ANNUAL WETLAND MITIGATION MONITORING REPORT

YEAR 7, 2015

MAINE TURNPIKE AUTHORITY/ MAINE DEPARTMENT OF TRANSPORTATION WEST GARDINER SERVICE PLAZA/REST AREA

U. S. Army Corps of Engineers Permit NAE-2006-2856
Maine DEP Permit L-23501-TG-B-N
West Gardiner Mitigation Site

MAINE TURNPIKE AUTHORITY
2360 CONGRESS STREET
PORTLAND, MAINE 04102

Prepared by:

HNTB CORPORATION
340 COUNTY ROAD, SUITE 6-C
WESTBROOK, MAINE 04092

December 2015

MITIGATION REPORT
TRANSMITTAL AND SELF-CERTIFICATION

DEPARTMENT OF THE ARMY PERMIT NUMBER: NAE-2006-2856
PROJECT TITLE: West Gardiner Service Plaza/Rest Area
Maine Turnpike Authority/Maine Department of Transportation

PERMITTEE: Maine Turnpike Authority, Peter Merfeld, PE
MAILING ADDRESS: Maine Turnpike Authority
2360 Congress Street
Portland, Maine, 04102
TELEPHONE: (207) 871-7771 X116

AUTHORIZED AGENT: HNTB, Kevin Slattery, PWS
MAILING ADDRESS: 31 St. James Avenue
Boston, MA 02116

TELEPHONE: (617) 532-2243

ATTACHED MITIGATION REPORT
TITLE: Annual Wetland Mitigation Monitoring Report Maine Turnpike Authority/Maine Department of Transportation West Gardiner Service Plaza/Rest Area

PREPARERS: Kevin Slattery, Nick Henke

DATE: December 09, 2015

CERTIFICATION OF COMPLIANCE: I certify that the attached report is accurate and discloses that the mitigation required by the Department of the Army Permit **[is]** ~~**[is not]**~~ in full compliance with the terms and conditions of that permit.

CORRECTIVE ACTION: A need for corrective action **[is]** ~~**[is not]**~~ identified in the attached report.

CONSULTATION: I ~~**[do]**~~ **[do not]** request consultation with the Corps of Engineers to discuss a corrective strategy or permit modification.

CERTIFIED: 12/9/15
(Signature of permittee) Date

Table of Contents

LIST OF APPENDICES

PROJECT OVERVIEW/EXECUTIVE SUMMARY

This report documents the results of the seventh year of 10 years of post construction monitoring at the compensation site for the Maine Turnpike/Maine DOT West Gardiner Service Plaza/Rest Area in West Gardiner, Maine. Following mitigation guidance, monitoring is to be conducted in post construction years 1, 2, 3, 5, 7, and 10. Reports were previously submitted for years 1, 2, 3, and 5. A similar report will be provided for monitoring year 10. The site is comprised of a variety of wetland cover types including open water, forested, emergent and scrub-shrub. The site is developing well and reflects the intention of the design, the desired functions are developing and the site appears stable. The long term prognosis for the site is excellent. All five of the U.S. Army Corps of Engineers Success Standards for post-construction assessment of wetland mitigation sites were met at the site.

The site hydrology is indicative of wetland conditions. Plant densities and herbaceous covers on site are high. Planting densities are over the success standard of 500 woody plants per acre and are expected to increase as volunteer plants continue to increase. The majority of the planted stock on site is surviving well, with the exception of balsam fir and elderberry. Since the site overall plant density is successful, no further plant replacements are recommended.

Four invasive hydrophytes; reed canary grass, purple loosestrife, glossy buckthorn, and cattails were found at the mitigation site. Reed canary grass and purple loosestrife are found throughout the site. Reed canary grass was not treated in 2015 but is planned for treatment using herbicide in spring of 2016. Biological control of the loosestrife was conducted in 2009, 2010 and again in 2015 using *Galerucella* beetles. During July 2015, 3,000 beetles were released at the site. This quantity of beetles is substantially greater than the numbers released during early applications. Cattails are found surrounding both the pond and stream in addition to some small patches throughout the site. There is also a large stand of pre-existing cattails to the south of the mitigation site. The site hydrology appears to be wetter in 2015 than previous years, including the existing wetlands south of the site. Wetter conditions are persistent likely due to downstream channel constriction and thereby contributing to the expansion of the cattails in the site. No additional controls for cattails are proposed at this time, but maintenance of downstream culverts is recommended. Buckthorn is common in nearby wetlands and was found in the preserved wetland and upland areas on site and several seedlings were found in the wetland restoration/creation area. Control of buckthorn using herbicides is also planned for the spring of 2016.

Other non-hydrophyte invasive species were also noted at the site in 2015, including multiflora rose and autumn olive, both in very low numbers. No remedial actions were implemented in 2015, but autumn olive and multiflora rose individuals have been flagged and removal and/or treatment with herbicide is proposed for 2016. The site will again be

monitored for invasive species and further remediation measures may be taken if needed to maintain the performance standard.

The mitigation site continues to show very good wildlife use. Waterfowl, raptors, muskrats, beavers, white tailed deer, and many amphibians use the site which is an indicator that the desired wildlife function is being achieved.

REQUIREMENTS

Mitigation Conditions

Permit mitigation special conditions:

"7. The permittee shall implement the wetland mitigation plan as described in the WETLAND MITIGATION REPORT prepared by HNTB Corporation, Site 1C, West Gardiner, Maine dated July 23, 2007 and as shown on the attached plans entitled WEST GARDINER WETLAND MITIGATION SITE dated JULY, 2007.

8. The permittee shall provide protection in perpetuity of the 27 acre mitigation site by a declaration of covenants and restrictions and/or a conservation easement as described in the wetland mitigation report. The declaration of covenants and restrictions and/or a conservation easement shall be recorded with the State of Maine Kennebec County Registry of Deeds. A copy of the executed and recorded document must be sent to the Corps of Engineers, Regulatory Division, attn: Chief, Policy Analysis and Technical Support Branch, 696 Virginia Road, Concord, MA 01742-2751 within 120 days of the permit's issuance, but no later than 10 days after the date of the recording.

9. Monitoring of the mitigation site will commence at the end of the growing season one year after completion and continue for 10 years as described in the wetland mitigation report. Monitoring reports will be submitted to the U.S Army Corps of Engineers, New England District, Regulatory Division, Policy Analysis/Technical Support Branch, 696 Virginia Road, Concord, Massachusetts 01742-2751."

Mitigation Goals

The service plaza/rest area resulted in 2.48 acres of permanent wetland disturbance and another 0.35 acres of temporary disturbance. The mitigation site provides approximately 18.81 acres of compensation through restored, created and protected wetlands. Permits issued for the project include U.S. Army Corps of Engineers (ACOE) Section 404 Permit NAE-2006-2856 and Maine Department of Environmental Protection (DEP) Natural Resource Protection Act Permit L-23501-TG-B-N.

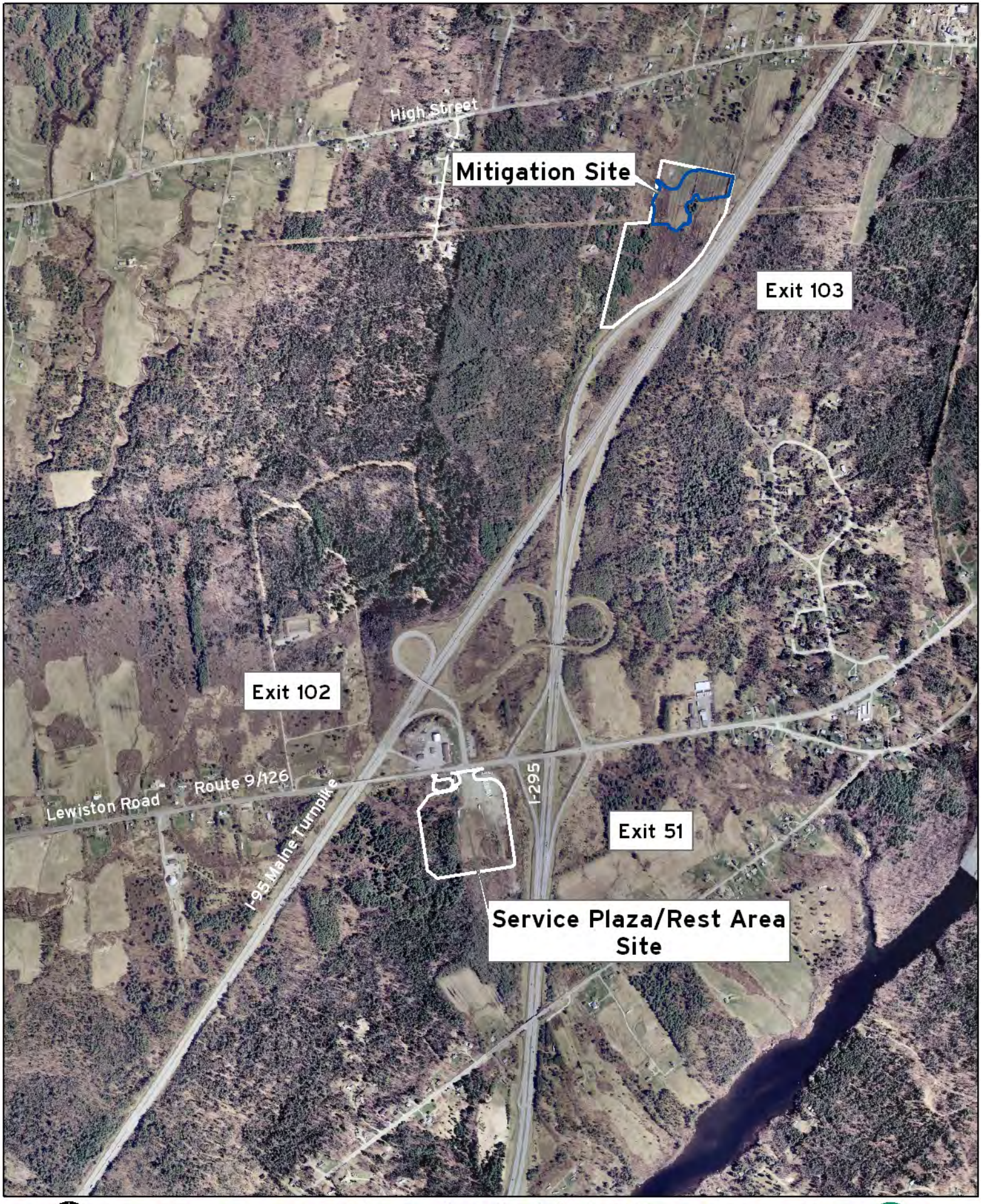
The federal and state permits authorize the following permanent impacts:

Forested wetland – 1.83 acres
Emergent wetland – 0.23 acres
Scrub-Shrub Wetland – 0.78 acres

Two previously drained hayfields were restored back to wetland as part of this compensation project. The entire compensation parcel is 27.09 acres (Figure 1). The mitigation consists of 3.19 acres of restoration, 3.72 acres of enhancement, and 0.15 acre of creation totaling 7.06 acres, and 11.75 acres of wetland preservation. Of the 11.75 acres preserved, 3.10 are forested, 6.42 are scrub-shrub, and 2.23 are emergent wetland. The cover types of the 18.81 acres of compensation included 7.58 acres of forested wetland, 2.72 acres of emergent wetland, 8.21 acres of scrub-shrub wetland and 0.30 acre of pond/aquatic wetland.

The wetland functions and values affected by the project include: groundwater interaction, flood flow alteration, sediment/shoreline stabilization, sediment/toxicant reduction, nutrient removal/transformation, production export and wildlife habitat. The design objective at the compensation site was to replace wetland functions and values affected or lost by the project and to also create in-kind replacement. The compensation site is near the service plaza/rest area project, in a similar setting with similar soil types. The site is adjacent to a large block of contiguous natural habitat. The majority of the compensation site was designed as forested wetland to maintain the in-kind replacement design goal. Within the forested areas a further design goal was to provide a diversity of vegetation, a diversity of vegetation strata, and a diversity of hydrological conditions on a micro topographical level.

The proposed cover types at the Site include a mixture of forested, scrub-shrub, emergent, and shallow aquatic elements. The 7.06 acres of wetland to be restored, enhanced or created at the Site will be composed of the following cover types as reported in Table 1.



0 500 1,000 2,000 Feet

Maine Turnpike Authority/MaineDOT
West Gardiner Service Plaza/Rest Area
Locus Map

MAINE TURNPIKE
MaineDOT

Table 1 Summary of Wetland Mitigation

WEILAND TYPE	IMPACT (acres) (permanent)	PROPOSED MITIGATION (acres)				
		CREATION	RESTORATION	ENHANCEMENT	PRESERVATION	TOTAL
Forested	1.76	0	1.70	2.78	3.10	**7.58**
Emergent	0.23	0	0.36	0.13	2.23	**2.72**
Scrub-Shrub/ Emergent	0.49	0.05	0.93	0.81	6.42	**8.21**
Pond/ Aquatic	0	0.10	0.20	0	0	**0.30**
TOTAL	**2.48**	**0.15**	**3.19**	**3.72**	**11.75**	**18.81**
		(2.1 ratio)	(2:1 ratio)	(2:1 ratio)	(10:1 ratio)	
		0.08 Credit	**1.60 Credit**	**1.86 Credit**	**1.18 Credit**	**2.24 Surplus**

Mitigation Success Standards

The five Success Standards for post-construction assessment of wetland mitigation sites established by ACOE are described below. The Success Standards listed below are copied from the Army Corps regulatory guidance for mitigation. Each year of monitoring the mitigation project site is inspected to determine if it meets the following standards:

Success Standard 1

The site has the hydrology as demonstrated with well data collected at least weekly from March through June or other substantial evidence, to support the designated wetland type.

Is the proposed hydrology met at the site?
What percentage of the site is meeting projected hydrology levels?
Areas that are too wet or too dry should be identified along with suggested corrective measures.

Success Standard 2

Does the site have at least 500 trees and shrubs per acre, of which at least 350 per acre are trees for proposed forested cover types, that are healthy and vigorous and are at least 18" 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 must be well represented on the site (e.g., at least 50 individuals of that species per acre).

Table 2 Volunteer and Planted Species Requirements For Success Standard

# Species Planted (Volunteer And Planted)	***Minimum # Species Required***
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.

Success Standard 3
Does each mitigation site have at least 80% areal cover, excluding planned open water areas or planned bare soil areas (such as for 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.

Success Standard 4
Are Common Reed (Phragmites australis), Purple Loosestrife (Lythrum salicaria), Russian and Autumn Olive (Eleagnus spp.), Buckthorn (Rhamnus frangula), Japanese knotweed (Polygonum cuspidatum) and/or Multiflora Rose (Rosa multiflora) plants at the mitigation site(s) being controlled?

Success Standard 5
Are all slopes, soils, substrates, and constructed features within and adjacent to the mitigation site(s) stabilized?

SUMMARY DATA

This is the fifth of six inspection reports for the compensation site. Inspections were made during the growing season to evaluate site stability, whether any vehicular trespass took place, site hydrology and function of the pond, stream, vegetative cover, wildlife use, condition of planted stock and replacements, and invasive species.

Monitoring Methods

For the annual assessments, five fixed monitoring stations were established at the compensation site. The sites were comprised of three cover types (by design); one emergent monitoring station, one scrub-shrub monitoring station and three forested stations. The stations were marked with driven re-bar and white pvc pipe, and a second pvc marker was placed nearby to establish bearing references at the station. The fixed monitoring stations were surveyed and are plotted on base maps with the planted stock information, which was also survey located at the time of planting.

Assessments of planted stock were made at each of the fixed monitoring stations using a 30-foot radius assessment plot. All stock was located using the as-built survey information and woody volunteers were noted. The fixed monitoring stations also were used to assess dominant herbaceous vegetation using a 5-foot radius assessment plot. All herbaceous vegetation was recorded and percent cover was estimated for determining dominance. Invasive species in the 30-foot radius assessment plot were noted. The results of the herbaceous plots are included in Appendix B.

The mitigation site was extensively walked to search for invasive species. The invasive species observed at the mitigation site included reed canary grass, purple loosestrife, glossy buckthorn, cattails, multiflora rose and autumn olive. Although cattails are considered invasive and occur at the site they are not considered a threat to the overall mitigation site.

During site visits, wildlife use was noted. Sites were inspected for erosion, evidence of ATV or off-road vehicle use and indicators of any improper hydrology.

Supplemental Information

Per the ACOE Guidelines, monitoring reports will include the following Appendices A through C:

Appendix A -- An as-built planting plan showing the location and extent of the designed plant community types (e.g., shrub swamp).

Appendix B -- A vegetative species list of herbaceous vegetation and volunteer species in each plant community type. The volunteer species list should at a minimum include those that cover at least 5% of their vegetative layer.

Appendix C -- Representative photos of each mitigation site taken from the same locations for each monitoring event.

For this report, one additional appendix is included: Appendix D – Forested Plot 2 Hydrology Evaluation, which was conducted at the request of the Maine Department of Environmental Protection. Maine DEP noted dominant non-hydrophytes at Forested Plot 2 reported in prior assessments, and seeks confirmation that the hydrology is suited to develop and maintain wetland conditions, or whether hydrological modifications may be needed.

Success Standard Achievement

Summary of Monitoring Success Standards

Success Standard 1: *"The site has the hydrology, as demonstrated with well data collected at least weekly from March through June or other substantial evidence, to support the designed wetland type. Is the proposed hydrology met on the site?"*

Hydrology was not assessed using well data due to the soil types (poorly drained, silt loam) and elevation variability of site. Hydrology was assessed using methods employed during wetland delineations (e.g. inundated, saturated in upper 12", water marks, drift lines, sediment deposits, drainage patterns).

The proposed hydrology is met on site. Site inspections found saturated conditions with water to the surface in many areas, including the emergent zones fringing the streams and pond. Standing water was present in the mound and pool topography areas and the very low density of herbaceous vegetation in the pool areas indicates prolonged saturation and/or inundation during the growing season. During the 2015 inspections, we noted that portions of the site appeared wetter than prior years. The stream draining through the site and to the south has high water levels which are contributing to expansion of cattail along the stream. The wetlands south of the site (off site) were noted as having wetter conditions as well, and also showing more cattail expansion. These findings lead to the conclusion that off-site factors such as constricted outlets at culverts, and/or possibly beaver activity could be affecting the site. We recommend that the Turnpike's Maintenance section inspect the culverts south of the site at the Turnpike and I-295 ramps and restore flows if those locations are constricted. Based upon observations, anticipated cover type hydrology was achieved and Success Standard 1 is being met on site.

Success Standard 2: *"Does the site have at least 500 trees and shrubs per acre, of which at least 350 per acre are trees for proposed forested cover types that are healthy and vigorous and are at least 18" tall in 75% of each planned woody zone."*

Based upon observation plots (Emergent Plot excluded), the site average has between 771 and 1,048 tree and shrub plants per acre which is over the goal of 500 trees and shrubs

per acre. The lowest plant density was found in the Emergent Plot (62 plants per acre) and the highest was found in Forested Plot 3 (1,557 plants per acre). From observation plot findings, the total stock survivability ranges from a low of 18% (in the Emergent Plot) to a high of 83% (in Forested Plot 3). These statistics are based upon the assumption that missing plants are dead. However, using the assumption that missing plants are alive, the density ranges from a low of 324 to a high of 1,696 woody plants per acre. The planted stock can be characterized as fair to excellent. Browse by deer and herbivory by insects are stunting plant vigor in the site. Although growth is slow for many deciduous species, the stem density is high and over time, the site will develop into a forested wetland. This Success Standard is being met at the site.

Success Standard 3: *"Does each mitigation site have at least 80% areal cover, excluding planned open water areas or planned bare soil areas (such as for turtle nesting), by noninvasive species? Do planned emergent areas on each mitigation site have at least 80% cover by noninvasive hydrophytes? Do planned shrub-shrub and forested cover types have at least 60% cover by noninvasive hydrophytes, of which at least 15% are woody species."*

From observation plot herbaceous covers, the average aerial coverage on site is 156%, which is a 46% increase over the 2013 assessment findings. Two of the monitoring plots have non-hydrophytes as a dominant species in the herbaceous layer (cinquefoil, tall goldenrod, and alsike clover). However, in all plots, the communities' total dominance meets the 80% hydrophyte criteria. In the last assessment in 2013, none of the plots had purple loosestrife as a dominant, however, the site now shows purple loosestrife as a dominant in four of the five monitoring plots (not in the Emergent Plot). Additional loosestrife bio-control measures were implemented in 2015 with the introduction of 3,000 *Galerucella* beetles. Survival and expansion of the beetle populations should reduce the density of loosestrife at the site. The total hydrophyte coverage is expected to continue increase on site in future monitoring years and represent a site that continues to shift to more hydrophytic species. This Success Standard is being met on site.

Success Standard 4: *"Are Common Reed (Phragmites australis), Purple Loosestrife (Lythrum salicaria), Russian and Autumn Olive (Eleagnus spp.), Buckthorn (Rhamnus frangula), Japanese knotweed (Polygonum cuspidatum) and/or Multiflora Rose (Rosa multiflora) plants at the mitigation site(s) being controlled?"*

Buckthorn, reed canary grass, purple loosestrife, autumn olive, and multiflora rose are the five invasive species that were present on site in prior monitoring years. In 2008 herbicide was applied to several individual purple loosestrife plants and patches of reed canary grass. Biological control for loosestrife using *Galerucella* beetles began in the summer of 2009, and continued in 2010 and again in 2015. The beetles were directly observed on site in 2011 and evidence of their presence was noted in 2013 (leaf damage). In 2015 the beetle population has not grown to the point of noticeable effect on loosestrife, and reintroduction was implemented at higher densities to further the control efforts. Buckthorn control was undertaken in 2008 through the use of herbicide in

uplands contained within the compensation site. Buckthorn continues to exist in the uplands in large numbers and plant seedlings were found within the compensation site in 2015. The largest buckthorn plants have been marked for treatment in spring of 2016 and will again be monitored in 2018. Autumn olive shrubs were found in a small isolated cluster on the western side of the site and a stand of larger individuals in the southeastern section of the site. Both locations were flagged for removal in spring of 2016. Multiflora rose was noted in four locations at the site including on the access road crossing the stream crossing next to the pond, at the southern end of the site near the former Central Maine Power pole, and in two upland areas on the west side of the site. Control of the olive and rose are scheduled to occur during early 2016. This Success Standard is met in 2015.

Success Standard 5: *Are all slopes, soils, substrates, and constructed features within and adjacent to the mitigation site(s) stabilized?*

The site is stable and no erosion was noted during site inspection. All erosion control was removed on site after construction was completed in 2008 and herbaceous vegetation was established. The relocated stream is stable and no signs of erosion were noted.

Inspections Since the Last Report

This is the fifth of six inspection reports for the compensation site. Inspections were made during the growing season to evaluate site stability, whether any vehicular trespass took place, site hydrology and functions of the stream and pond, vegetative cover, wildlife use, condition of planted stock and the presence of invasive species.

Soils Data

Soil test pits/profiles were completed during Year 7 monitoring. The site was built on a large area of hydric soils (Buxton, Scantic) that were previously drained by a series of shallow parallel furrows for agricultural activity. The existing soils have a high organic content and the fine-textured slow draining characteristics provide the same moisture retention functions as high organic matter topsoil. All fixed monitoring station soil profiles met the criteria for hydric soils at the time of construction and during the Years 1-7 monitoring. The detailed soil profile for Forested Plot 2 is included in Appendix D and pictures of removed soils are also included.

Forested Plot 2 Supplemental Evaluation

As requested by the Maine Department of Environmental Protection, monitoring year seven also includes data forms documenting the soil and hydrological characteristics observed at Forested Plot 2 to verify that the wetland hydrology is sufficient at this location (see Appendix D).

In prior monitoring years, the herbaceous layer at Forested Plot 2 has included dominant species in the community plot that are not hydrophytes. The herbaceous layer data is

collected by estimating percent cover for all species within a 5 foot radius around the center point of each plot. Due to the micro-topography present at the center of Forested Plot 2, this method may not fully represent the entire assemblage of species present throughout the wetland near the plot. Slightly higher ground from the site construction provides suitable conditions for some non-hydrophytes to survive there. The estimated area of higher ground is in the range of 150 square feet, and can be best described as an inclusion within the context of much wetter and entirely hydrophyte dominated species. Additional hydrology and soil data were gathered at this plot to evaluate whether the plot was performing as a wetland (see Appendix D). Forested Plot 2 shows primary hydrology indicators including presence of surface water and saturation with standing puddled water measuring 1-2" in depth. A soil core sample was also taken to ensure hydric soils were present in this location. The soil core filled with water within minutes of soil being removed indicating that these soils were saturated to the surface. Soils consist of an A-horizon of silt loam texture with a 98% 5Y 3/2 matrix, with 2% 5Y 5/6 distinct/prominent redoximorphic features (mottling). The B-horizon has the same soil texture and an 80% 5Y 4/2 matrix, with 20% 5Y 4/4 distinct redoximorphic features comprised of mottles and pore linings. Based on the further evaluation conducted at this site, we conclude that Forested Plot 2 is functioning as intended and not at risk of incorrect hydrology, and will continue to develop as a forested wetland.

Remedial Actions

Remedial action undertaken during 2015 include releasing 3,000 *Galerucella* beetles to help control purple loosestrife. Beetles released at the site in 2009 and 2010 to control purple loosestrife are still present and feeding on loosestrife plants but in very low numbers. We desire that supplemental beetle introduction will help the population increase and begin to affect the growing loosestrife population. Biological control of loosestrife is the most effective measure for this site because the plants are not densely concentrated and herbicide treatment on a plant by plant basis would not be effective.

Erosion Control Measures

All temporary erosion controls were removed from the mitigation site prior to the 2015 assessment. The site is stable and there was no indication of active erosion anywhere on the site.

Estimates of Percent Vegetative Cover for Mitigation Site and Percent Cover of the Invasive Species

Vegetative Cover

The site has dense herbaceous growth in most areas of the forested, scrub-shrub and emergent cover. Due to overlapping foliage, the cover exceeds 100% in all areas during the growing season. The coverage observed at the monitoring stations ranged from 151%

to 192%. On average, the overall percent coverage observed was estimated to be 156%, which is 46% higher than 2013.

The list of herbaceous species observed at each of the fixed monitoring stations is included in Appendix B. Using the 50/20 rule for determining dominance, three fixed monitoring stations had 100% dominance by hydrophytes, and two (FO 2 and FO 3) shared dominance between hydrophytes and non-hydrophytes. FO 2 had one non-hydrophyte (tall goldenrod) as one of the dominant plants in the plot and FO 3 had two non-hydrophytes (cinquefoil and alsike clover) as two of the dominant plants in the plot. Most of the non-hydrophytes present are due to the topographic variability found within the radius of the sample plots. The hydrophyte communities found at the plots are similar to previous year's plots. Some variation in herbaceous plant communities was noted and is expected for an evolving site and weather conditions that vary from year to year (wetter or drier). The species composition is indicative of wetland communities and the shift away from upland, facultative-upland and facultative species to more hydrophytic vegetation is occurring at the site.

Invasive Species

Cattails (*Typha latifolia*)

The cattails at the site are growing mostly along the shallow edges of the pond and the relocated streambed. Areas of the mitigation property to the south have extensive cattail dominated marsh that are preserved and not proposed for remediation. Some small pockets of emergent wetland within the overall site mosaic were observed with sparse cattails, but the cattails do not appear to be rapidly spreading in those areas. Cattails are estimated to constitute 15% of the overall restoration/enhancement/creation site and did not significantly increase from the previous monitoring year in 2013, but as noted are expanding along the stream through the site. Cattails are expected to decline as more wildlife uses the site and they are subject to herbivory, and as woody trees and shrubs increase in size. The site hydrology appears to be wetter in 2015 than previous years, including the existing wetlands south of the site. The wetter conditions are persistent likely due to downstream channel constriction and thereby contributing to the expansion of the cattails in the site. Further, the off-site changes to downstream hydrology are likely to continue affecting the hydrology of the mitigation site. Reducing downstream water levels will translate to lower on-site levels and likely lead to a shift from cattail dominance in areas adjoining the stream. No additional controls for cattails are proposed at this time, but maintenance of downstream culverts is recommended.

Reed Canary Grass (*Phalaris arundinacea*)

Reed canary grass is present in small patches throughout the site and is estimated to constitute about 3% of the overall restoration/enhancement/creation site (Figure 2) and increased slightly from the previous assessment year. Reed canary grass was present in the mitigation site and in adjacent wetlands prior to construction. Reed canary grass will

be sprayed with herbicide in spring of 2016. The site will again be monitored for the invasive after the use of herbicide.

Purple Loosestrife (*Lythrum salicaria*)
Purple loosestrife seedlings were found at all five monitoring plots and observed as individual plants and small patches throughout the site. Clusters of plants were also found along the stream edge. In 2009 and 2010, four sleeve cages with *Galerucella* beetles were released at the site. Herbivory was noted on purple loosestrife plants near the release locations and further into the site in 2010, 2011, and in 2013. In 2015, 3,000 beetles obtained from New Jersey Department of Agriculture were released at the site. Species released include both *G. calmariensis* and *G. pusilla*.

Common Reed (*Phragmites australis*)
No common reed was found at the site.

Buckthorn (*Rhamnus frangula*)
Buckthorn was found in the upland knoll on the central/southeast side of the site and as isolated seedlings within the compensation site in 2015 (Figure 2). The species was present in the herbaceous layer beneath the white pine trees at the upland knoll in the site and a stand of large individuals is now present on the northern portion of the upland knoll. In 2008 herbicide was sprayed on the buckthorn on the upland knoll to reduce the population. During spring of 2016, herbicide control methods for buckthorn will be implemented at the highest density stands of the invasive shrub.

Russian and Autumn Olive *(Eleagnus* spp.)
During the 2013 and 2015 assessments, a group of autumn olive shrubs were found in an upland area near the stream on the west side of the site immediately adjacent to the property fence. In addition a stand of large individuals was located in the southeast portion of the site. Both locations were flagged for removal. Control of the invasive shrub is recommended by cutting stems and treating the base stems with herbicide, and that remediation is scheduled for the spring of 2016.

Japanese Knotweed
No Japanese knotweed was found at the site.

Multiflora Rose *(Rosa multiflora*)
Four small multiflora rose plants were found in the site including one on the access road crossing the stream crossing next to the pond, one on the Central Maine Power pole access route through the site, and two in upland areas on the west side of the site. Removal of the plants by hand-digging is recommended when control measures are implemented at the site in spring of 2016 for other invasive species or by herbicide treatment of cut stems.

Fish and Wildlife

The site continues to support a wide variety of wildlife. Most evident are waterfowl, wading birds, and white-tailed deer. Muskrat use was evident at the pond and remains of two muskrat were found at two separate areas onsite. Bird species found using the site include crows, blue jay, white throated sparrow, cedar wax wing, blue heron, bobolinks, goldfinch, green heron, ducks, Canada geese, and kestrels. Wildlife observed directly and through indicators such as tracks and scat includes deer, moose, muskrat, raccoon, green frogs, grey treefrog, American toads, garter snake, crayfish, and fish (appear to be stickleback). Monarch butterfly, honeybees and dragonflies were also noted on site.

Planted Stock Survival

To assess the planted stock survival, stock within a 30-foot radius of the fixed monitoring stations was evaluated. Stock was listed as alive, dead, or not found. The results were evaluated to determine the total stock survivability at the monitoring stations. A high and low survivability was assessed based upon including the missing plants in the calculation, assumed as either all alive or all dead. From this, high and low woody plant survivability was measured for each fixed station. Although the survivability data is most relevant at forested, and scrub-shrub stations, it was also assessed at the emergent station. A high and low average survivability was calculated for the site by averaging the high and low survivability of the forested and scrub-shrub monitoring stations. To be conservative, the low average was used for reporting here.

Average survivability was also assessed per species. Fifteen of the 19 wetland species that were planted were represented in the monitoring plots. For each of these species a determination of survivability was assessed from both the plot data, and overall site canvassing.

The site had a wide range of planted stock survivability from a low of 18% in the Emergent Plot to a high of 83% in the Forested 3 Station as shown in Table 3. The high average of the woody stock survivability for the forested plots was 94% and the low was 58%. Overall, the site-wide survivability rate of 61% to 95% for the forested and scrub-shrub plots, the survivability of plantings is characterized as high.

The site assessment also finds many more volunteer woody plants in the assessment plots. The volunteers in each plot were located and are shown on the planting plans included in Appendix A. The symbol for volunteer plants on the figures is different from the planted stock. In total, 134 volunteer woody trees and shrubs were added to the assessment plots to date but are not yet included in the performance tally. The volunteers at the plots range from a low of four at Forested Plot 1 to a high of 53 at Scrub-Shrub Plot. For future conditions at the site, these volunteers will contribute an important component of the site structure and vegetative cover.

The West Gardiner wetland mitigation construction contract included a two-year woody plant establishment period. Plant losses were noted and replanting at the site was completed in the spring of 2011 when 586 plants were added. Plant species were chosen

based on observation of best performers (survival). No additional plantings were made at the site since 2011.

Woody stock survivability data from the plots was projected to the equivalent number of woody trees and shrubs per acre based upon the results from each monitoring station. This projection finds a density range from a low of 62 woody trees and shrubs per acre in the Emergent Plot to a high of 1,557 in Forested Plot 3. Using the same low and high density method, and not including volunteer plants, the site wide average density per acre of woody trees and shrubs taken from the station data ranges from 771 to 1,048 plants per acre in the forested and scrub-shrub zones. By including the volunteer plants, the site wide high average density increases to 1,457 woody trees and shrubs per acre.

Table 3 Woody Stock Survivability at Monitoring Stations

STATION	Dead Plants	Alive Plants	Not Found Plants	Total Planted	% Survival High	% Survival Low
EM	1	4	17	22	95	18
SS	3	67	23	93	97	72
FO 1	1	12	10	23	96	52
FO 2	2	20	30	52	96	38
FO 3	12	101	9	122	90	83
Ave. Forested Stations					94%	58%
Ave. Forested and Scrub-Shrub					95%	61%
Ave. All Forested Stations, Scrub-Shrub and Emergent					95%	53%

EM – Emergent SS = Scrub-Shrub FO = Forested

Vigor varies by species. From the plot data for all stations, some stock varieties were less successful such as balsam fir, green ash, American elm, and elderberry. The poorest overall site performers are balsam fir and elderberry. There were four dead fir individuals and four dead elderberry individuals found in the assessment plots, which represent 1.1% each of the total plants found in the five plots. These findings are far less for fir individuals than reported in 2013 (17 plants, 5.4%) and the same for elderberry individuals (4 plants, 1.3%). Conversely, other species are doing very well including larch, red maple, buttonbush, swamp rose, pussy willow, and red osier dogwood. These numbers only reflect the percent of dead individuals among the individuals located in 2015 and do not account for missing individuals. Missing individuals for the 2015 assessment were much greater than 2013 totaling 89 verses 37 respectively.

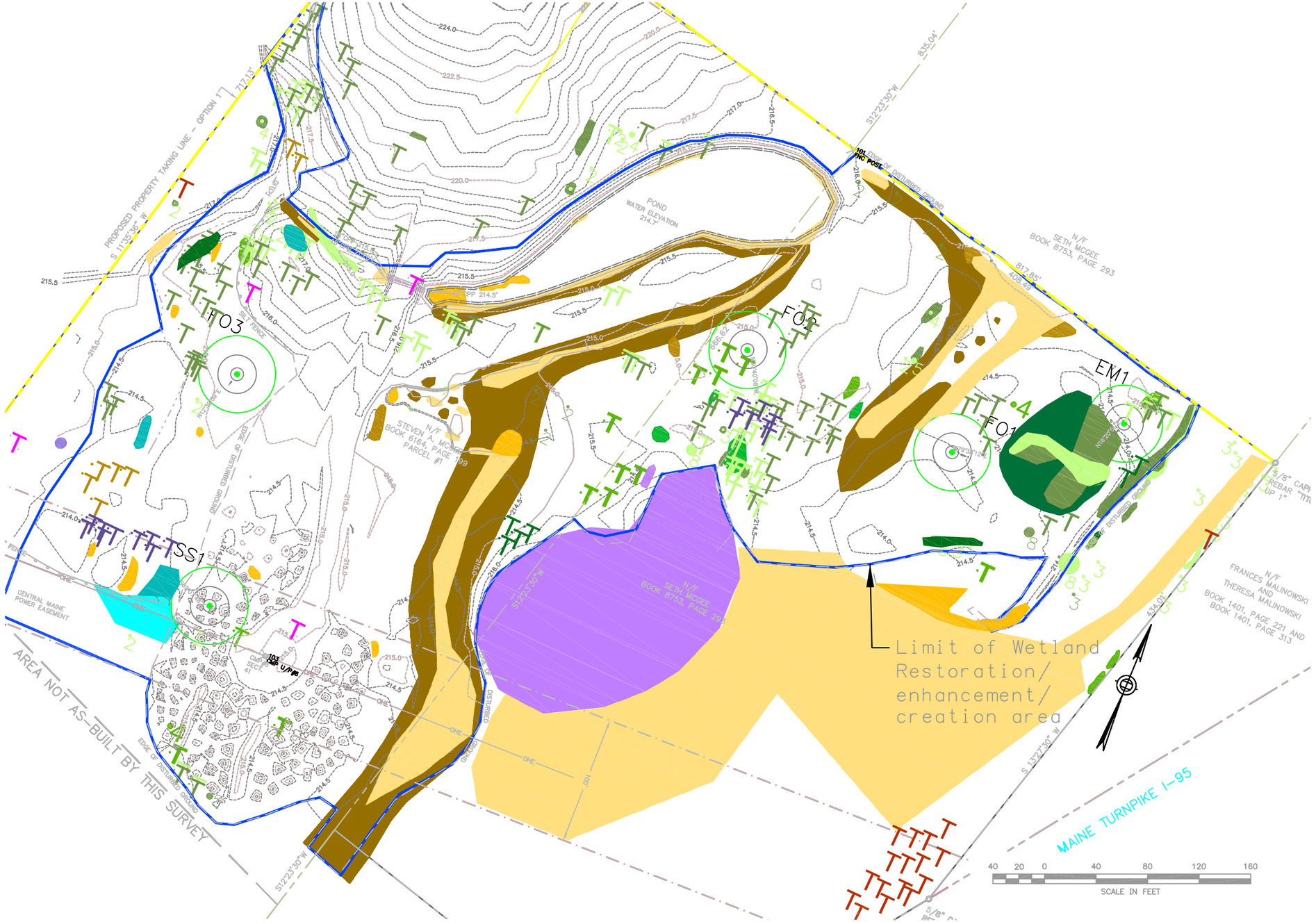
Table 4 Estimated Woody Stock Survivability and Vigor by Species

Stock Type	Common Name	Site Survey Quantity	Estimated Survival	Relative Vigor of Live Stock
Wetland Trees	Balsam Fir	165	Low	Good
	Red Maple	237	High	Good
	Green Ash	753	High	Excellent
	Larch	478	Moderate	Excellent
	American Elm	300	High	Good
	TOTAL	1933		
Upland Trees	Big Tooth Aspen	5	Moderate	Fair
	Quaking Aspen	6	Moderate	Fair
	Black Cherry	5	Poor	Fair
	White Pine	12	Moderate	Fair
	Red Oak	10	Moderate	Fair
	TOTAL	38		
Wetland Shrubs	Silky Dogwood	232	High	Very Good
	Red Osier Dogwood	249	High	Very Good
	Serviceberry	158	High	Good
	Arrowwood	257	High	Excellent
	Cranberry Bush	149	High	Good
	Buttonbush	54	High	Very Good
	Elderberry	178	Poor	Fair
	Winterberry	47	Moderate	Fair
	Highbush Blueberry	249	Moderate	Good
	Swamp Rose	219	High	Excellent
	Pussy Willow	150	High	Excellent
	Steeplebush	107	High	Very Good
	Meadowsweet	57	High	Good
	Nannyberry	24	High	Good
	TOTAL	2130		
Upland Shrub	Beaked Hazlenut	25	Moderate	Fair
	TOTAL	25		
	SITE TOTAL	**4,126Woody Stock**		

Estimated Survival
High = > 70%
Moderate = 50%-70%
Low = < 50%

LEGEND

- Fixed Monitoring Station
- Trace Reed Canary Grass 2009
- Location of Reed Canary Grass-2009
- Trace Reed Canary Grass 2010
- Location of Reed Canary Grass-2010
- Trace Reed Canary Grass 2011
- Location of Reed Canary Grass-2011
- Trace Reed Canary Grass 2013
- Location of Reed Canary Grass-2013
- Location of Reed Canary Grass-2015
- Location of Buckthorn Seedlings 2009
- Location of Buckthorn Seedlings 2010
- Location of Buckthorn Seedlings 2013
- Trace Buckthorn 2013
- Location of Cattails 2010
- Location of Cattails 2011
- Location of Cattails 2013
- Location of Cattails 2015
- Trace Cattails 2013
- Purple Loosestrife 2011
- Purple Loosestrife 2013
- Trace Multi Flora Rose 2013, 2015
- Limit of Compensation Site
- Trace Autumn Olive 2015



Scale:	Designed by:	HNTB CORPORATION 340 County Road, Suite 6-C Westbrook, ME 04092 TEL (207) 774-5155 FAX (207) 772-7410	THE GOLD STAR MEMORIAL HIGHWAY	West Gardiner Mitigation Invasive Species 2015

HNTB ARCHITECTS ENGINEERS PLANNERS

No.	Revision	By	Date

	By	Date		By	Date
Designed			Checked		
Drawn			In Charge of		

SHEET NUMBER:

CONTRACT: OF

NAME: \\bosw00\PLANNINGDEPT\Maine Turnpike\W Gardiner\Monitoring\2015 Monitoring Year 7\INV2009+2010+2011+2013+2015.dwg DATE: Nov 23, 2015 - 9:16am

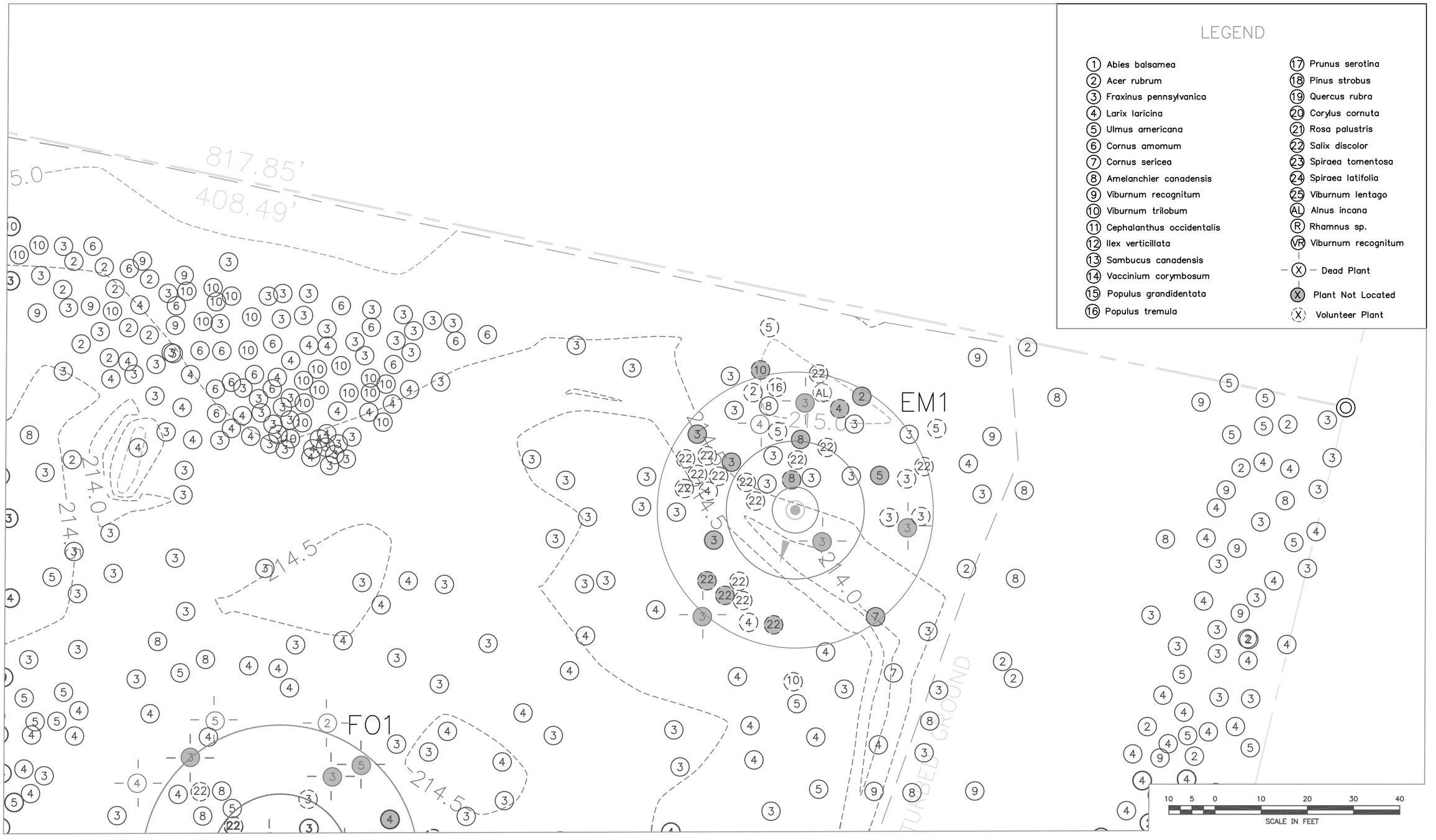
CONCLUSION

The seventh year of monitoring indicates that the desired functions are developing on site and the site appears stable. After the seventh year of monitoring the prognosis of the site is excellent, although invasive species continue to expand within the site. Plant densities and herbaceous covers on site are high. Planting densities at the site are over the success standard of 500 plants per acre and are expected to increase as volunteers continue to increase. Overall the herbaceous cover on the site is good and will improve over time. The site hydrology is indicative of wetland conditions. No erosion was noted on site. All five of the success standards were met on site during the seventh year of monitoring and the site is developing as anticipated.

The site has six invasive species but currently none pose an immediate threat to the site. Reed canary grass, cattails, purple loosestrife, buckthorn, autumn olive, and multiflora rose are all present on site. Biological control of the loosestrife is being utilized with *Galerucella* beetles, and direct treatment and/or removal of the buckthorn, autumn olive and multiflora rose are also planned for spring of 2016. The site will again be monitored for invasive species and further remediation measures may be taken if needed to maintain the performance standard. The mitigation site shows very good wildlife use. Waterfowl, muskrats, beavers, white tailed deer, and many amphibians use the site which is an indicator that the desired wildlife function is being achieved.

The seventh year of monitoring indicates that the desired cover types and functions of the mitigation plan will be achieved as the site matures.

APPENDIX A
As-Built Planting Plan



Scale:

Designed by: HNTB

No.	Revision	By	Date

	By	Date		By	Date
Designed			Checked		
Drawn			In Charge of		

HNTB CORPORATION
340 COUNTY ROAD, SUITE 6-C
Westbrook, ME 04092
TEL (207) 774-5155
FAX (207) 772-7410

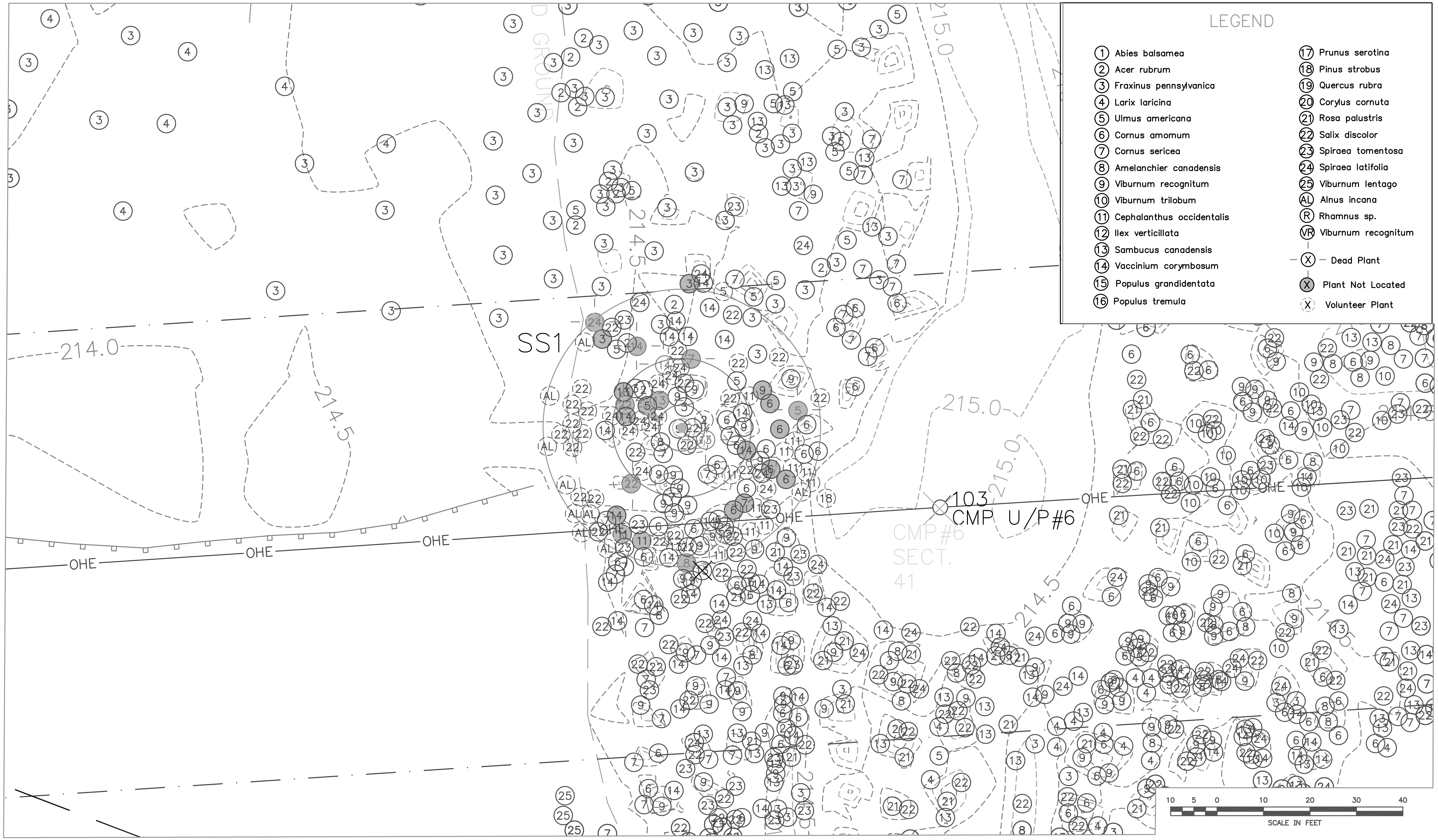
MAINE TURNPIKE

THE GOLD STAR MEMORIAL HIGHWAY

W. Gardiner Mitigation EM 1 2015

SHEET NUMBER:

CONTRACT: OF



Scale:			
No.	Revision	By	Date

Designed by:

HNTB

	By	Date		By	Date
Designed			Checked		
Drawn			In Charge of		

HNTB CORPORATION
340 COUNTY ROAD, SUITE 6-C
Westbrook, ME 04092
TEL (207) 774-5155
FAX (207) 772-7410

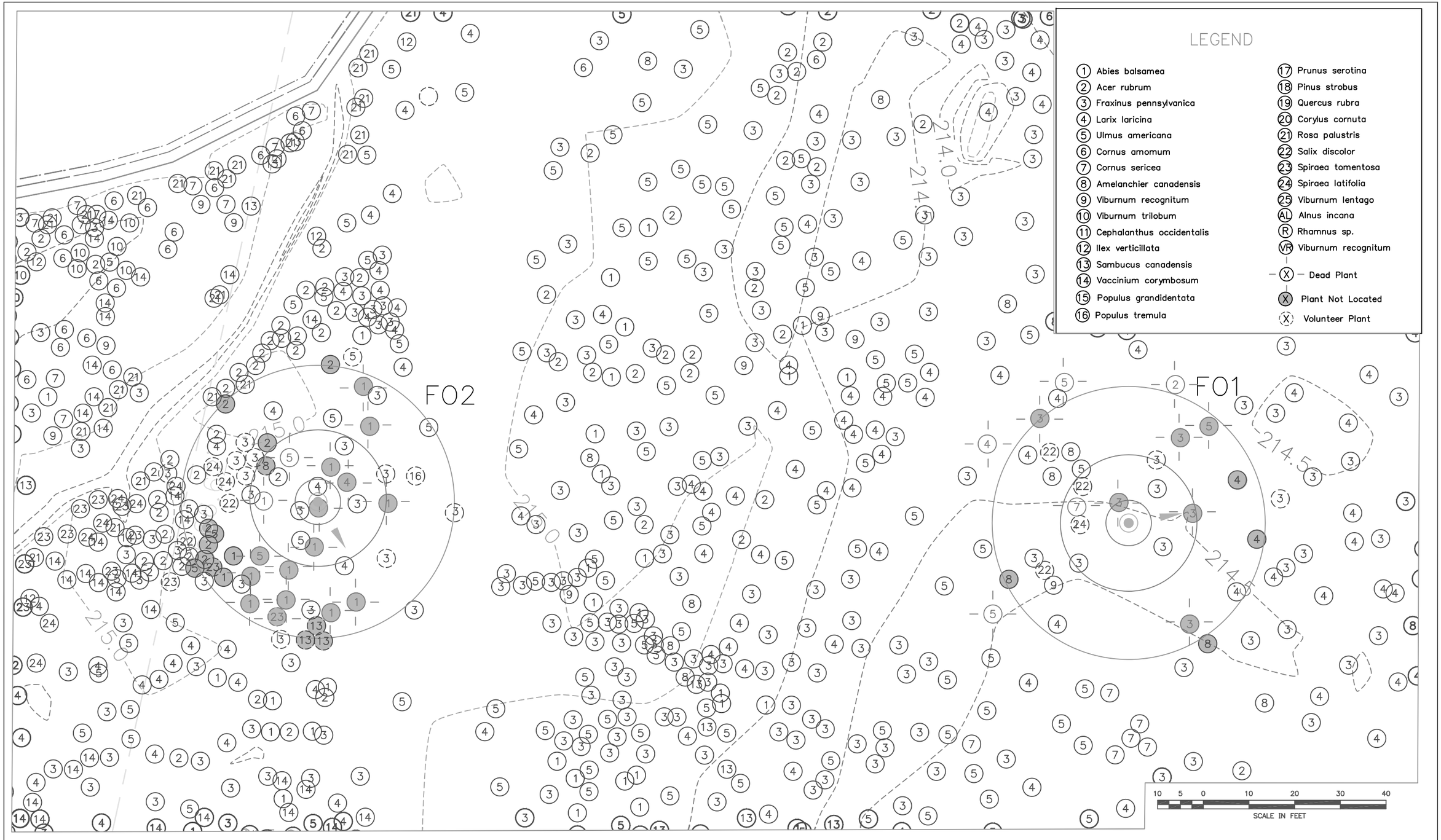
MAINE TURNPIKE

THE GOLD STAR MEMORIAL HIGHWAY

W. Gardiner Mitigation SS 1 2015

SHEET NUMBER:

CONTRACT: OF



Scale:				Designed by: HNTB					
No.	Revision	By	Date						
					By	Date		By	Date
				Designed			Checked		
				Drawn			In Charge of		

HNTB CORPORATION
340 COUNTY ROAD, SUITE 6-C
Westbrook, ME 04092
TEL (207) 774-5155
FAX (207) 772-7410

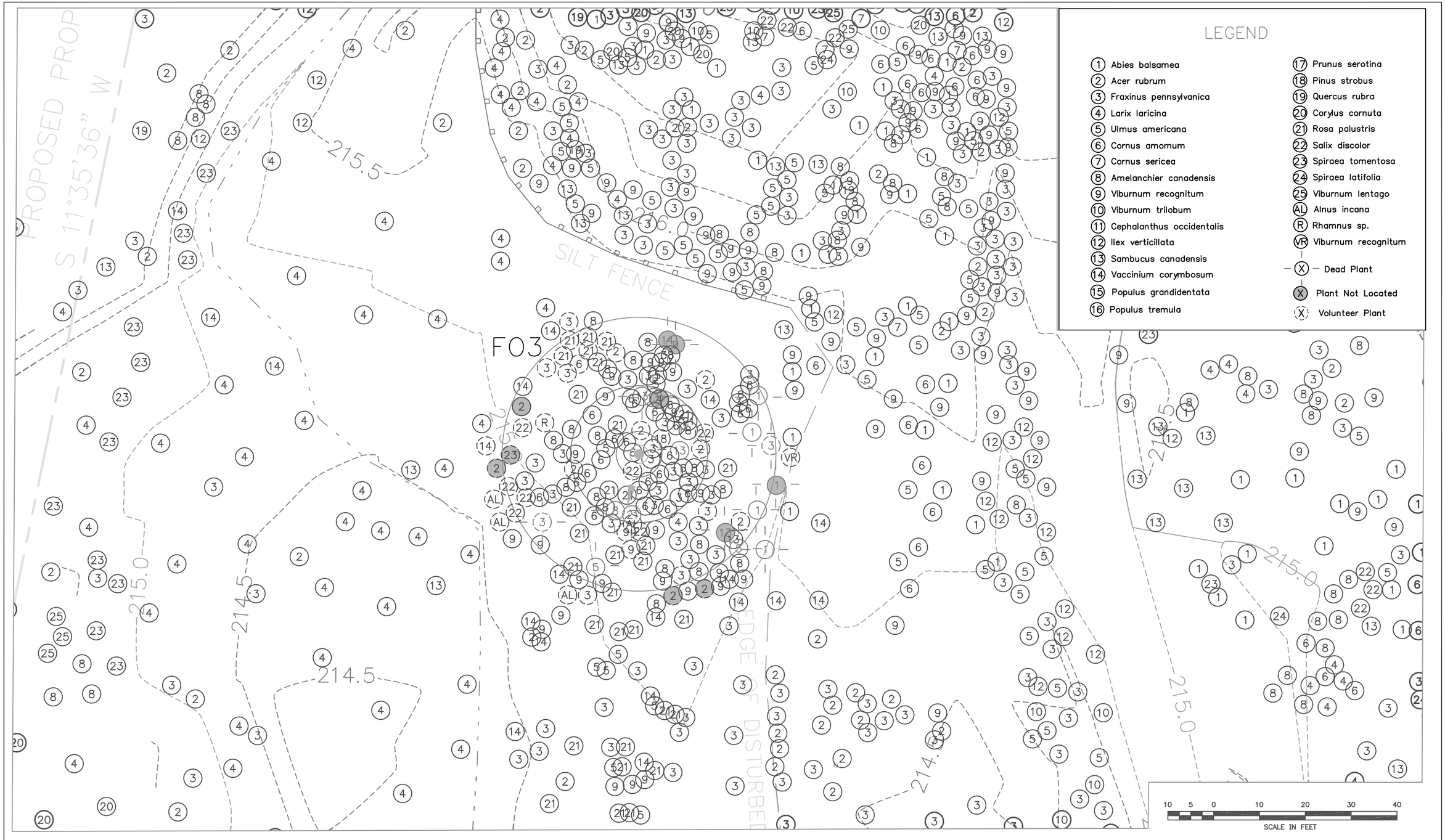
MAINE TURNPIKE

THE GOLD STAR MEMORIAL HIGHWAY

W. Gardiner Mitigation FO 1 & FO 2 2015

CONTRACT:

SHEET NUMBER: OF



LEGEND

- (1) Abies balsamea
- (2) Acer rubrum
- (3) Fraxinus pennsylvanica
- (4) Larix laricina
- (5) Ulmus americana
- (6) Cornus amomum
- (7) Cornus sericea
- (8) Amelanchier canadensis
- (9) Viburnum recognitum
- (10) Viburnum trilobum
- (11) Cephalanthus occidentalis
- (12) Ilex verticillata
- (13) Sambucus canadensis
- (14) Vaccinium corymbosum
- (15) Populus grandidentata
- (16) Populus tremula
- (17) Prunus serotina
- (18) Pinus strobus
- (19) Quercus rubra
- (20) Corylus cornuta
- (21) Rosa palustris
- (22) Salix discolor
- (23) Spiraea tomentosa
- (24) Spiraea latifolia
- (25) Viburnum lentago
- (AL) Alnus incana
- (R) Rhamnus sp.
- (VR) Viburnum recognitum
- (X) Dead Plant
- (X) Plant Not Located
- (X) Volunteer Plant

Scale:

Designed by: HNTB

No.	Revision	By	Date

	By	Date		By	Date
Designed			Checked		
Drawn			In Charge of		

HNTB CORPORATION
340 COUNTY ROAD, SUITE 6-C
Westbrook, ME 04092
TEL (207) 774-5155
FAX (207) 772-7410

MAINE TURNPIKE

THE GOLD STAR MEMORIAL HIGHWAY

W. Gardiner Mitigation FO 3 2015

SHEET NUMBER:

CONTRACT: OF

APPENDIX B
Herbaceous Species

HERBACEOUS
2015

PLOT EM		Page 1	10/1/2015	
SCIENTIFIC NAME	**COMMON NAME**	**INDICATOR STATUS**	**PERCENT COVER**	**COMMENTS**
Carex lurida	Lurid Sedge	OBL	15	Dominant
Carex scoparia	Broom Sedge	FACW	20	Dominant
Carex vulpinoidea	Fox Sedge	OBL	15	Dominant
Glyceria canadensis	Canada Manna Grass	OBL	6	
Juncus effusus	Soft Rush	OBL	15	Dominant
Lycopus virginicus	Virginia Bugleweed	OBL	4	
Lythrum salicaria	Purple Loosestrife	OBL	5	Invasive Hydrophyte
Mimulus ringens	Monkey Flower	OBL	2	
Onoclea sensibilis	Sensitive Fern	FACW	t	
Poa palustris	Fowl Bluegrass	FACW	20	Dominant
Scirpus cyperinus	Wool Grass	OBL	8	
Scirpus microcarpus	Small-fruited Bulrush	OBL	10	
Typha latifolia	Broad-leaved cattail	OBL	4	Invasive Hydrophyte
Agrostis alba	Red Top	FACW	5	
Juncus bufonius	Toad Rush	FACW	5	
Phalaris arundinacea	Reed Canary Grass	FACW+	15	Invasive Hydrophyte
Symphyotrichum puniceum	Purple-Stem American-Aster	OBL	15	Dominant
Symphyotrichum lanceolatum	White Panicled American-Aster	FACW	8	
Eupatorium perfoliatum	Boneset	FACW+	4	
Helenium autumnale	Sneezweed	FACW+	t	
Scirpus atrovirens	Green Bulrush	OBL	5	
Eleocharis spp			5	
Carex intumescens	Bladder Sedge	FACW+	6	
Total			192	

HERBACEOUS
2015

PLOT SS		Page 1	10/2/2015	
SCIENTIFIC NAME	**COMMON NAME**	**INDICATOR STATUS**	**PERCENT COVER**	
Agrostis alba	Red Top	FACW	5	
Calamagrostis canadensis	Blue-joint Reedgrass	OBL	4	
Carex lupulina	Hop Sedge	OBL	1	
Carex scoparia	Broom Sedge	FACW	10	Dominant
Carex vulpinoidea	Fox Sedge	OBL	8	Dominant
Helenium autumnale	Sneezweed	FACW	4	
Juncus bufonius	Toad Rush	FACW	5	
Lythrum salicaria	Purple Loosestrife	OBL	15	Invasive Hydrophyte
Mimulus ringens	Monkey Flower	OBL	5	
Potentilla simplex	Dwarf/common Cinquefoil	FACU	2	
Scirpus atrovirens	Green Bulrush	OBL	5	
Scirpus cyperinus	Wool Grass	OBL	20	Dominant
Solidago gigantea	Giant Goldenrod	FACW	6	Dominant
Carex intumescens	Bladder Sedge	FACW+	t	
Juncus effusus	Soft Rush	OBL	6	Dominant
Poa palustris	Fowl Bluegrass	FACW	6	Dominant
Lysimachia terrestris	Swampcandles	OBL	3	
Carex lurida	Lurid Sedge	OBL	10	Dominant
Solidago rugosa	Wrinkled Goldenrod	FAC	2	
Eleocharis obtusa	Blunt Spike-Rush	OBL	4	
Euthamia graminifolia	Flat-Top Goldentop	FAC	4	
Symphyotrichum puniceum	Purple-Stem American-Aster	OBL	6	Dominant
Symphyotrichum novae-angliae	New England American-Aster	FACW	5	
Vicia cracco	Cow Vetch	UPL	t	
Eupatoriadelphus maculatus	Joe-Pye Weed	FACW	2	
Carex tribuloides	Blunt Broom Sedge	FACW+	5	
Solidago spp			t	
Eupatorium perfoliatum	Boneset	FACW+	3	
Iris versicolor	Blue Flag Iris	OBL	t	
Epilobium coloratum	Purple-leaf Willow-herb	OBL	5	
Penthorum sedoides	Ditch-Stonecrop	OBL	t	
Doellingeria umbellata	Parasol White-Top	FACW	t	
Total			151	

HERBACEOUS
2015

PLOT FO 1		Page 1	10/1/2015	
SCIENTIFIC NAME	**COMMON NAME**	**INDICATOR STATUS**	**PERCENT COVER**	
Agrostis alba	Red Top	FACW	5	
Carex lurida	Lurid Sedge	OBL	8	Dominant
Carex vulpinoidea	Fox Sedge	OBL	10	Dominant
Eupatoriadelphus maculatus	Joe-Pye Weed	FACW	t	
Eupatorium perfoliatum	Boneset	FACW	6	
Euthamia graminifolia	Flat-topped Fragrant Gold	FAC	3	
Helenium autumnale	Sneezweed	FACW	5	
Lycopus virginicus	Virginia Bugleweed	OBL	2	
Lythrum salicaria	Purple Loosestrife	OBL	20	Invasive Hydrophyte
Polygonum sagittatum	Arrowleaf Tearthumb	OBL	5	
Potentilla simplex	Dwarf/common Cinquefoil	FACU	t	
Scirpus atrovirens	Green Bulrush	OBL	4	
Scirpus cyperinus	Wool Grass	OBL	6	
Scirpus microcarpus	Small-fruited Bulrush	OBL	8	Dominant
Solidago altissima	Tall Goldenrod	FACU	4	
Solidago gigantea	Giant Goldenrod	FACW	6	
Vicia cracco	Cow Vetch	UPL	t	
Symphyotrichum novae-angliae	New England American-Aster	FACW	5	
Symphyotrichum puniceum	Purple-Stem American-Aster	OBL	10	Dominant
Carex scoparia	Broom Sedge	FACW	10	Dominant
Poa palustris	Fowl Bluegrass	FACW	15	Dominant
Onoclea sensibilis	Sensitive Fern	FACW	3	
Juncus effusus	Soft Rush	OBL	8	Dominant
Mimulus ringens	Monkey Flower	OBL	2	
Symphyotrichum tradescantii	Tradescant's American-Aster	FACW	4	
Geranium bicknellii	Bicknell's Crane's-Bill		t	
Solidago rugosa	Wrinkled Goldenrod	FAC	t	
Juncus bufonius	Toad Rush	FACW	3	
Iris versicolor	Blue Flag Iris	OBL	2	
Typha latifolia	Broad-leaved cattail	OBL	t	Invasive Hydrophyte
Total			154	

HERBACEOUS
2015

PLOT FO 2		Page 1	10/1/2015	
SCIENTIFIC NAME	**COMMON NAME**	**INDICATOR STATUS**	**PERCENT COVER**	
Agrostis alba	Red Top	FACW	10	
Carex lurida	Lurid Sedge	OBL	4	
Carex scoparia	Broom Sedge	FACW	4	
Carex vulpinoidea	Fox Sedge	OBL	12	Dominant
Geranium bicknellii	Bicknell's Crane's-Bill		t	
Helenium autumnale	Sneezweed	FACW+	6	
Juncus effusus	Soft Rush	FACW+	10	
Lythrum salicaria	Purple Loosestrife	FACW+	15	Invasive Hydrophyte
Mimulus ringens	Monkey Flower	OBL	2	
Phalaris arundinacea	Reed Canary Grass	FACW+	6	Invasive Hydrophyte
Phleum pratense	Timothy	FACU	t	
Potentilla simplex	Dwarf/common Cinquefoil	FACU-	10	
Scirpus atrovirens	Green Bulrush	OBL	t	
Solidago altissima	Tall Goldenrod	FACU-	25	Dominant
Solidago gigantea	Giant Goldenrod	FACW	10	
Vicia cracco	Cow Vetch	UPL	t	
Poa palustris	Fowl Bluegrass	FACW	20	Dominant
Symphyotrichum novae-angliae	New England American-Aster	FACW	15	Dominant
Symphyotrichum puniceum	Purple-Stem American-Aster	OBL	10	
Symphyotrichum tradescantii	Tradescant's American-Aster	FACW	4	
Doellingeria umbellata	Parasol White-Top	FACW	t	
Juncus bufonius	Toad Rush	FACW	3	
Scirpus cyperinus	Wool Grass	FACW+	t	
Medicago sativa	Alfalfa	UPL	t	
Total			166	

HERBACEOUS
2015

PLOT FO 3		Page 1	10/1/2015	
SCIENTIFIC NAME	**COMMON NAME**	**INDICATOR STATUS**	**PERCENT COVER**	
Agrostis alba	Red Top	FACW	5	
Anthoxanthum odoratum	Large Sweet Vernal Grass	FACU	3	
Calamagrostis canadensis	Blue-joint Reedgrass	OBL	6	
Carex lurida	Lurid Sedge	OBL	3	
Carex vulpinoidea	Fox Sedge	OBL	3	
Cirsium spp	Thistle		5	
Equisetum spp	Horsetail		t	
Eupatorium perfoliatum	Boneset	FACW	3	
Juncus bufonius	Toad Rush	FACW	8	Dominant
Juncus effusus	Soft Rush	OBL	5	
Lythrum salicaria	Purple Loosestrife	OBL	10	Invasive Hydrophyte
Potentilla simplex	Dwarf/common Cinquefoil	FACU	8	Dominant
Scirpus atrovirens	Green Bulrush	OBL	3	
Scirpus cyperinus	Wool Grass	OBL	3	
Solidago gigantea	Giant Goldenrod	FACW	3	
Trifolium hybridum	Alsike Clover	FACU	15	Dominant
Symphyotrichum puniceum	Purple-Stem American-Aster	OBL	t	
Daucus carota	Queen Ann's Lace	UPL	4	
Carex scoparia	Broom Sedge	FACW	5	
Euthamia graminifolia	Flat-Top Goldentop	FAC	3	
Iris versicolor	Blue Flag Iris	OBL	t	
Helenium autumnale	Sneezweed	FACW+	5	
Eleocharis spp			3	
Mimulus ringens	Monkey Flower	OBL	1	
Poa palustris	Fowl Bluegrass	FACW	8	Dominant
Lysimachia terrestris	Swampcandles	OBL	3	
Symphyotrichum novae-angliae	New England American-Aster	FACW	15	Dominant
Doellingeria umbellata	Parasol White-Top	FACW	10	Dominant
Rosa palustris	Swamp Rose	OBL	t	
Lycopus virginicus	Virginia Water-Horehound	OBL	3	
Setaria viridis	Green Foxtail		t	
Symphyotrichum tradescantii	Tradescant's American-Aster	FACW	10	Dominant
Total			153	

APPENDIX C
Site Photographs

Emergent Station – View North

Scrub-shrub Station – View North (located within mound and pool topography)

Forested Station 1 – View North

Forested Station 2 – View Northeast

Forested Station 3 – View Southeast (located within mound and pool topography)

Site Overview – View East

Cattails (*Typha latifolia*) located on the southern bank of the pond looking west.

Autumn Olive (*Eleagnus spp.*) located at the southern portion of the site along the ROW fence.

Large Buckthorn (*Rhamnus frangula*) individuals found on the upland knoll at the center of the site looking north.

Reed Canary Grass *(Phalaris arundinacea*) on the right pictured next to Bluejoint (*Calamagrostis canadensis*) on the left.

APPENDIX D
Forested Plot 2 Hydrology Evaluation

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PAUL R. LEPAGE
GOVERNOR

PATRICIA W. AHO
COMMISSIONER

October 14, 2014

Conrad Welzel
Maine Turnpike Authority
2360 Congress Street
Portland, Maine 04102

Dear Mr. Welzel:

The Department of Environmental Protection received the fifth year monitoring report (report) for the West Gardiner Service Plaza mitigation site, which was prepared by HNTB Corporation, entitled "Annual Wetland Mitigation Monitoring Report, Year 5, 2013, Maine Turnpike Authority / Maine Department of Transportation West Gardiner Service Plaza / Rest Area," and dated December 2013. The monitoring report is the fifth of ten years of monitoring, as required, for the completion of impacts authorized under L-23501-TG-B-N (and NAE-2006-02856).

A site inspection was conducted on September 17, 2014 to evaluate the mitigation thus far. As noted in the 2013 monitoring report, and as observed during the site inspection, overall, the mitigation site appears to be performing well. Of concern is the presence and distribution of invasive species of vegetation including reed canary grass (*Phalaris arundinaceae*), purple loosestrife (*Lythrum salicaria*), glossy buckthorn (*Ramnus frangula*), autumn and Russian olive (*Eleagnus spp.*), and multiflora rose (*Rosa multiflora*). According to the monitoring report, purple loosestrife biological control was introduced between 2009 and 2010, and is successfully limiting the spread of the species. Herbicidal application was undertaken in 2008 for buckthorn control. The report recommended control measures for autumn and Russian olive as well as multiflora rose in 2014. Although the report documented an increase in buckthorn and reed canary grass on-site, it did not propose any further control for these species at this time. Established populations of invasive species were documented in the report and observed by the Department off-site, on properties in close proximity to the mitigation area. As a result, invasive species control on-site is complicated, and made more difficult, by the annual introduction of new seed sources. Although the percent aerial cover of vegetation presently meets the success standards, and the present abundance of each invasive species listed above represents less than 10% individually, the probability for expansion throughout the mitigation site is high. Thus, the Department recommends control measures be undertaken in 2015 for reed canary grass and buckthorn, in addition to those already proposed in 2014 for autumn and Russian olive and multiflora rose, to ensure long-term performance objectives are met.

Additionally, the report noted that monitoring plot FO2 contains an herbaceous layer dominated (among others) by tall goldenrod (*Solidago altissima*) and common cinquefoil (*Potentilla simplex*), both FACU species. In the next monitoring report (Year 7), the Department requests

AUGUSTA
17 STATE HOUSE STATION
AUGUSTA, MAINE 04333-0017
(207) 287-7688 FAX: (207) 287-7826

BANGOR
106 HOGAN ROAD, SUITE 6
BANGOR, MAINE 04401
(207) 941-4570 FAX: (207) 941-4584

PORTLAND
312 CANCO ROAD
PORTLAND, MAINE 04103
(207) 822-6300 FAX: (207) 822-6303

PRESQUE ISLE
1235 CENTRAL DRIVE, SKYWAY PARK
PRESQUE ISLE, MAINE 04769
(207) 764-0477 FAX: (207) 760-3143

web site: www.maine.gov/dep

that you submit a complete data form documenting all three criteria observed at FO2 to support that hydrology is sufficient at this location.

The Department appreciates the effort that Maine Turnpike Authority and HNTB have undertaken to perform the mitigation measures. If you have any questions related to this matter, please feel free to contact me directly at (207) 215-4525 or by email at megan.bishop@maine.gov.

Sincerely,

Megan Bishop
Division of Land Resource Regulation
Bureau of Land & Water Quality

cc: Kevin Slattery
HNTB Corporation
31 St. James Avenue
Suite 300
Boston, Massachusetts 02116

U.S. Army Corps of Engineers
Maine Project Office
675 Western Avenue #3
Manchester, Maine 04351

Maine Turnpike Authority
2360 Congress Street
Portland, Maine 04102

Daniel E. Wathen, Augusta, Chairman
James F. Cloutier, Portland
Gerard P. Conley, Sr., Portland
John E. Dority, Augusta
Robert D. Stone, Auburn
Freeman R. Goodrich, Wells
Karen Doyle, Chief Financial Officer MaineDOT, Ex-Officio

Peter Mills, Executive Director
Douglas Davidson, Chief Financial Officer & Treasurer
Peter S. Merfeld, P.E., Chief Operations Officer
Jonathan Arey, Secretary & General Counsel

HNTB - Boston

October 29, 2014

Megan Bishop
Division of Land Resource Regulation
Bureau of Land & Water Quality
17 State House Station
Augusta, Maine 04333-0017

Dear Megan, Megan,

It was a pleasure meeting you on September 17th on the West Gardiner Mitigation Site Visit. I am glad you agree with Kevin Slattery's findings that this Mitigation Site is performing well.

Your letter points out two basic concerns; 1) a few invasive species that need management and, 2) verifying the hydrology at plot FO2 to assure proper wetland development. The Maine Turnpike Authority staff have reviewed your letter of 10/14/14 regarding the mitigation site and conferenced with Kevin Slattery of HNTB to discuss how best to address your concerns about the site.

The purpose of this letter is to share with you the proposed action steps the MTA will take next regarding your concerns. Please feel free to comment on our action plan.

1: Invasive plants:

We have two actions that we intend to implement with regards to these undesirable plants. All control measures will be conducted during the 2015 growing season.

1) A combination of targeted application of herbicides and/or cutting and stem treatment for Reed Canary Grass, Autumn Olive, Glossy Buckthorn and Multiflora Rose.

   The Reed Canary Grass occurs in patches and is suitable for approved herbicide application. The Autumn Olive and Multiflora Rose are very limited in numbers and we will either pull whole plants, or cut the plant stems and treat stems with herbicide. Glossy Buckthorn will be treated by spraying the dense concentrations of seedlings beneath the white pines in the central upland area of the site, and

Maine Turnpike Authority
2360 Congress Street
Portland, Maine 04102

also by identifying the largest plants within the mitigation area and either pulling the plants or cutting the stems and treating with approved herbicide.

2) Supplement the bio-control measures using *Galerucella sp.* beetles for Purple Loosestrife.

For the Purple Loosestrife we will continue with biological control methods and increase the beetle population with the intention expanding the beetle's ability to reduce the on-site loosestrife. The intent is to release more beetles at the site during the 2015 growing season.

2: Plot FO2 Hydrology:

While at the site doing the work on the invasive plant controls and annual monitoring, we will do at least two hydrology assessments following the routine federal wetland delineation protocols. Also, during the annual monitoring for the site, a soil profile will be established to determine whether wetland indicators are present. We will document observations and be better able to evaluate if there are other corrective actions that need to be done to assure the intended hydrology is achieved at this Plot and throughout the site.

I hope these actions meet your expectations. If you would like to discuss any of the site's technical performance or our approaches above, both the Authority and HNTB are available to do so.

Please feel free to call me if you have any questions or comments.

Thank you,

Conrad Welzel
Government Relations Manager

CC: Steve Tartre, PE
Maine Turnpike Authority

Kevin Slattery, HNTB
31 St. James Ave
Boston, Massachusetts 02110

Jay Clement, USACE
675 Western Ave. #3
Manchester, Maine 04351

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: West Gardiner Service Plaza Mitigation Site City/County: West Gardiner/Kennebec Co Sampling Date: 10/02/2015

Applicant/Owner: Maine Turnpike Authority State: ME Sampling Point: FO 2

Investigator(s): Kevin Slattery, PWS, and Nick Henke Section, Township, Range: _____

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

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

Soil Map Unit Name: _____ NWI classification: _____

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

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

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

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

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

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

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

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

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

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

Wetland Hydrology Present? Yes X No

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

Remarks:

Surface depressions with visible puddled standing water, 1-2 inches. Likely from recent rain.
Water quickly infiltrated soil pit once dug.

SOIL

Sampling Point: FO 2

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0" - 15"	5Y 3/2	98	5Y 5/6	2	F/M	M	SL	Distinct to Prominant
15" - 25"	5Y 4/2	80	5Y 4/4	20	M	M	SL	Distinct, some pore lining color.

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils[3]:

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

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

Restrictive Layer (if observed):

Type:_____

Depth (inches):_____

Hydric Soil Present? Yes _____ No _____

Remarks:

Forested Plot 2 – Surface water present.

Forested Plot 2 – Soil core sample.

Forested Plot 2 – Free water to surface in soil core.