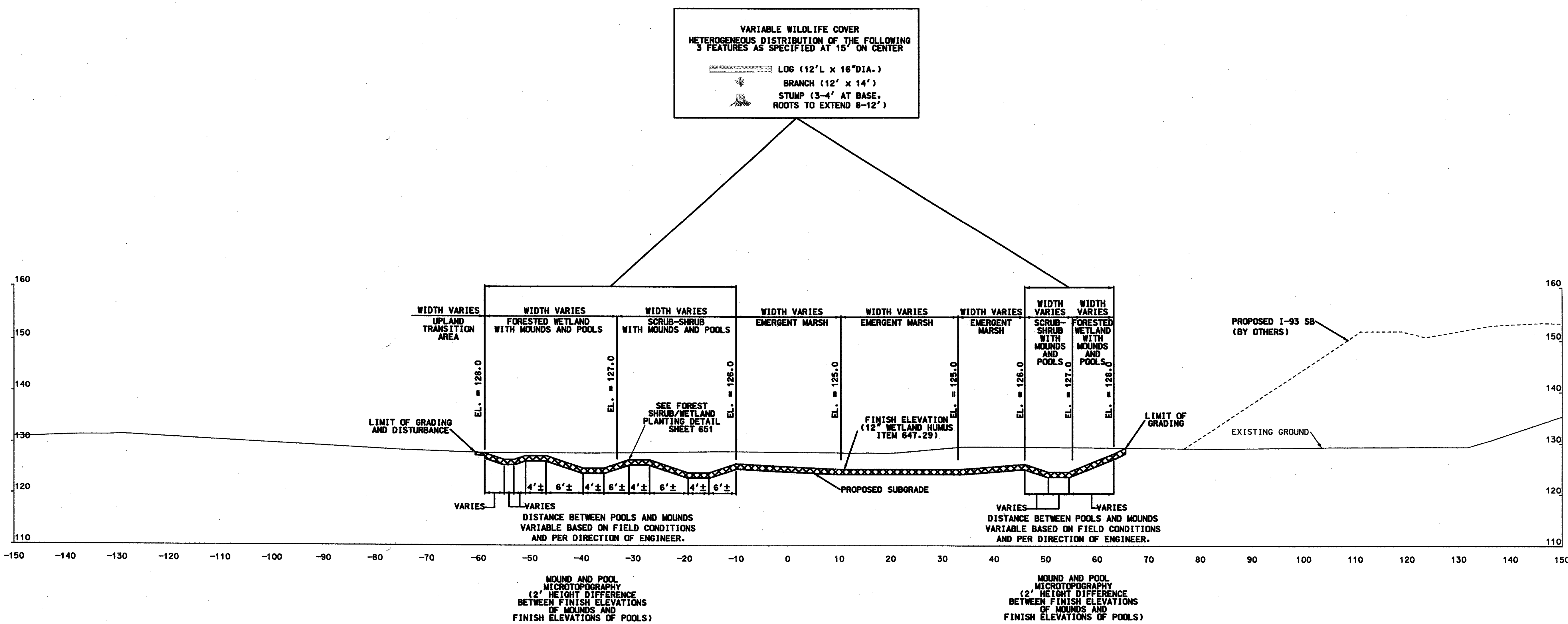
WETLAND MITIGATION 3108
TYPICAL SECTION 1

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
13933DTY01LBG	13933-D	645	658

SDR PROCCESSED		DATE
NEW DESIGN	RJS-CJG	DATE 7-09-2010
SHEET CHECKED	FLD	DATE 7-09-2010
AS BUILT DETAILS		DATE

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	STATION	DESCRIPTION



TYPICAL SECTION 2

N.T.S.

THE Louis Berger Group, INC.
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(603) 644 5200

STATE OF NEW HAMPSHIRE

DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

WETLAND MITIGATION 3108
TYPICAL SECTION 2

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
13933DTY02LBG	13933-D	646	658

SDR PROCCESSED		DATE
NEW DESIGN	RJS-CJG	DATE 7-09-2010
SHEET CHECKED	FLD	DATE 7-09-2010
AS BUILT DETAILS		DATE

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	STATION	DESCRIPTION

OBSERVATION WELL INSTALLATION LOG

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
MATERIALS & RESEARCH - GEOTECHNICAL SECTION
PROJECT SALEM-MANCHESTER 10418
DESCRIPTION Wetland Mitigation Sites

WELL NO. OW1-B01

STA. 1111+44 OFF. LT 129
BASELINE I-93 SB CL
ELEVATION (ft) 129.5
START/END 5/22/06 / 5/22/06
INSPECTOR Craig Cleveland
NORTH/EAST (ft) 96953/1099236

DRILL RIG CME 45-C Trlr
BOREHOLE DIAMETER 3.615 in

GROUNDWATER	DEPTH (ft)	ELEV. (ft)
1. 5/22/2006 at 2:00 pm	2.2	127.3

Elev. (ft)	Depth (ft)	MATERIAL DESCRIPTION
	0	Dark brown, loamy TOPSOIL, mixed w/ black, FINE SAND, some-little silt, w/ pockets of dark brown medium-fine sand -FILL-
128.5		Dark yellowish brown, MEDIUM-FINE SAND
		Loose, dark yellowish brown, MEDIUM-FINE SAND, trace coarse sand -GLACIAL OUTWASH-
	5	Medium dense, dark yellowish brown to greyish brown, MEDIUM-FINE SAND, trace coarse sand
		Medium dense, greyish brown, MEDIUM-FINE SAND, trace coarse sand
		Loose, greyish brown, FINE SAND, w/ dark yellowish brown mottles
119.5	10	Loose, olive, SILT
		Loose, olive, SILT
	15	Medium dense, olive to grey, SILT
		Loose, grey, SILT
		Loose, grey, SILT
	20	Advanced hole to 22.0' w/ roller bit
		Bottom of Exploration @ 22.0 ft (El. 107.5)
	25	Note: Monitoring well installed in completed test boring. See observation well log for details.

Remarks: Observation well constructed of 1.5 in. PVC with a screened section of 0.010 in. machined slots.

SHEET 1 OF 1
ENGLISH

The stratification lines represent approximate boundaries. The transition may be gradual.

WELL-05 S:\GINTW\PROJECTS\SALEM TO MANCHESTER (10418-13933)\WETLAND MITIGATION SITES\SOUTH WETMIT BORINGS.GPJ 9/21/2006 1:31:19 PM WELL-05

OBSERVATION WELL INSTALLATION LOG

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
MATERIALS & RESEARCH - GEOTECHNICAL SECTION
PROJECT SALEM-MANCHESTER 10418
DESCRIPTION Wetland Mitigation Sites

WELL NO. OW1-B02

STA. 1109+03 OFF. LT 147
BASELINE I-93 SB CL
ELEVATION (ft) 129.2
START/END 6/27/06 / 6/27/06
INSPECTOR John Woodward
NORTH/EAST (ft) 96727/1099333

DRILL RIG CME 45-C Track rig
BOREHOLE DIAMETER 3.615 in

GROUNDWATER	DEPTH (ft)	ELEV. (ft)
1. 6/28/2006 at 9:00 am	1.8	127.4

Elev. (ft)	Depth (ft)	MATERIAL DESCRIPTION
128.8	0	Black, fibrous to sandy TOPSOIL, trace muck
127.7		-SUBSOIL-
		Very loose, dark yellowish brown, MEDIUM-FINE SAND, little-trace silt Note: heavily mottled -GLACIAL OUTWASH-
	5	Medium dense, greyish brown-light yellowish brown, FINE SAND
		Loose, greyish brown, FINE SAND, trace medium sand
		Very loose, similar to S4
	10	Very loose, greyish brown, FINE SAND
		Very loose, similar to S6, occasional yellowish brown mottle
	15	Loose, greyish brown and olive, SILT (non-cohesive)
		Loose, olive, SILT, w/ occasional very thin layer grey clayey silt
		Medium dense, light olive, SILT, w/ occasional very thin layer grey clayey silt
	20	Bottom of Exploration @ 20.0 ft (El. 109.2)
	25	Note: Monitoring Well installed in completed test boring; see observation well log for details

Remarks: Observation well constructed of 1.5 in. PVC with a screened section of 0.010 in. machined slots.

SHEET 1 OF 1
ENGLISH

The stratification lines represent approximate boundaries. The transition may be gradual.

WELL-05 S:\GINTW\PROJECTS\SALEM TO MANCHESTER (10418-13933)\WETLAND MITIGATION SITES\SOUTH WETMIT BORINGS.GPJ 9/21/2006 1:31:37 PM WELL-05

OBSERVATION WELL INSTALLATION LOG

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
MATERIALS & RESEARCH - GEOTECHNICAL SECTION
PROJECT SALEM-MANCHESTER 10418
DESCRIPTION Wetland Mitigation Sites

WELL NO. WM1-B03(OW)

STA. 1106+89 OFF. LT 136
BASELINE I-93 SB CL
ELEVATION (ft) 128.9
START/END 6/26/06 / 6/27/06
INSPECTOR John Woodward
NORTH/EAST (ft) 96542/1099449

DRILL RIG
BOREHOLE DIAMETER

GROUNDWATER	DEPTH (ft)	ELEV. (ft)
Not Measured		- 128.9

Elev. (ft)	Depth (ft)	MATERIAL DESCRIPTION
128.4	0	Black, fibrous to "mucky" TOPSOIL
		Very loose, brown, MEDIUM-FINE SAND -GLACIAL OUTWASH-
		Very loose, greyish brown, MEDIUM-FINE SAND, little-trace coarse sand, occasional dark yellowish brown mottle
	5	Medium dense, brownish grey, MEDIUM-FINE SAND, occasional fine sand layer (stratified), occasional yellowish brown mottle
		Medium dense, similar to S3
		Medium dense, greyish brown and brownish grey, FINE SAND, slight trace of silt, occasional dark yellowish brown mottle
	10	Loose, greyish brown to olive, fine sandy SILT
		Loose, similar to S6
	15	Loose, brownish grey to grey, silty FINE SAND to FINE SAND, some silt
		Loose, brownish grey and grey, FINE SAND, little-trace silt
		Very loose, grey, FINE SAND, trace silt, w/ isolated 1" silt layer
	20	Bottom of Exploration @ 20.0 ft (El. 108.9)
	25	Note: Monitoring Well installed in completed test boring; see observation well log for details

Remarks: Observation well constructed of 1.5 in. PVC with a screened section of 0.010 in. machined slots.

SHEET 1 OF 1
ENGLISH

The stratification lines represent approximate boundaries. The transition may be gradual.

WELL-05 S:\GINTW\PROJECTS\SALEM TO MANCHESTER (10418-13933)\WETLAND MITIGATION SITES\SOUTH WETMIT BORINGS.GPJ 9/21/2006 1:31:52 PM WELL-05

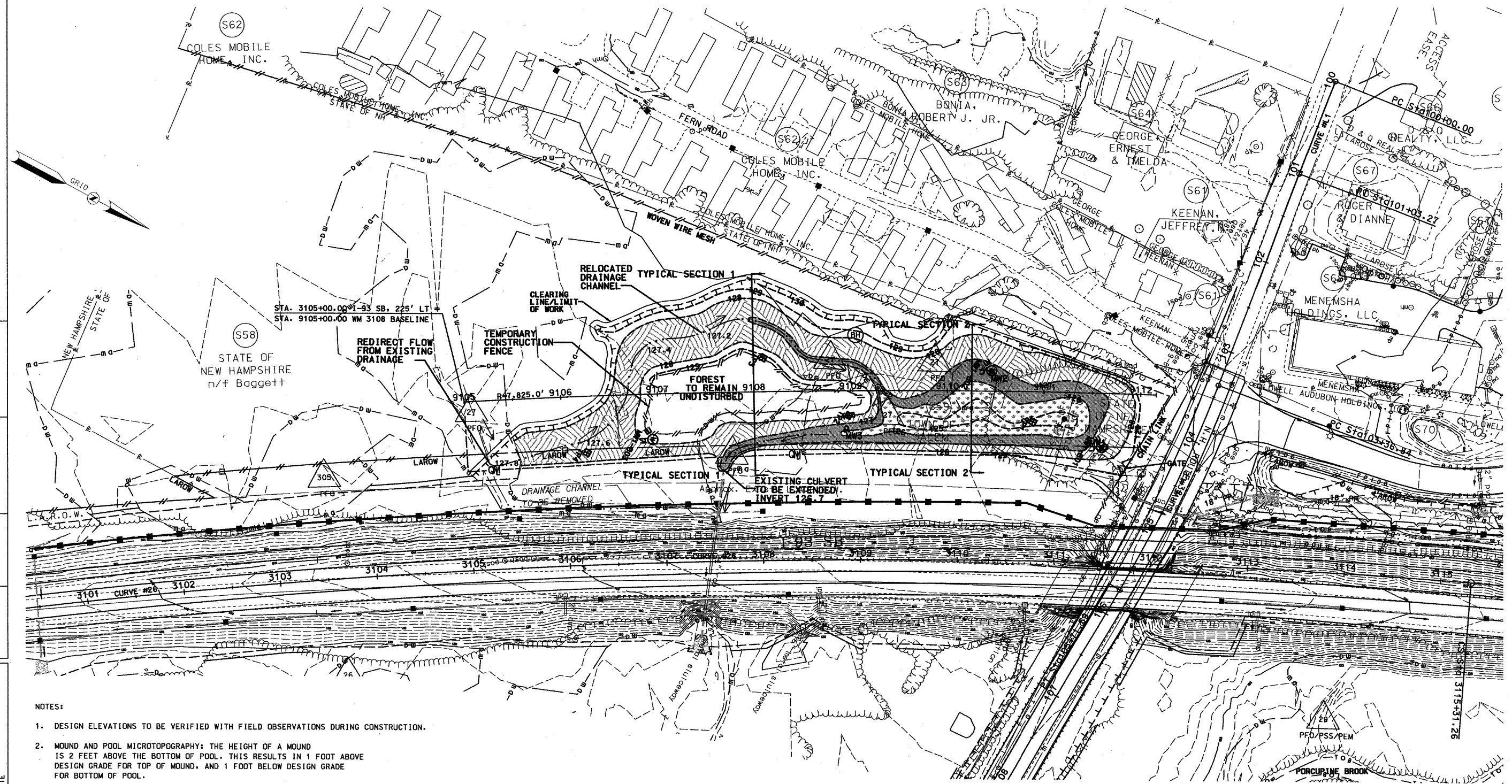
NOTE: SEE GRADING PLAN FOR WELL LOCATIONS

THE Louis Berger Group, INC.
Manchester, New Hampshire
(603) 644 5200

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

WETLAND MITIGATION 3108
WELL INSTALLATION LOGS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
13933DSW01LBG	13933-D	647	658



NOTES:

1. DESIGN ELEVATIONS TO BE VERIFIED WITH FIELD OBSERVATIONS DURING CONSTRUCTION.
2. MOUND AND POOL MICROTOPOGRAPHY: THE HEIGHT OF A MOUND IS 2 FEET ABOVE THE BOTTOM OF POOL. THIS RESULTS IN 1 FOOT ABOVE DESIGN GRADE FOR TOP OF MOUND, AND 1 FOOT BELOW DESIGN GRADE FOR BOTTOM OF POOL.
3. THE DESIRED WETLAND CLASSES ASSUMED THE FOLLOWING ELEVATIONS:

CLASS	ELEVATION	ACRES
EMERGENT MARSH	125–126	0.2
SCRUB–SHRUB	126–127	0.3
FORESTED WETLAND	127–128	0.8
		1.30 TOTAL

50 0 50 100
SCALE IN FEET

THE Louis Berger Group, INC.
Manchester, New Hampshire
(603) 644 5200

REVISIONS AFTER PROPOSAL	NUMBER	DATE	STATION
DESCRIPTION			
STATION			

		DATE
SDR PROCESSED		
NEW DESIGN	RJS–CJG	7–09–2010
SHEET CHECKED	FLD	7–09–2010
AS BUILT DETAILS		DATE

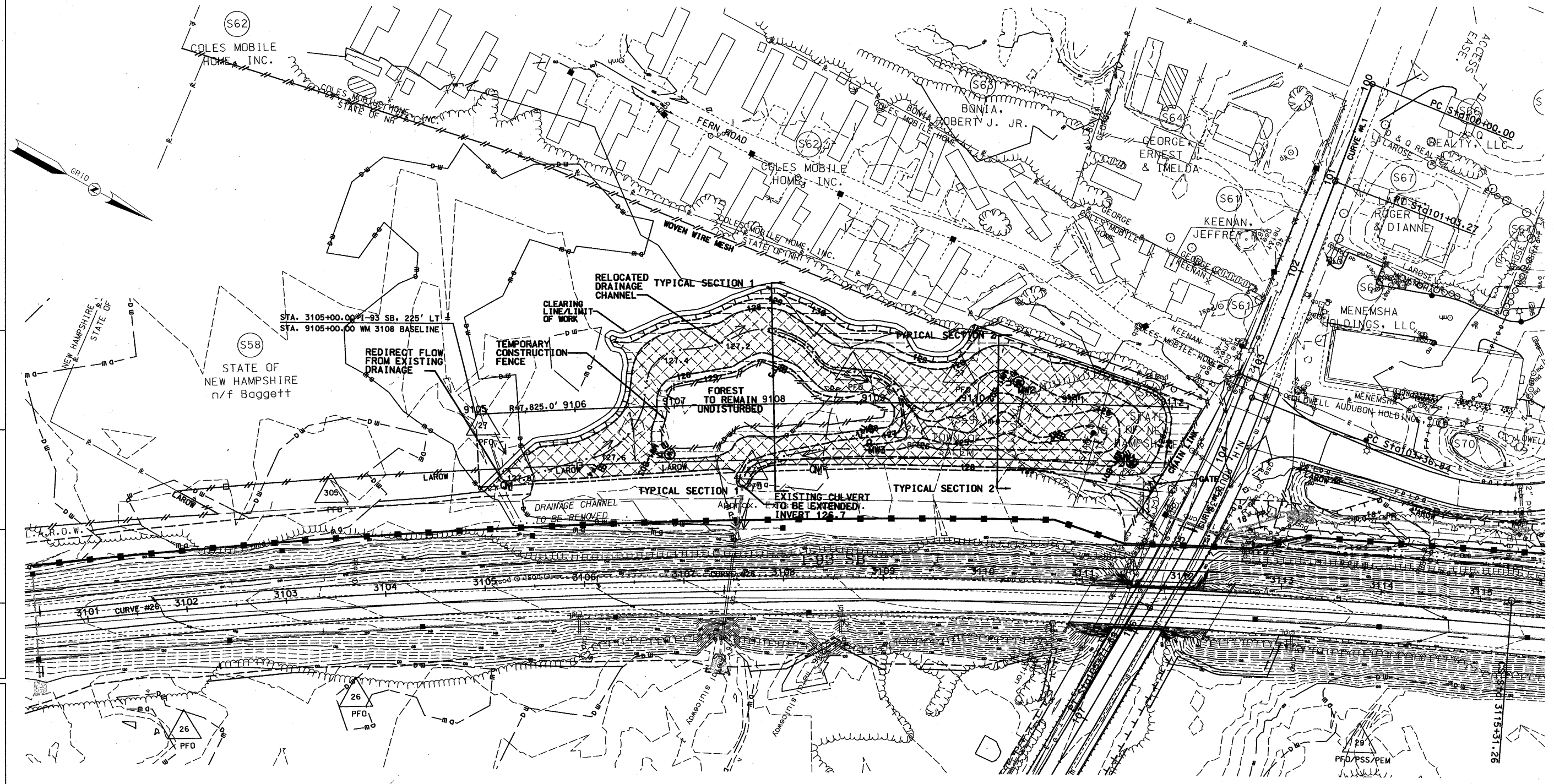
STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION ◦ BUREAU OF HIGHWAY DESIGN

WETLAND MITIGATION 3108 GRADING PLAN

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
13933DG00LBG	13933–D	648	658

REVISIONS AFTER PROPOSAL			
STATION	DESCRIPTION	NUMBER	DATE
STATION			

		DATE
SDR PROCCESSED		
NEW DESIGN	RJS-CJG	DATE 7-09-2010
SHEET CHECKED	FLD	DATE 7-09-2010
AS BUILT DETAILS		DATE



NOTES:

1. WETLAND HUMUS WILL BE SALVAGED FROM IMPACTED WETLANDS ALONG THE I-93 CORRIDOR. SHOULD QUANTITIES BE INSUFFICIENT, A MANUFACTURED SOIL MADE TO U.S. ARMY CORPS OF ENGINEERS REQUIREMENTS (SEE GUIDELINES FOR MITIGATION PLAN CHECKLIST, JANUARY 12, 2007) SHALL BE SUBSTITUTED.

LEGEND

WETLAND HUMUS 12"
ITEM #647.29

HUMUS 6"
ITEM #647.16

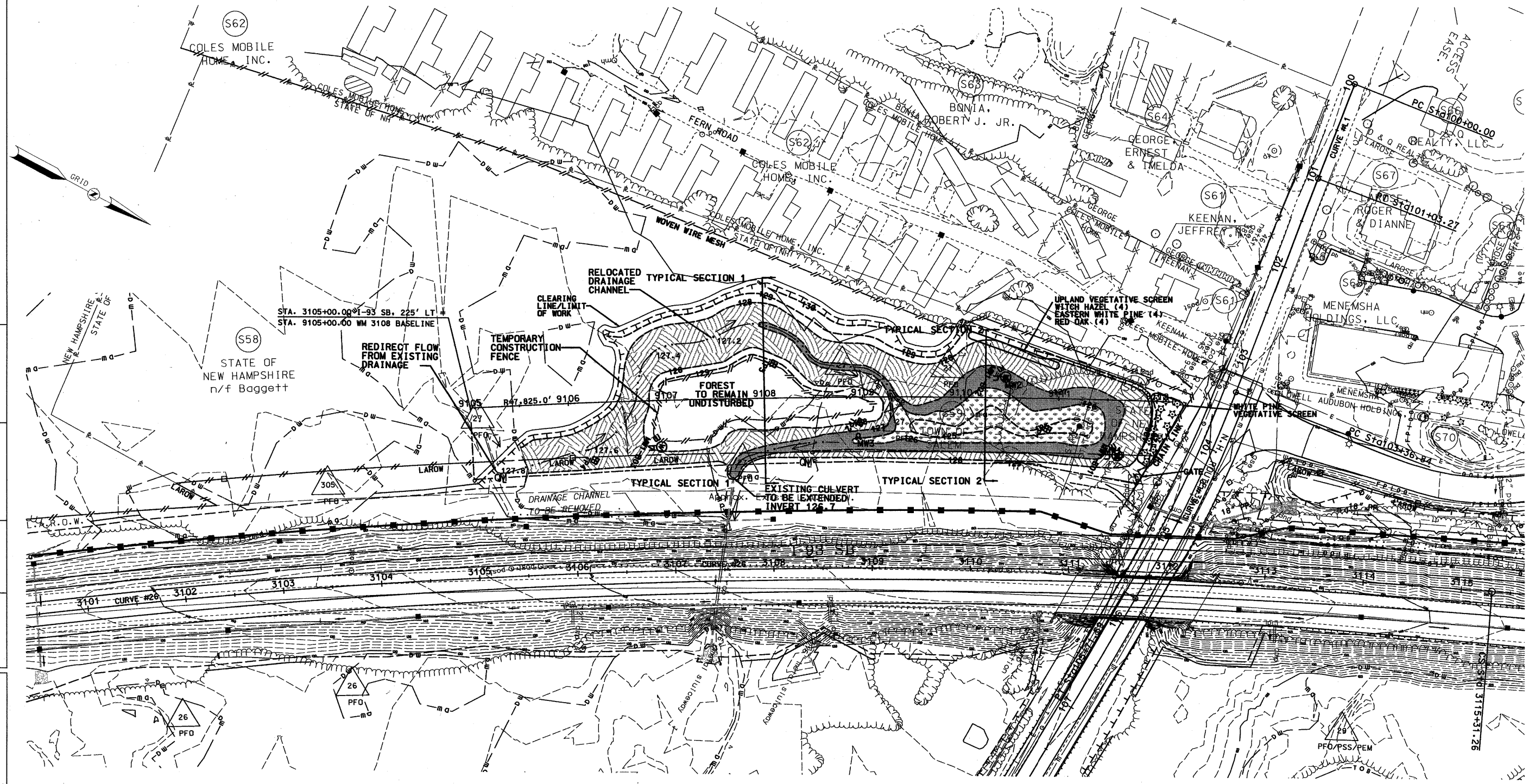
50 0 50 100
SCALE IN FEET

THE Louis Berger Group, INC.
Manchester, New Hampshire
(603) 644 5200

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

WETLAND MITIGATION 3108 SOILS PLAN

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
13933DS01LBG	13933-D	649	658



NOTE:

1. THE DESIRED WETLAND CLASSES ASSUMED THE FOLLOWING ELEVATIONS:

	CLASS	ELEVATION	ACRES
	EMERGENT MARSH	125-126	0.2
	SCRUB-SHRUB	126-127	0.3
	FORESTED WETLAND	127-128	0.8
			1.3 TOTAL

2. SEE PLANTING DETAILS FOR ADDITIONAL PLANTING AND SEEDING NOTES.

50 0 50 100
SCALE IN FEET

NUMBER	DATE	STATION	DESCRIPTION
		STATION	REVISIONS AFTER PROPOSAL

	DATE
SDR PROCESSED	
NEW DESIGN	RJS-CJG DATE 7-09-2010
SHEET CHECKED	FLD DATE 7-09-2010
AS BUILT DETAILS	DATE

THE Louis Berger Group, INC.
Manchester, New Hampshire
(603) 644 5200

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

WETLAND MITIGATION 3108 PLANTING PLAN

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
13933DP01LBG	13933-D	650	658

PLANTING NOTES:

SCRUB-SHRUB FOREST WETLAND AND UPLAND TRANSITION:

1. WOODY PLANTS SHALL BE KEPT MOIST AND COOL WHILE ON SITE.
2. IF WATER TRUCK ACCESS IS LIMITED, OTHER MEANS FOR PLANT WATERING WILL BE REQUIRED.
3. PLANT SPACING IS VARIABLE DEPENDING UPON SPECIFIC SITE CONDITIONS. ON AVERAGE, SHRUBS WILL BE PLANTED APPROXIMATELY 6 FT. ON-CENTER, TREES WILL BE PLANTED 10 FT. ON-CENTER.
4. PLANTING WILL OCCUR IN LIKE SPECIES CLUSTERS PER DIRECTION OF WETLAND SCIENTIST.
5. CONTAINER GROWN OR BALLED AND BURLAPPED PLANTS WILL BE PLANTED DURING EARLY SPRING AND/OR FALL.

EMERGENT MARSH:

1. THE CONTRACTOR WILL BE REQUIRED TO HAVE REFRIGERATOR UNIT ON SITE TO STORE HERBACEOUS PLANT MATERIALS PRIOR TO PLANTING TO PREVENT SPOILAGE.
2. HERBACEOUS PLANT MATERIALS WILL BE CONTAINER GROWN (1 QUART OR SMALLER). TUBERS, BULBS OR ROOTSTOCKS WILL BE HAND PLANTED IN SATURATED SOIL TO A WATER DEPTH OF APPROXIMATELY 18 INCHES PER RECOMMENDATIONS OF THE SUPPLIER.
3. HERBACEOUS PLANT MATERIAL WILL BE PLANTED 24-36 INCH ON CENTER IN IRREGURARLY SHAPED CLUSTERS PER DIRECTION OF THE WETLAND SCIENTIST.
4. FERTILIZER TABLETS WILL BE INSTALLED WITH THE PLANT MATERIAL AT THE DIRECTION OF THE WETLAND SCIENTIST.

RESTORATION & STABILIZATION AREA:

1. EXISTING WOODY VEGETATION IN THE AREA TO BE MAINTAINED AND PROTECTED FROM INJURY. ALL EXPOSED SOILS WILL BE SEEDED WITH EITHER WETLAND OR UPLAND SEED MIX. MULCH WILL BE APPLIED PER ITEM 645.11.

Wetland Seed Mix (ITEM #644.77)

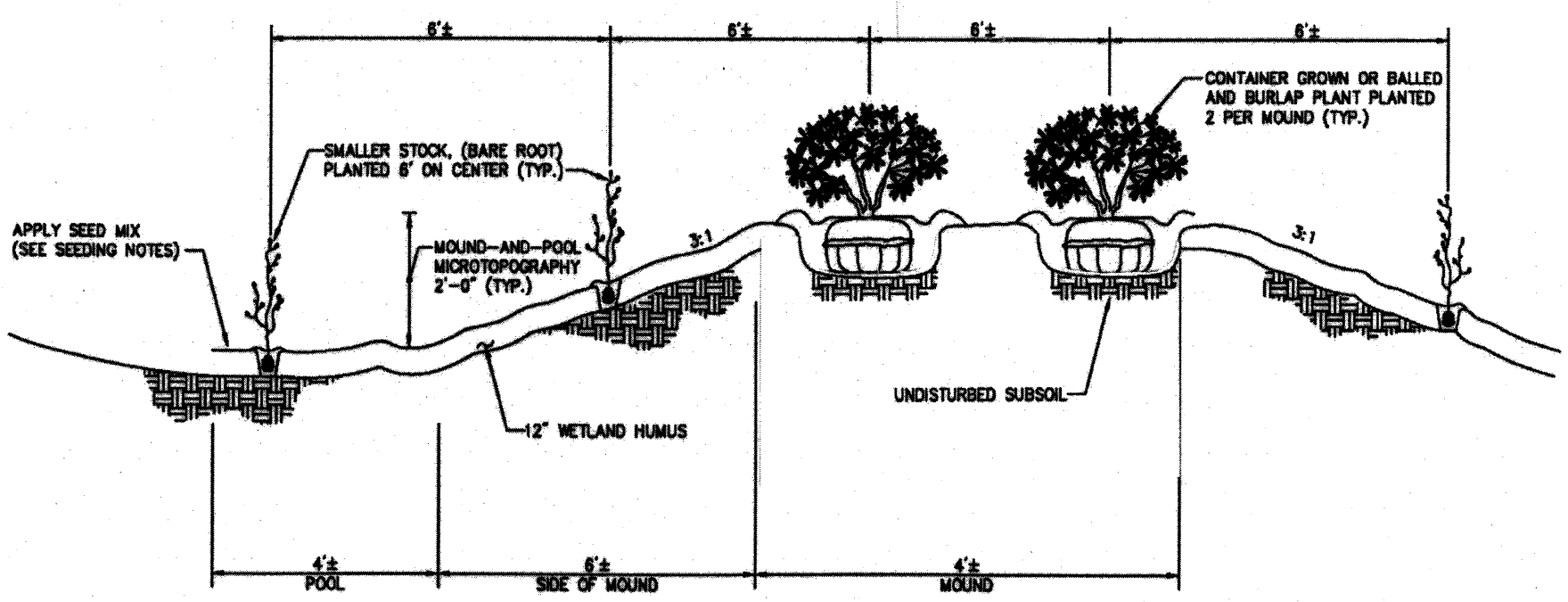
Botanical Name	Common Name	Lbs/Acre
Agrostis scarra	Tickle Grass	6
Asclepias incarnata	Marsh Milkweed	0.5
Carex vulpinoidea	Fox Sedge	2
Festuca rubra	Creeping Red Fescue	10
Polygonum pennsylvanicum	Pennsylvania Smartweed	3
Verbena hastata	Blue Vervain	2
Total Seeding Rate		23.5*

*Seeding Rate (Pure Live Seed) = 26.34 kg /hectare [23.5 lbs./Acre]

Upland Seed Mix (Item #644.74)

Botanical Name	Common Name	Lbs/Acre
Chrysanthemum leucanthemum	Ox Eye Daisy	3.5
Coreopsis lanceolata	Lanceleaf Coreopsis	4.25
Cichorium intybus	Chicory	1.5
Oenothera lamarckiana	Evening Primrose	1.5
Festuca rubra	Creeping Red Fescue	8
Giallardia puchella	Indian Blanket	3.75
Hesperis matronalis	Dames' Rocket	1.5
Panicum virgatum	Switchgrass	1.5
Rudbeckia hirta	Black-eyed Susan	3
Total Seeding Rate		28.50*

*Seeding Rate (Pure Live Seed) = 31.95 kg /hectare [28.50 lbs/Acre]



FOREST/SHRUB WETLAND PLANTING DETAIL

NOT TO SCALE

REVISIONS AFTER PROPOSAL

STATION	DESCRIPTION
STATION	
STATION	

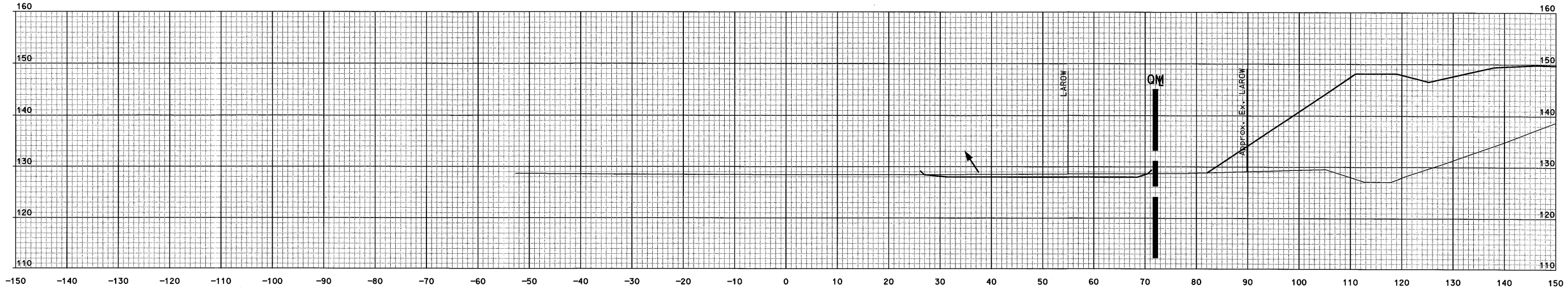
NUMBER	DATE

	DATE
SDR PROCESSED	
NEW DESIGN	RJS-CJG DATE 7-09-2010
SHEET CHECKED	FLD DATE 7-09-2010
AS BUILT DETAILS	DATE

THE Louis Berger Group, INC.
Manchester, New Hampshire
(603) 644 5200

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION ◦ BUREAU OF HIGHWAY DESIGN
WETLAND MITIGATION 3108 PLANTING DETAILS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
13933DP02LBG	13933-D	651	658



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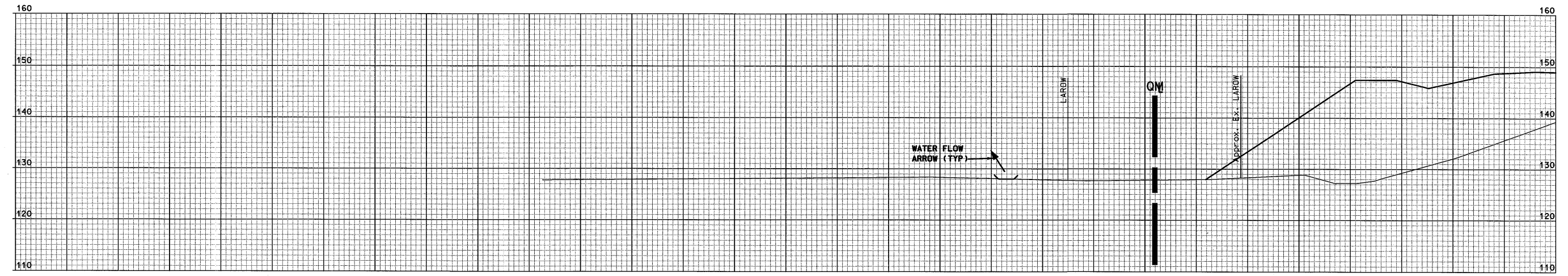

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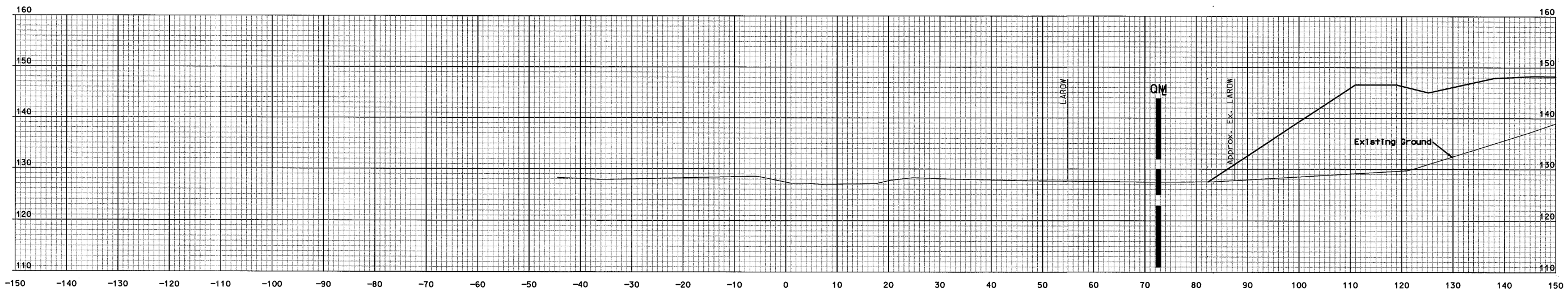


9105+00

SEE GRADING PLAN (SHEET NO 648)
FOR SPOT ELEVATIONS

WETLAND MITIGATION 3108

REVISIONS AFTER PROPOSAL

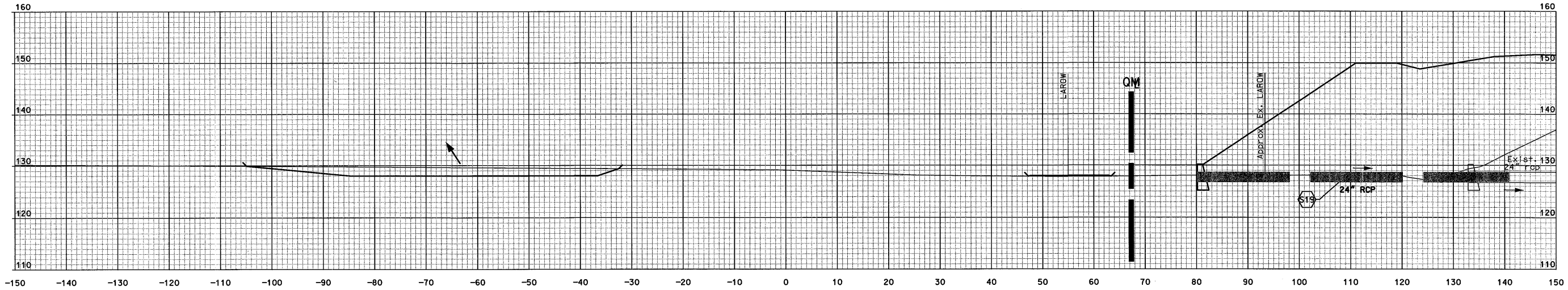
NUMBER	DESCRIPTION	STATION	STATION	DATE

		DATE
SDR PROCCESSED		
NEW DESIGN	RJS-CJG	DATE 7-09-2010
SHEET CHECKED	FLD	DATE 7-09-2010
AS BUILT DETAILS		DATE

THE Louis Berger Group, INC.
Manchester, New Hampshire
(603) 644 5200

SHEET TOTALS
COMMON EXCAV. 139.5 C.Y. ROCK EXCAV. – C.Y.
FILL – C.Y. MUCK EXCAV. – C.Y.

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
13933D_XS_WM38LBG	13933-D	653	658



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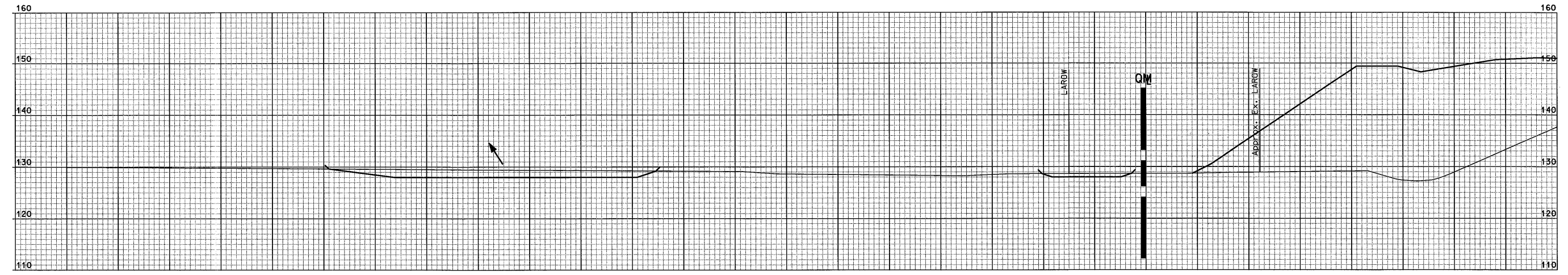

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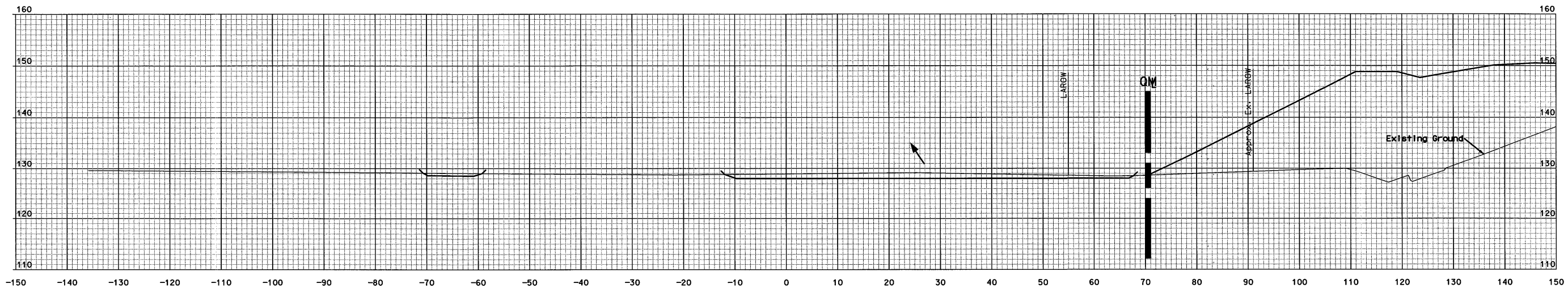

9106+50

SEE GRADING PLAN (SHEET NO 648)
FOR SPOT ELEVATIONS

WETLAND MITIGATION 3108

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	DESCRIPTION	STATION

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NEW DESIGN	RJS-CJG	DATE 7-09-2010
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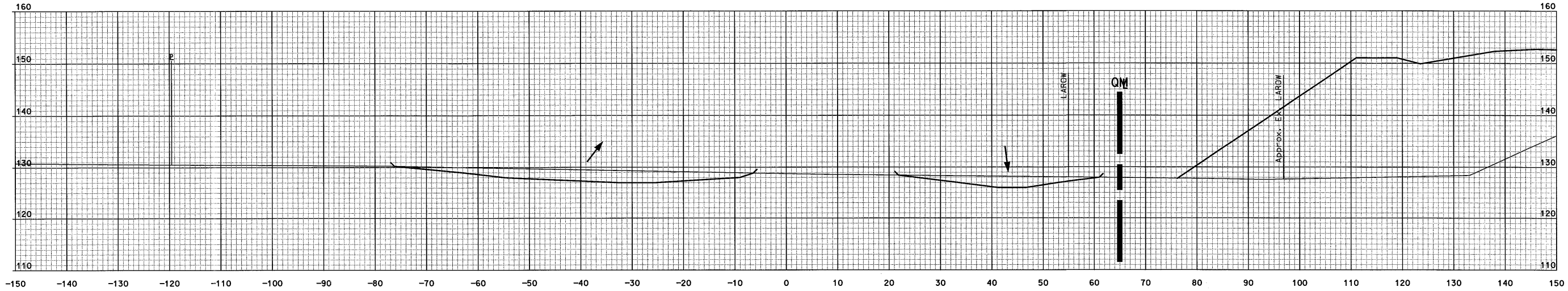
THE Louis Berger Group, INC.
Manchester, New Hampshire
(603) 644 5200

SHEET TOTALS
COMMON EXCAV. 548.5 C.Y. ROCK EXCAV. – C.Y.
FILL 5.2 C.Y. MUCK EXCAV. – C.Y.

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
13933D_XS_WM38LBG	13933-D	654	658



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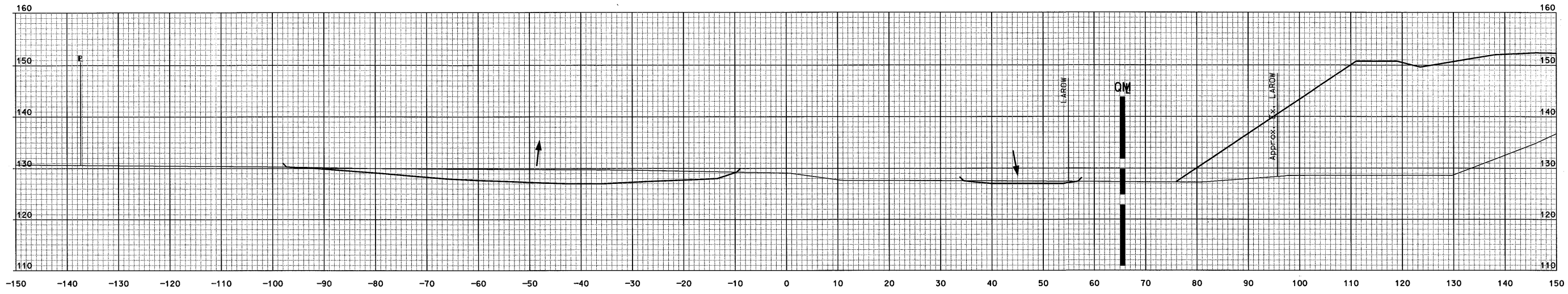

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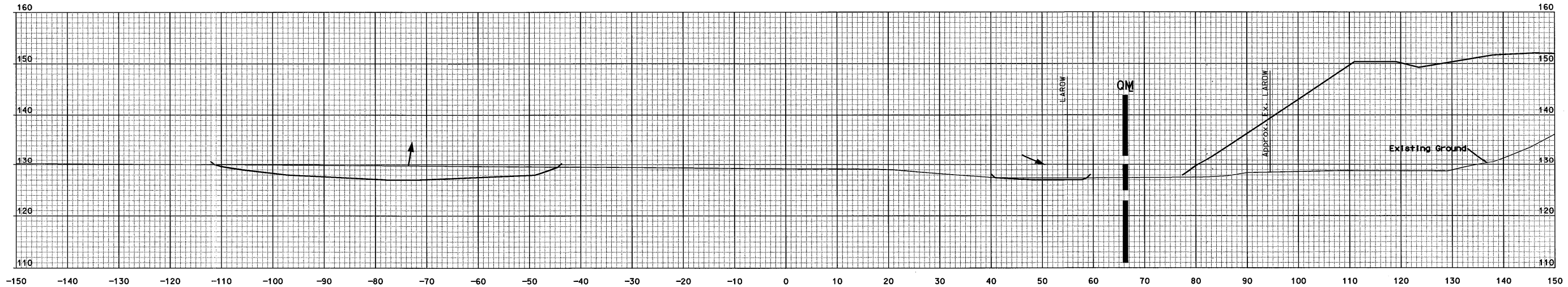

9108+00

SEE GRADING PLAN (SHEET NO 648)
FOR SPOT ELEVATIONS

WETLAND MITIGATION 3108

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	DESCRIPTION

		DATE
SDR PROCCESSED		
NEW DESIGN	RJS-CJG	DATE 7-09-2010
SHEET CHECKED	FLD	DATE 7-09-2010
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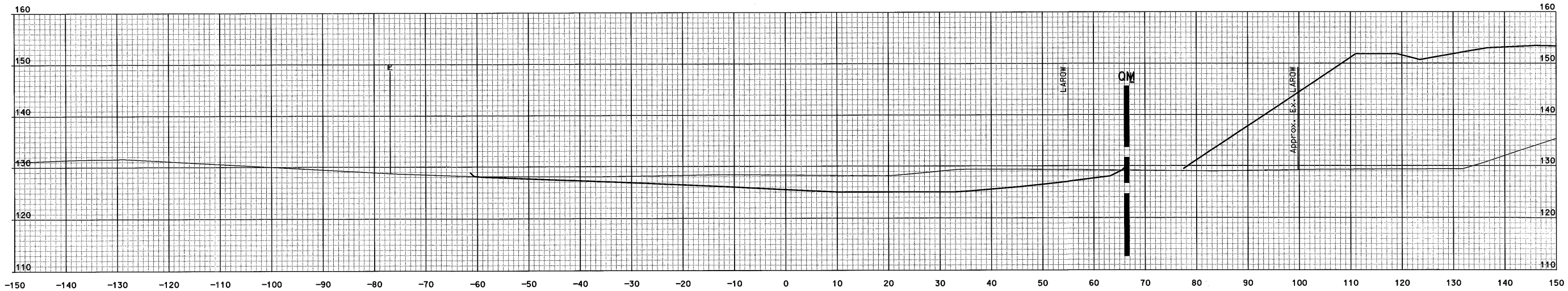
THE Louis Berger Group, INC.
Manchester, New Hampshire
(603) 644 5200

SHEET TOTALS
COMMON EXCAV. 903.1 C.Y. ROCK EXCAV. – C.Y.
FILL – C.Y. MUCK EXCAV. – C.Y.

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
13933D_XS_WM38LBG	13933-D	655	658



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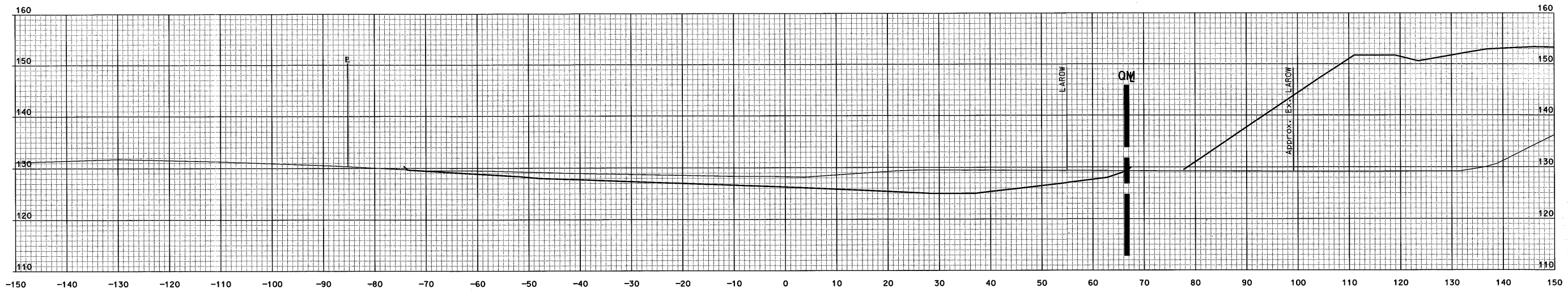

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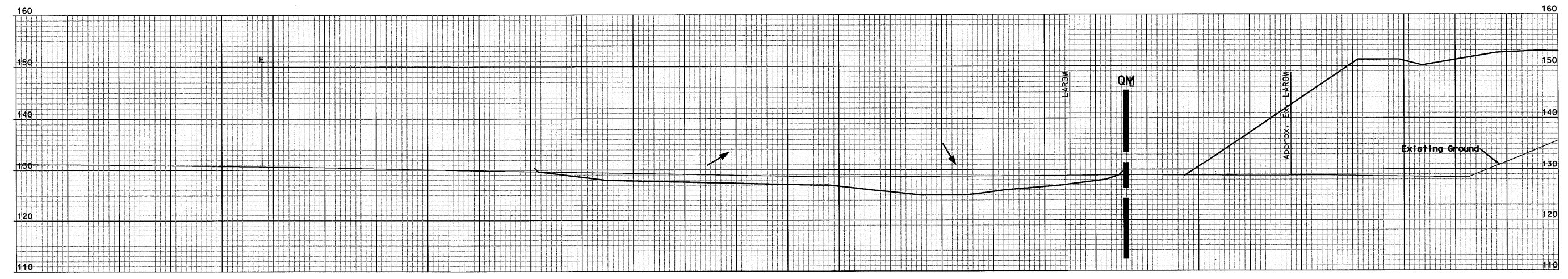

9109+50

SEE GRADING PLAN (SHEET NO 648)
FOR SPOT ELEVATIONS

WETLAND MITIGATION 3108

REVISIONS AFTER PROPOSAL			
NUMBER	DATE	DESCRIPTION	STATION

SDR PROCCESSED		DATE
NEW DESIGN	RJS-CJG	DATE 7-09-2010
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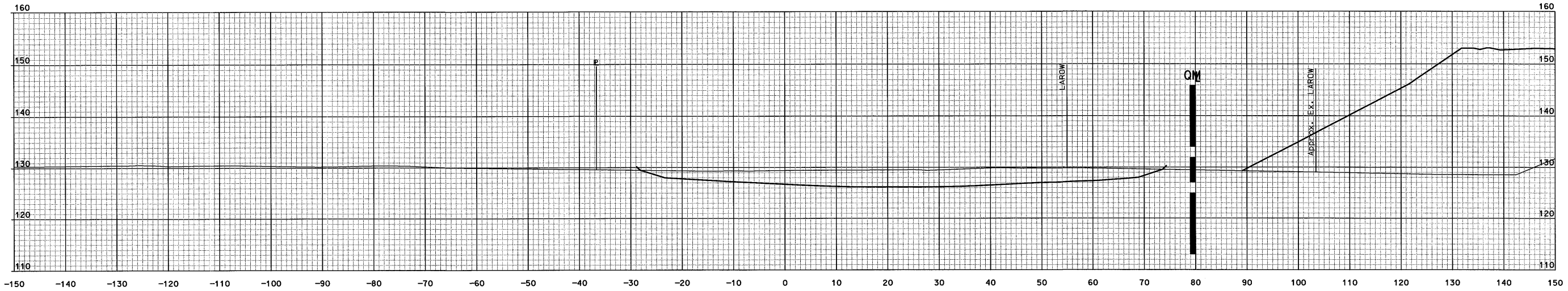
THE Louis Berger Group, INC.
Manchester, New Hampshire
(603) 644 5200

SHEET TOTALS
COMMON EXCAV. 998.7 C.Y. ROCK EXCAV. – C.Y.
FILL – C.Y. MUCK EXCAV. – C.Y.

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
13933D_XS_WM38LBG	13933-D	656	658



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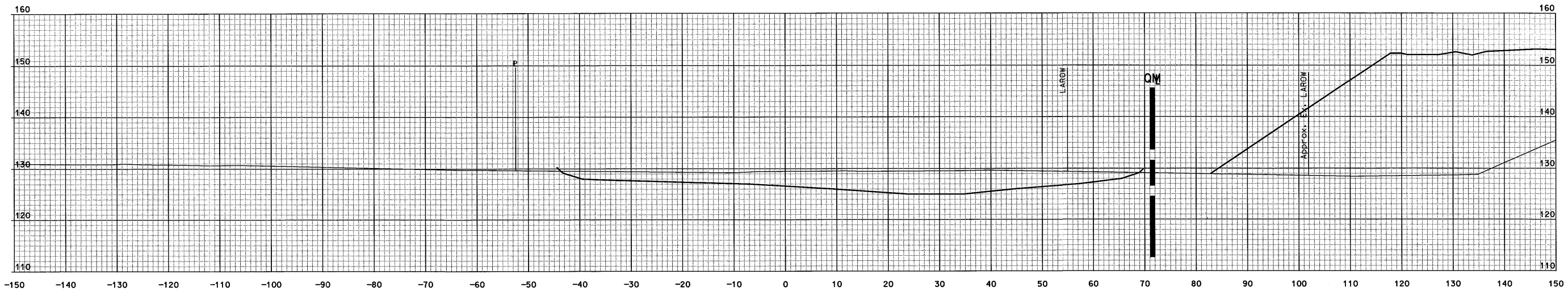

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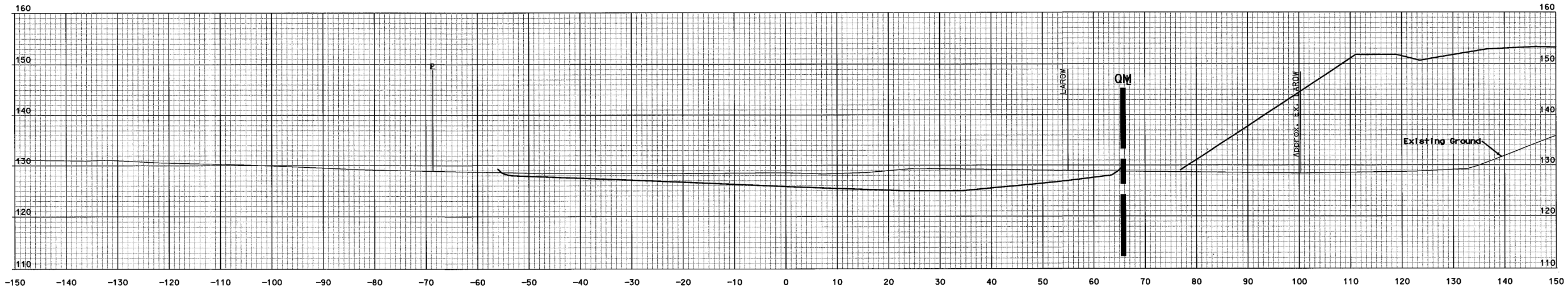

9110+50

**SEE GRADING PLAN (SHEET NO 648)
FOR SPOT ELEVATIONS**

WETLAND MITIGATION 3108

REVISIONS AFTER PROPOSAL

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THE Louis Berger Group, INC.
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SHEET TOTALS
COMMON EXCAV. 1318.6 C.Y. ROCK EXCAV. – C.Y.
FILL – C.Y. MUCK EXCAV. – C.Y.

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
13933D_XS_WM38LBG	13933-D	657	658

REVISIONS AFTER PROPOSAL

NUMBER	DATE	STATION	STATION	DESCRIPTION

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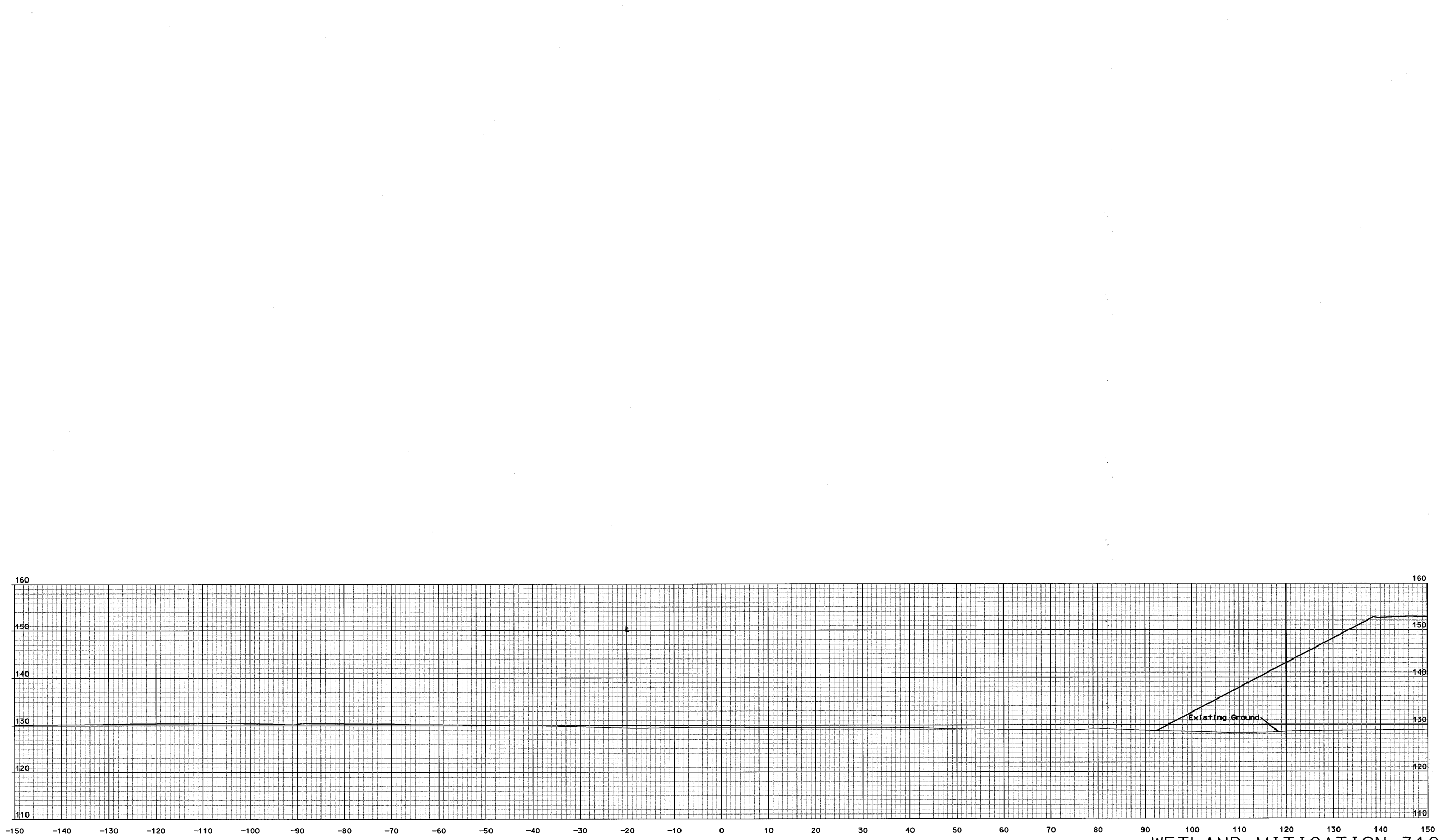

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WETLAND MITIGATION 3108

THE Louis Berger Group, INC.
Manchester, New Hampshire
(603) 644 5200

SHEET TOTALS			
COMMON EXCAV. — C.Y.	ROCK EXCAV. — C.Y.		
FILL — C.Y.	MUCK EXCAV. — C.Y.		
DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
13933D_XS_WM38LBG	13933-D	658	658