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# Transmittal

**To:** Jay Clement (USACE), Bill Bullard (MDEP)

**CC:** Deane Van Dusen (MaineDOT), Jim Wendel (Scarborough), Ken Grondin (Grondin), Rich Jordan (Boyle Associates)

**From:** David Brenneman (Boyle Associates) on behalf of Grondin Aggregates/Larrabee Farms Wetland Mitigation Site

**Date:** 1/9/12

**Re:** **Maine DOT Gorham Bypass Wetland Mitigation Project at Larrabee Farms Wetland Mitigation Site – YEAR FOUR (2011) MONITORING REPORT**

**Corps Permit No.:** NAE-2005-4220

**Maine DEP NRPA Project Number:** L-23402-TH-A-N

Attached, please find the fourth year (2011) wetland mitigation project monitoring report for the above-mentioned project.

This site was included during a site visit by Paul Minkin and Ruth Ladd in September, 2011.

If you have any questions or would like to conduct additional site visits, please contact Ken Grondin (207-854-1147) or Richard Jordan (207-671-2760).

Thank you,

David Brenneman, Environmental Scientist  
[dbrenneman@boyleassociates.net](mailto:dbrenneman@boyleassociates.net)

**MITIGATION REPORT**

**TRANSMITTAL AND SELF-CERTIFICATION**

**DEPARTMENT OF THE ARMY PERMIT NUMBER:** NAE-2005-4220

**MAINE DEP NRPA PERMIT NUMBER:** L-23402-TH-A-N

**PROJECT TITLE:** Maine Department of Transportation Gorham Bypass Project: Larrabee Farms Wetland Mitigation Project

**PERMITTEE:** Maine Department of Transportation (MaineDOT)

**MAILING ADDRESS:**

Deane Van Dusen, Environmental Dept.

State House Station 16

Augusta, Maine 04333

TELEPHONE: 207.624.3088

**AUTHORIZED AGENT:** Grondin Aggregates, LLC

**MAILING ADDRESS:**

Ken Grondin

11 Bartlett Road

Gorham, Maine 04038

TELEPHONE: 207.854.1147

**ATTACHED MITIGATION REPORT TITLE:** Maine Department of Transportation Gorham Bypass:  
Fourth Year Wetland Mitigation Monitoring Report

**PREPARERS:** Boyle Associates (207.591.5220)

**DATE:** January 9, 2012

**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:** \_\_\_\_\_ {Signature on File (y.1)} \_\_\_\_\_  
(Signature of permittee) Date

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**Project Overview Form**

**Corps Permit No.:** NAE-2005-4220

**Maine DEP NRPA Project Number:** L-23402-TH-A-N

**Mitigation Site Name:** Larrabee Farms Wetland Mitigation Site: MaineDOT Gorham Bypass Mitigation

**Monitoring Report:** Year 4 of 10

**Name and Contact Information for Permittee (left) and Agent (right):**

Maine Department of Transportation (MaineDOT) Deane Van Dusen: Phone # 207.592.3198 State House Station 16 Augusta, Maine 04333	Grondin Aggregates, LLC Ken Grondin: Phone # 207.854.1147 11 Bartlett Road Gorham, ME 04038
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**Name of Party Conducting the Monitoring:** Dave Brenneman - Boyle Associates (phone # 207.591.5220)

**Date(s) of Inspection(s) (Specific to Monitoring):** April, 15 & 27, May 13, June 14, 15, & 17, September, 21.

**Project Summary:**

Fourth year monitoring procedures were conducted at the vernal pool, herbaceous, scrub-shrub, and forested wetland creation areas at the Larrabee Farms Wetland Mitigation Site. These wetland mitigation areas were designed as compensation for wetland, stream and vernal pool functions and values impacted by MaineDOT's Gorham Bypass Project. Construction of the MaineDOT project impacted approximately 11 acres of forested, scrub-shrub, wet meadow, and emergent wetlands, and nine streams with associated wetlands. The project also relocated approximately 290 linear feet of Brandy Brook near Flaggy Meadow Road and realigned a section of an unnamed Brandy Brook tributary. Wetland compensation included 67.5 acres comprised of 15.7 acres of wetland creation (14.1 acres of PFO, 1.2 acres of PSS and 0.4 acres of PEM); 12.8 acres of wetland preservation; 28.4 acres of upland buffer preservation; and creation of four vernal pools (0.3 acres +/- of created pool area and preservation of 10.3 acres of upland and wetland habitat buffers adjacent to the pools). The preservation area includes 2,042 linear feet of a wooded, intermittent stream and 100 linear feet of the Nonesuch River.

**Location of and Directions to Mitigation Site:**

The Larrabee Farms Wetland Mitigation Site is located in the town of Scarborough. The site entrance is located approximately 1 mile southeast of the corner of Route 114 and Beech Ridge Road.

**Start and Completion Dates for Mitigation:**

Conservation easement recorded - Cumberland County Registry of Deeds	Feb. 2007
Final wetland creation grading began	March 2007
Vernal pools constructed	March 2007
Final wetland grading completed	Oct. 15, 2007
Hydroseeding with wetland herbaceous seed mix completed and installation of woody vegetation completed	Oct. 15, 2007

**Performance Standards are/are not being met:**

The success standards for hydrology, invasive species, aerial cover, woody species diversity, and slope and soils stabilization are being met. The success standards for planted woody species densities are not yet being met.

**Dates of Corrective or Maintenance Activities Conducted Since Last Report:**

Planted additional ~650 woody plants throughout PSS and PFO creation areas.	05/2011
Chemical invasive species control within and around the perimeter of the creation area.	09/2011
Mechanical and/or chemical invasive species control within and around the creation area.	12/2011

**Recommendations for Additional Remedial Actions:**

- Continue on-going invasive plant monitoring and removal efforts.
- Remove ~50 black alder (*Alnus glutinosa*) plants and replace with speckled alder (*Alnus incana*)
- Relocate woody sampling plot locations during 2012 monitoring period; install additional woody plants in the fall of 2012 if the planted woody density criteria is not met.

**Requirements (1 page)**

**Performance Standards**

The wetland and vernal pool creation and buffer areas will be assessed annually during the growing season (May-October for creation areas, April-May for VPs) for at least 10 years. Monitoring will take place twice per season during the first through fifth years following planting. For the wetland creation areas, one visit will take place in the spring, and will include a general site walk and assessment of general site health, an assessment of any winter damage and in order to determine any corrective needs. A second site visit will take place between June and October to assess plant mortality/vitality and to gather data for the annual monitoring reports. The data gathering and reporting procedure will then take place once during the first through fifth years, and during the 7<sup>th</sup> and 10<sup>th</sup> years, if necessary, following construction.

**Success Standards:**

1. Hydrology	
• Adequate to support the designed wetland type:	Yes
• Proposed hydrology being met:	Yes
• Percentage of site meeting proposed hydrology:	100%
• Too wet/dry areas identified and corrective measures proposed:	N.A.
2. Proposed vegetation diversity and/or density goals for woody plants from the plan met:	<b>Density - No</b>
3. Aerial cover	
A. Each mitigation site has at least 80% aerial cover, by noninvasive species:	Yes
B. Emergent areas have at least 80% cover by noninvasive hydrophytes:	Yes
C. Scrub-shrub and forested cover types have at least 60% cover by noninvasive hydrophytes, of which at least 15% are woody species:	<b>No</b>
4. Common reed ( <i>Phragmites australis</i> ), Purple loosestrife ( <i>Lythrum salicaria</i> ), Russian and Autumn olive ( <i>Elaeagnus</i> spp.), Buckthorn ( <i>Rhamnus</i> spp.), Japanese knotweed ( <i>Polygonum cuspidatum</i> ), and/or Multiflora rose ( <i>Rosa multiflora</i> ) plants at the mitigation site(s) are being controlled:	Yes
5. All slopes, soils, substrates, and constructed features within and adjacent to the mitigation site(s) are stable:	Yes

In general, the mitigation area is doing well and is successfully providing wetland functions and values similar to a natural mixed (PFO/PSS/PEM) wetland system. Wetland functions and values being provided across the site include wildlife habitat, groundwater recharge/discharge, floodflow alteration, educational and scientific values, production export, and great scenic and recreational values. There is a dominance of hydrophytic vegetation, presence of hydric soils, and abundant evidence of hydrology. Ground cover by non-invasive hydrophytes has increased since 2009, and the site is meeting the aerial cover requirements. Finally, health and vitality of the established shrubs and trees is good.

While the surviving planted woody plants are doing well, woody plant density is not meeting the Corps density standard of approximately 500 trees and shrubs per acre. As prescribed in the mitigation plan, in the spring of 2011 (prior to the fall monitoring period.) Grondin installed 250 additional speckled alder throughout the PSS creation areas. Also, 200 green ash (*Fraxinus pennsylvanica*) and 200 black willow (*Salix nigra*) plants were installed throughout the PFO creation areas. Despite the additional plantings, and while the site is providing a variety of target functions and values, the average woody density across the entire site remains below the Corps standard. Low but consistent annual mortality has contributed to the lower overall density after four growing seasons. Additionally, plants were clumped around the site rather than planted in evenly spaced rows, and there is inconsistency in plant densities between the monitoring plots (e.g. the highest density plot has 694 plants/acre while the lowest density plot has 104 plants/acre). Further speculative reasoning for the lower than desired density is that some species may have been overlooked or under-counted due to the thick herbaceous vegetation. Finally, the site is sprouting many volunteer woody plants, but none are yet of a specific density sufficient to be counted.

Of additional general note – NEACE staff (Minkin and Ladd) visited the site in September, 2011.

**Summary Data (maximum of 4 pages)**

**Describe the monitoring inspections, and provide their dates, that occurred since the last report.**

**Vernal Pool Habitat Creation Monitoring**

The three created vernal pools, created in 2008, were monitored twice in April and once in May of 2011. Egg mass counts were conducted at each visit to ensure that all masses were accounted for. A fourth pool was added on March 30 and 31, 2010 to provide compensation for a manmade vernal pool habitat that had been inadvertently impacted by construction of the Gorham Bypass. This pool was constructed in an upland forest southeast of the wetland creation area and was monitored at the same time as the other created pools in 2011.

**Wetland Creation Monitoring**

Site walks were conducted throughout winter, spring and summer of 2011 to assess general site health and to determine if any winter damage occurred that would require correction measures. No significant damage was observed, and no corrective measures were recommended.

As stated above, previous year data indicate that the site has not been meeting the woody plant density requirement, but site monitors noted variability in density data between the plots. Plot locations used during the 2008 and 2010 monitoring sessions were chosen randomly. For the 2011 monitoring effort, site monitors did not move the plot locations theorizing that the additional woody planting would even out the disparity in plot data.

In-depth monitoring of the creation area occurred in June and September of 2011. Round monitoring plots with 50-foot radii were used to sample 2.94 acres of the forested wetland creation area. Round monitoring plots with a radius of 30 feet were used to sample 0.25 acre of the scrub-shrub creation area. The entire herbaceous wetland creation area was monitored (no sample plots were used). The combined sample areas represent approximately 25% of the entire wetland creation site (100% of the PEM, 22.3% of the PFO areas and 22.5% of the PSS areas).

**Success Standards**

**1) Hydrology**

**Is the proposed hydrology met at the site?**

Yes.

As anticipated, the primary source of hydrology in the wetland creation area comes from groundwater interception. Further hydrologic input is provided by surface runoff and atmospheric deposition. General hydrology across the wetland creation area varies from seasonally saturated to occasionally flooded. During visits to the site at various times of the growing season, hydrology was always evident. Discharge was seen from the side-slopes and rip-rap spillways on the northeast side of the creation area and surface flow and ponding was noted throughout the site..

**What percentage of the site is meeting projected hydrology levels?**

100%.

**Areas that are too wet or too dry should be identified along with suggested corrective measures.**

Groundwater discharge and surface flow was evident across the creation site throughout the spring, summer and fall, from ice-out in April through the date of this monitoring report. Pits not inundated during the monitoring visits show evidence of former flooding/ponding during the growing season. All four of the observed soil profiles keyed as hydric using the *Field Indicators of Hydric Soils in the United States, version 7* and/or the *Field Indicators for Identifying Hydric Soils in New England, Version 3*. Most of the wetland vegetation observed is alive and growing, indicating an adequate hydrologic regime.

The three created ephemeral ponds were dry or nearly dry during monitoring in the late summer 2011. The wet season depth in these pools was observed to be approximately four feet, or the approximate level of the top of grade of surrounding creation areas.

**2) The proposed vegetation diversity and density goals for woody plants from the plan are met.**

Diversity Goal being met: **Yes** – Of the 14 species of shrubs and trees planted at the mitigation site, seven species have more than 50 individual plants per acre.

Density Goal being met: **No** – The woody vegetation density success standard, as described in the mitigation plan, is 500 trees and shrubs per acre in planned planted areas (of which at least 350 per acre are tree species for PFO creation areas). In order to achieve that goal, following the ACOE's, *Guidance for the New England Division Mitigation Plan Checklist (10/24/2006 Draft)*, and as described in the planting plan, Grondin installed 400 trees/acre in PFO areas and 600 shrubs/acre in planned PSS areas. However, since the area planted as PFO creation is much larger than that planted as PSS, overall plant density is closer to that installed in PFO creation areas (*i.e.* 400 plants/acre).

In 2011, the average density of woody plants across both PFO and PSS creation areas is 409 trees and shrubs per acre. Within the PSS creation areas the average density is 512 shrubs/acre and within the PFO creation areas the average density is 384 trees/acre. **This density data do not include volunteer species.** While several volunteer plants were noted to have a height of greater than 18 inches, none have a density of 50 or more plants per acre and could therefore not be counted. Monitors anticipate that additional volunteer species and seedlings from reproduction within the creation area will reach sufficient density to be included in future monitoring assessments; these additional plants may help bring the overall woody plant density closer to the Corp standards.

**REMEDICATION:** An additional 400 trees and 230 shrubs (+/-) were needed to reach the minimum average density of 350 trees per acre. In 2011, a mix of quick growing and hardy black willow and green ash (200 of each species) were installed across PFO creation areas and speckled alder (250 +/-) were installed across PSS creation areas.

**3) a. Each mitigation site has at least 80% aerial cover, excluding planned open water areas or planned bare soil areas (such as for turtle nesting), by noninvasive species (See Table 8 in App. D).**

**Yes.**

Monitors recorded an average of 117% aerial cover by non-invasive species throughout the wetland creation site. Average percent aerial cover increased from 90 in 2010 to 117 in 2011. Herbaceous vegetation is spreading well across the mitigation site and trees and shrubs will provide additional aerial coverage as they mature.

Additionally, certain herbaceous species seem to be spreading well after four seasons. Over the years, a noticeable increase in soft rush (*Juncus effusus*) and switchgrass (*Panicum virgatum*) has been seen in several areas across the site. These two species seem to be adapting successfully and out-competing invasive species such as broadleaf cattail (*Typha latifolia*), bird's-foot trefoil (*Lotus corniculatus*) and reed-canary grass (*Phalaris arundinacea*).

**3) b. Planned emergent areas on each mitigation site have at least 80% cover by noninvasive hydrophytes.**

**Yes.**

The PEM creation has approximately 130% aerial coverage by plants, 94% of the cover comes from non-invasive hydrophytes - the rest of the cover is nearly all broadleaf cattail. Cattails have continued to grow thickly in the semi-permanently flooded areas within the site, but are not spreading outside of these areas. Barnyard grass (*Echinochloa crusgalli*) was present in past years, but was non-existent in 2011. The area is stable and cover by non-invasive species has met the target requirements for planned emergent areas.

**3) c. Planned scrub-shrub and forested cover types have at least 60% cover by noninvasive hydrophytes, of which at least 15% are woody species.**

**No.**

Monitors tallied an average of 115% aerial cover by non-invasive hydrophytes in the scrub-shrub and forested creation areas but only 13% aerial cover from woody hydrophytes. Even though densities of planted woody material are below the standard, many individual woody plants are doing very well and have shown signs of increasing aerial coverage over the last four years. In particular, there were many individuals of tamarack (*Larix*

*laricina*) that have attained heights of over 15 feet tall. The additional woody plantings and crown spread and growth of established plants did help increase the aerial cover of woody species by 4%, but the small size of the planted individuals was not enough to bring the total aerial cover of woody plants over 15%. Growth during the 2012 growing season coupled with the robust nature of the alder and ash species should be sufficient to bring the aerial cover above the 15% threshold.

**4) Common reed, Purple loosestrife, Russian and Autumn olive, Buckthorn, Japanese knotweed, and/or Multiflora rose plants at the mitigation site(s) are being controlled.**

**Yes.**

The site was inventoried in July of 2011 for any invasive species. In past years, hand removal was conducted on the small amounts of invasive plants found within the creation area. While this method has been successful in stopping the plants from spreading, it does not appear to be eradicating them. In an effort to try to remove these plants entirely, a chemical control plan was implemented this season. In early September, a licensed State of Maine Master Pesticide Applicator transected the site and applied a 1.5% solution of Accord Concentrate (active ingredient glyphosate) to all purple loosestrife and common reed plants found within the creation area. Japanese knotweed growing on the side-slopes directly adjacent to the creation area were controlled along with the loosestrife and common reed. Black locust was found within the creation area, but in past years was not deemed to be spreading enough to warrant control. During this year's survey for invasive species, it appeared that some control was going to be warranted before these individuals spread any further. During the chemical control effort of the other invasive species, small black locust plants (less than 24" in height) were sprayed in a similar manner to the other invasive species. A few larger individuals remained that were deemed too difficult to obtain adequate spray coverage. These individuals were controlled by either mechanical removal with a Weed Wrench or a cut-stump treatment of Accord in early winter (post dormancy).

Other noxious species observed within the creation area were bird's-foot trefoil, reed canary-grass, and broadleaf cattail. No control methods were conducted on the bird's-foot trefoil or the reed canary grass as it appears that these species are slowly being out-competed by other non-invasive herbaceous plants (as described above in section 3a). Broadleaf cattail found within the creation area is only found within the ditches and pools around the site. They do not appear to be spreading and in some areas are slowly being out-competed by non-invasive species.

Regretfully, it was noted during monitoring that a small percentage of the speckled alders planted in the spring of 2011 were found to actually be the invasive black alder (*Alnus glutinosa*). Prior to ordering bare-root stock, the nursery (Lawyer Nursery, Inc. Plains, MT) had given assurance that they no longer grew black alder due to its invasive nature. Despite this and the subsequent inspection of the dormant bare-root material (acknowledging that no leaves make a positive identification difficult,) some black alder individuals were still found on the site after leaf-out. Currently, we are in correspondence with the nursery to see if they can provide replacement plants. Regardless of the outcome, all black alder individuals found in 2012 will be flagged and removed, destroyed and replaced with the native speckled alder.

**5) All slopes, soils, substrates, and constructed features within and adjacent to the mitigation site(s) are stable.**

**Yes.**

All slopes, soils, substrates, and constructed features within and adjacent to the mitigation site are stable.

**Soils data:** Four soil profiles were investigated within the wetland creation site. Soils observed consisted of grayish-brown layers with redoximorphic features, some of which underlie dark A horizons. Three of the profiles keyed as hydric following the *Field Indicators of Hydric soils in the United States, Version 7* and one profile keyed as hydric following the *Field Indicators for Identifying Hydric Soils in New England, Version 3*. Please see Tables 1 through 4 in Appendix D for representative soil profile descriptions for each creation type.

**Erosion Control Measures:** No erosion concerns were observed within the creation area and no control measures are in place.

**Visual Estimate of Percent Cover of Non-invasive and Invasive Species:** The average percent vegetative cover by non-invasive plants at the mitigation site is 117%. The average percent cover of invasive species is



18% (primarily cattails), a slight reduction from 2010. The cattails within the site are relegated to the deeper ponded areas and swales and as such do not seem to be spreading while the cover of other herbaceous species is growing. Because they do not seem to pose a risk of spreading throughout the site and are not impeding woody plant success, and because the pockets of cattails are providing habitat for many species (most notably, several nesting pairs of red wing blackbirds can be found in the site each summer), we do not suggest any remediation efforts targeting the cattails at this point.

**Fish and Wildlife Use at the Site:** Please see Table 5 in Appendix D.

**General health and vigor of the surviving plants, prognosis for their future survival, and a diagnosis of the cause(s) of morbidity or mortality:** Overall, planted shrub species (*Alnus incana*, *Aronia melanocarpa*, *Betula populifolia*, *Cornus sericea*, *Ilex verticillata*, *Salix discolor*, *Vaccinium corymbosum*, *Viburnum cassinoides*, and *V. dentatum*) and tree species (*Abies balsamea*, *Acer rubrum*, *Fraxinus pennsylvanica*, *Larix laricina*, *Pinus strobus*, *Quercus bicolor*, *Salix nigra*, and *Ulmus americana*) appear to be healthy and growing. Hydrology appears adequate for these plants and there is limited evidence of death from herbivory, flooding, or desiccation. Over most of the creation site, our best professional judgment is that the plants have a high likelihood of survival and the site is clearly trending toward a woody vegetation-dominated wetland complex with pockets of herbaceous and open-water wetland.

An additional 650 woody plants were installed in 2011. In general, plants were installed evenly throughout appropriate habitats within the creation area, with grouping of plants installed in areas of sparser woody cover. Bare-root stock was selected for ease of planting. Upon arrival from the nursery, roots were soaked for a minimum of 24 hours prior to planting to ensure adequate hydration. The timing of planting was carefully selected to ensure plants were thoroughly watered in. Within 24 hours after planting a heavy rainstorm event (greater than 1") occurred at the site. This year's additional plantings were surveyed toward the end of the growing season and the new alder and ash individuals were doing exceptionally well. The willow plants were slower to establish and did not appear as robust as the other two plant species, but still appeared viable.

#### **VERNAL POOL CREATION:**

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Three vernal pools were created in 2008, and are located on the northeastern corner of the Larrabee Farms parcel, within an approximately 10-acre habitat preservation area. A fourth vernal pool was constructed in late March, 2010. This pool was created southwest of the wetland creation area, within the existing MDOT easement for the original mitigation project. The pool's upland and wetland habitat is further buffered on the west by an additional conservation easement for a separate mitigation project (Portland International Jetport Expansion).

#### **Does the vernal pool creation take into account the critical need for unobstructed access to and from the pool, as well as an adequate extent of upland habitat to ensure success?**

Yes – The upland areas around the pools is preserved via a conservation easement and there has been very little traffic (only by foot) on the nearby trails. Please see mitigation plan and drawings for more information.

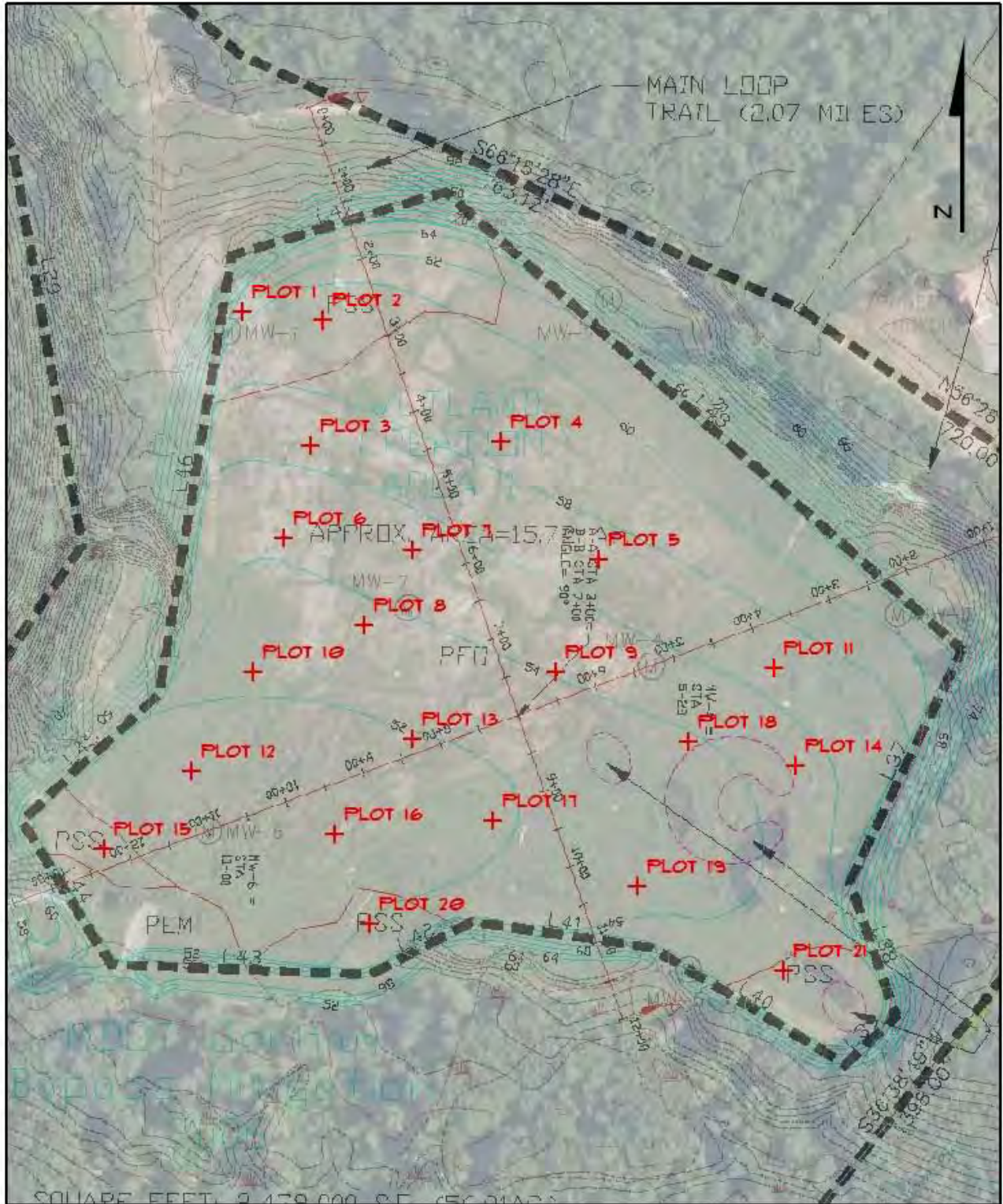
#### **Pool(s) are monitored for obligate and facultative vernal pool species weekly for four weeks from the beginning of the vernal pool activity in the spring and then biweekly until the end of July for the entire monitoring period.**

The three vernal pools on the northwestern side of the site and the newly created pool southwest of the MaineDOT wetland creation area were visited starting during the first week of ice-out in 2011 (early spring) to assess the appropriate time for monitoring. The pools were monitored twice in April, once in May, and occasionally throughout the summer. Table 6, in Appendix D, provides the findings from the VP monitoring efforts. All four pools are providing breeding habitat for indicator species.

#### **In addition, photographs of the pool(s) taken monthly during the pool monitoring period (April/May-August) from a set location(s) will be included.**

Please see Appendix C for photos of the vernal pools and surrounding habitat. Additional photos are available upon request.

**Maps (maximum of 3 pages)**



Project # 236  
 Prepared by: DRB  
 Drawing Date : 7 Dec 2010  
 Notes:  
 Drawing Clip (with permission)  
 Sebago Technicals Project  
 (Dated 11/17/2007)

**Figure 1. Larrabee Farms: MDOT Gorham Bypass  
 Creation Area - PLOT LOCATIONS**

0 85 170 340 Feet





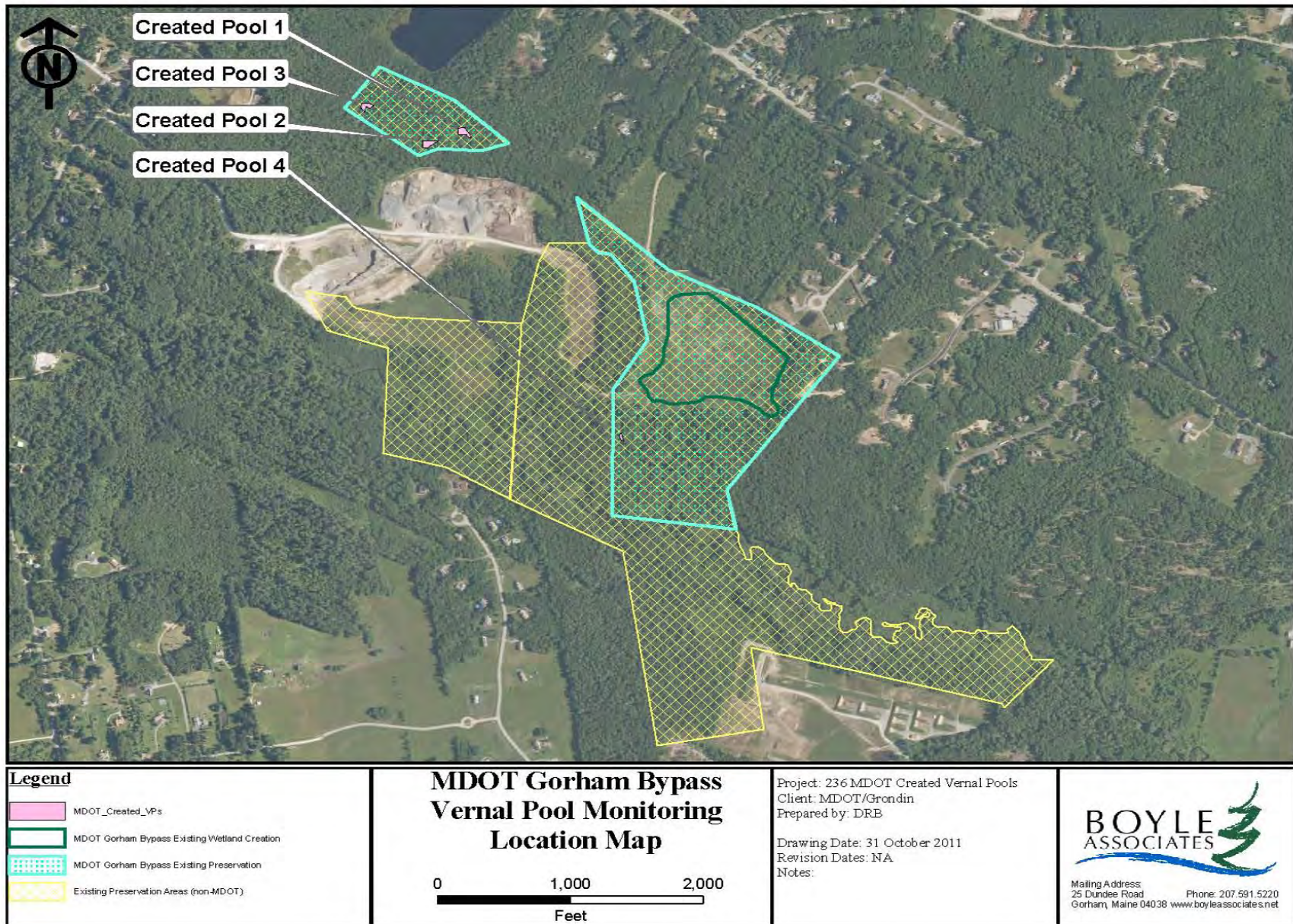


Figure 2. Locations of created vernal pools at Larrabee Farms

**Conclusions (1 page)**

In general, and as can be observed in the accompanying photographs and data, the vernal pool habitat and wetland creation areas are faring well into the fourth growing season. In the wetland creation area, hydrology is adequate and wetland conditions are being achieved. Pockets of standing water are abundant across the creation area, there is evidence of reducing conditions in the soil profiles and planned open water areas are functioning as designed. Planted woody vegetation is growing well, and herbaceous cover has increased over the years. Wildlife usage within the wetland creation site and surrounding habitat preservation areas is abundant year-round. Use of the hiking trails by local residents has been seen on several occasions during monitoring and during the fall hunters have successfully harvested deer from the site and surroundings. In 2012 Grondin will be working with the Town of Scarborough's Public Works and Recreation departments to establish permanent trails throughout the property (the completed portions). In the vernal pool creation areas, all four pools are providing breeding habitat for vernal pool indicator species. Green frog tadpole predation still appears to be occurring in all four pools despite the remediation efforts taken in 2009 meant to reduce two of the pools' hydroperiod. The remediation appears to have positively affected the pool hydrology, but green frog tadpoles are somehow over-wintering within the pools, apparently surviving in wet leaf litter and small pockets of water. We will re-assess pool hydrology over the winter and spring of 2012 to decide if additional hydrologic manipulation (*i.e.* adding substrate to reduce water depth) is warranted or prudent.

As mentioned above, despite plantings in the spring of 2011, the woody plant density requirements for woody species have not yet been met within the wetland creation areas. Monitors will choose new random plot locations for the 2012 monitoring in the same random fashion originally used in year one (the area sampled will remain the same as in previous monitoring efforts). Additionally, monitors will gather data on volunteer woody plants greater than 18" tall within the creation areas to determine actual woody plant density for next year's monitoring effort. If additional remediation means are deemed necessary or if project goals are still not fully met, Grondin will meet with representatives from the USACE and MDEP to discuss recommendations and remediation.

**Appendix A** -- An as-built plan showing topography to 1-foot contours, any inlet/outlet structures and the location and extent of the designed plant community types (e.g., shrub swamp). Within each community type, the plan shall show the species planted—but it is not necessary to illustrate the precise location of each individual plant. There should also be a soil profile description and the actual measured organic content of the topsoil. This should be included in the first monitoring report unless there are grading or soil modifications or additional plantings of different species in subsequent years.

- As built plans were included in Year 1 monitoring and are available upon request.
- Soil profile data is included in Appendix D in tables 1 through 4.

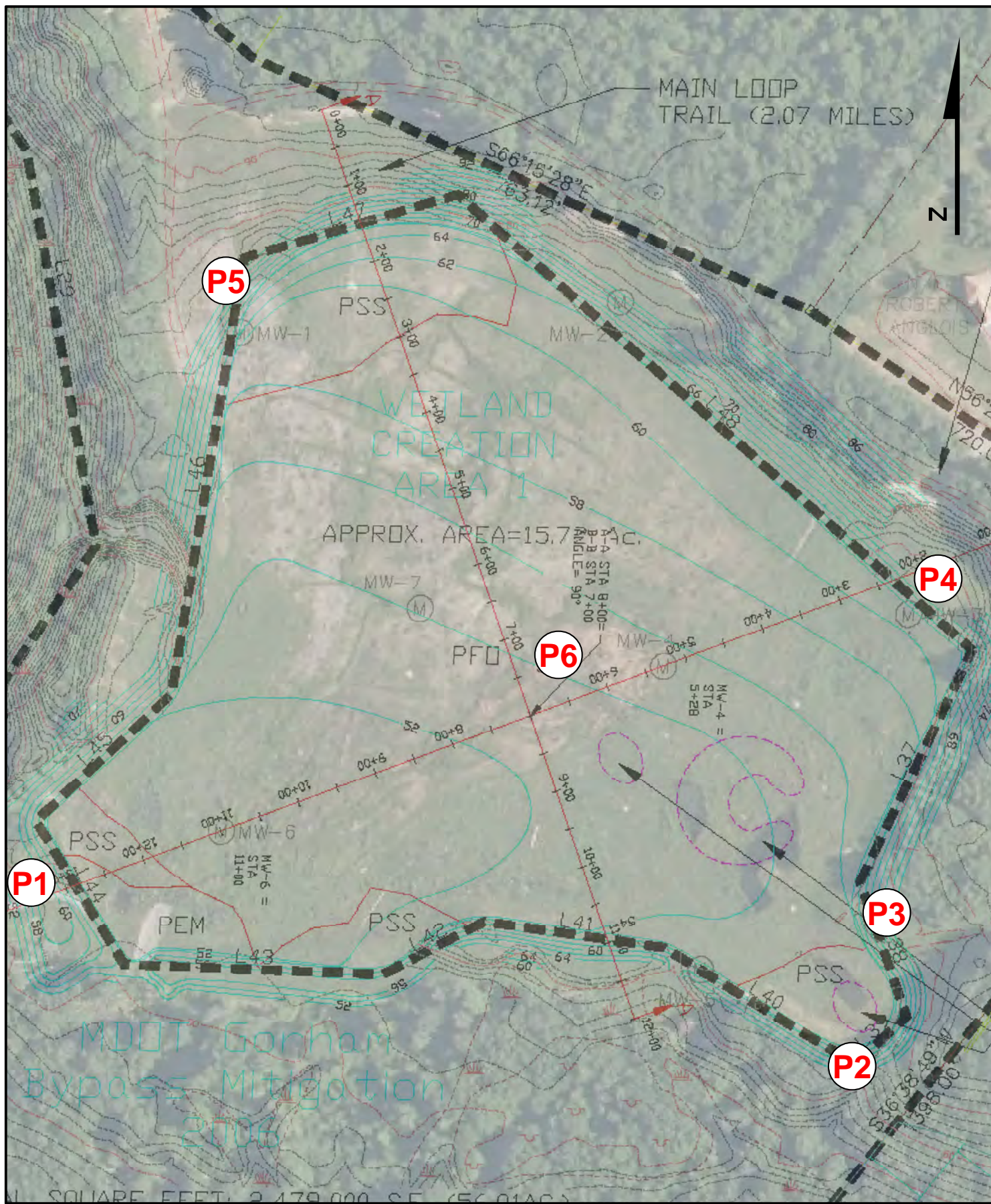
**Appendix B** – A vegetative species list of volunteers in each plant community type. The volunteer species list should, at a minimum, include those that cover at least 5% of their vegetative layer\*.

Common Name	Scientific Name	Indicator Status	Percent Aerial Cover
Shallow Sedge	<i>Carex lurida</i>	OBL	7
Pointed Broom Sedge	<i>Carex scoparia</i>	FACW	4
Bird's-foot Trefoil	<i>Lotus corniculatus</i>	FACU	3
Woolgrass	<i>Scirpus cyperinus</i>	FACW	5
Broad-leaved Cattail	<i>Typha latifolia</i>	OBL	13

\*Being that this is the fourth year of monitoring, percent aerial cover by volunteer species is relatively low. Therefore, all volunteer species with 3% aerial cover or greater (within the area of the mitigation site surveyed) are included in the volunteer species table. No significant numbers (50 plants per acre) of woody volunteers greater than 18 inches were observed.

**Appendix C** -- Representative photos of each mitigation site taken from the same locations for each monitoring event. Photos should be dated and clearly labeled with the direction from which the photo was taken. The photo sites must also be identified on the appropriate maps.

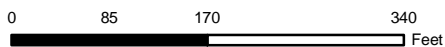




Project: # 236  
 Prepared by: DRB  
 Drawing Date: 21 Dec 2010

Notes:  
 Drawing Clip (with permission)  
 Sebago Technics Project  
 (Dated 11/17/2007)

### Larrabee Farms: MDOT Gorham Bypass Creation Area - PHOTO LOCATIONS



Mailing Address:  
 25 Dundee Road  
 Gorham, Maine 04038

Phone 207.591.5220  
 www.boyleassociates.net



**Wetland Creation Area (NOTE: see photo location drawing FMD):**



Photolocation 1 (Year 4). Facing northeast across PEM, PSS and PFO creation areas, 21-Sep-2011.



Photolocation 1 (Year 4). Facing east across PEM creation area at the southwestern end of the site, 21-Sep-2011.





Photolocation 2 (Year 4). Facing northwest across PSS and PFO creation areas and southernmost ephemeral pool, 21-Sep-2011.



Photolocation 3 (Year 4). Facing west near wildlife/ephemeral pool, 21-Sep-2011.





Photolocation (between 4 and 5) (Year 4). Facing southwest from the northern boundary of creation site, 21-Sep-2011.



Photolocation 5 (Year 4). Facing SE across northernmost PSS creation area and PFO creation area, 21-Sep-2011.



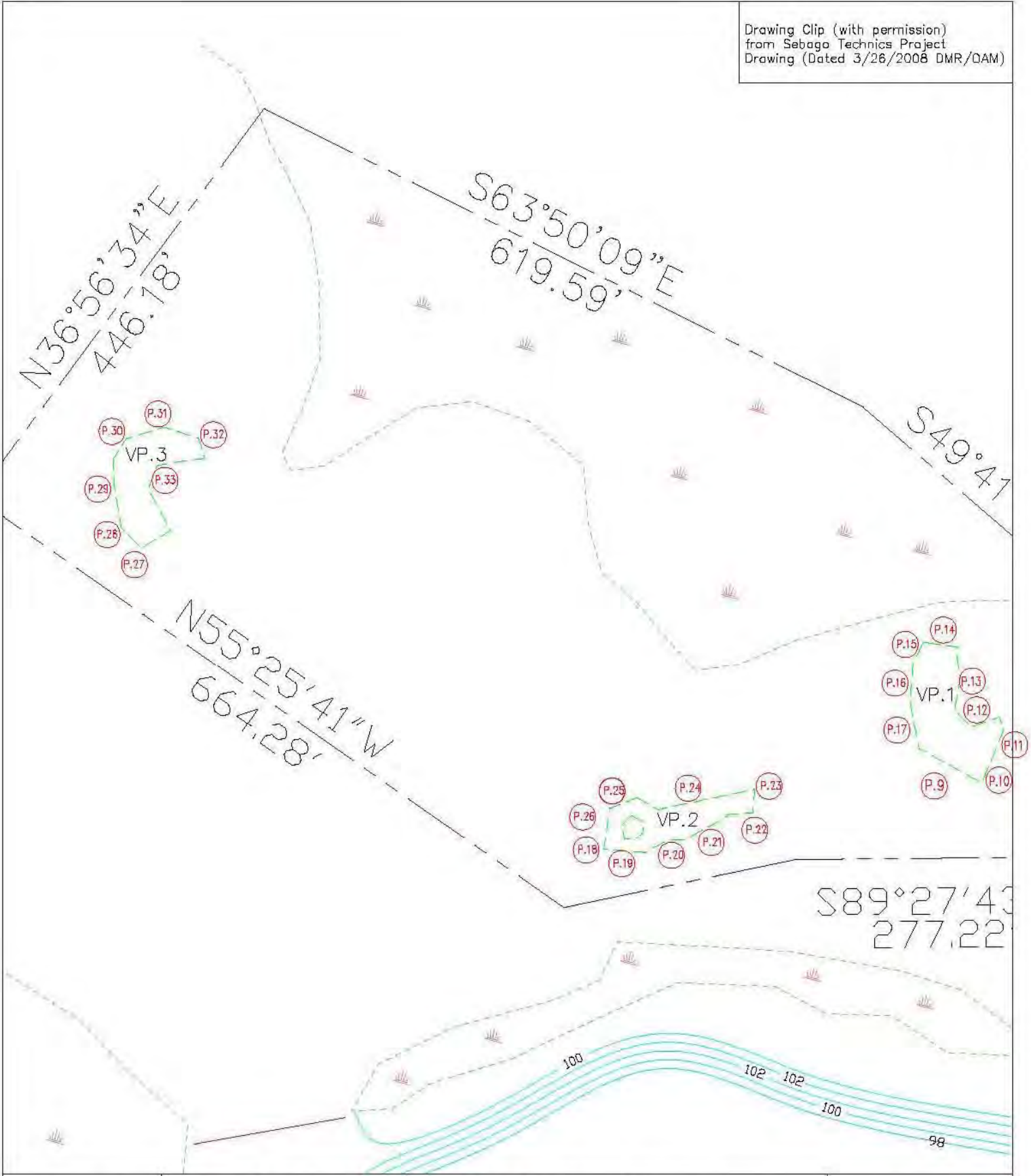


Photolocation 6 (Year 4) Facing west from within creation site, 21-Sep-2011.



Photolocation 6 (Year 4) Facing north from within creation site, 21-Sep-2011.

Drawing Clip (with permission)  
 from Sebago Technics Project  
 Drawing (Dated 3/26/2008 DMR/DAM)



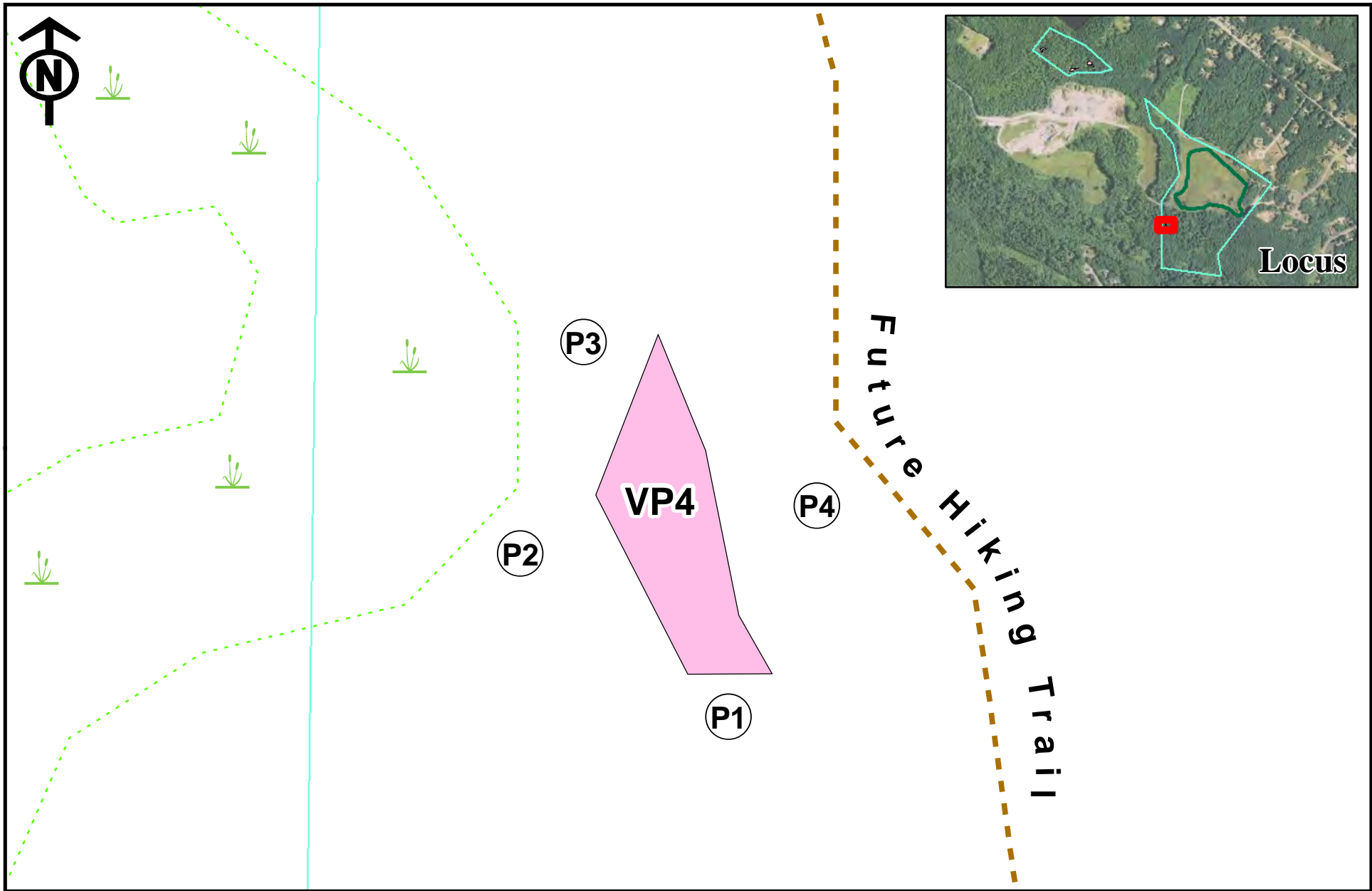
Date: 2008-Dec-15  
 Job #: 237  
 Scale: NTS  
 Created By: REJ

**Larrabee Farms: MDOT Gorham Bypass**  
**Vernal Pool Creation Areas**  
**PHOTO LOCATIONS**

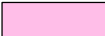




Mailing Address:  
 25 Dundee Road  
 Gorham, Maine 04038  
[www.boyleassociates.net](http://www.boyleassociates.net)

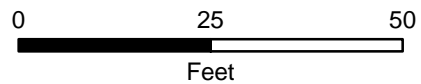




**Legend**

-  MDOT Created Vernal Pool
-  MDOT Gorham Bypass Existing Preservation
-  MDOT Gorham Bypass Existing Wetland Creation

**MDOT Gorham Bypass  
Vernal Pool Monitoring  
Newly Created Pool (2010)  
Photo Location Map**



Project: 236 MDOT Created Vernal Pools  
Client: MDOT/Grondin  
Prepared by: DRB

Drawing Date: 16 November 2011  
Revision Dates: 10 January 2012  
Notes:



Mailing Address:  
25 Dundee Road  
Gorham, Maine 04038 [www.boyleassociates.net](http://www.boyleassociates.net)  
Phone: 207.591.5220

***10.3 acres of vernal pool habitat creation and preservation (3 distinct pools)***  
**Vernal Pool One (Northeastern-most Pool)**



Photolocation 9 (Year 4). Facing northwest at vernal pool 1 at spring high, 15-April-2011.



Photolocation 10 (Year 4). Facing west across vernal pool 1 in mid-summer, 19-July-2011.





Photolocation 16 (Year 4). Facing northeast at vernal pool 1, 27-April-2011.



Photolocation 17 (Year 4). Facing northwest over vernal pool 1. Sand mound in right side of photo under water this season, 27-April-2011.



**Vernal Pool 2 (Central Pool)**



Photolocation 18 (Year 4). Facing east across vernal pool, 27-April-2011.



Photolocation 20 (Year 4). Facing west across vernal pool 2 in spring, 27-April-2011.





Photolocation 24 (Year 4). Facing northeast across vernal pool 2, 27-April-2011.



Photolocation 26 (Year 4). Facing east across pool, 19-July-2011.



**Vernal Pool 3 (Southwestern-most Pool)**



Photolocation 27 (Year 4). Facing northwest across vernal pool 3 during dry season, 19-July-2011.



Photolocation 29 (Year 4). Facing north across a portion of vernal pool 3, 27-April-2011.





Photolocation 30 (Year 4) Facing northwest across vernal pool 3, 13-May-2011.



Photolocation 31 (Year 4). Facing south across pool 3, 19-April-2011.





Photolocation 32 (Year 4) Facing northwest at pool 3, 19-July-2011.



**Newly created vernal pool (March, 2010)**



Photolocation 1 (Year 1). Facing north across vernal pool, 19-April-2011.



Photolocation 2 (Year 1). Facing east across vernal pool, 27-April-2011.





Photolocation 3 (Year 1). Facing south across vernal pool, 27-April-2011.



Photolocation 4 (Year 1). Facing west across vernal pool, 19-July-2011.

**Appendix D. Tables**

**Table 1. Soil profile 1 in PEM creation area (National Wetland Soil Indicators: A11)**

<u>Depth</u>	<u>Horizon</u>	<u>Matrix</u>	<u>Redox</u>	<u>Texture</u>
0-7	A	10YR 3/2	7.5Y 4/6 – 5%	SL
7-16	B	2.5Y 5/2	2.5Y 4/4 – 5%	CL
16-25+	Oa	2.5YR 2.5/1	None observed	---

**Table 2. Soil profile 2 in PSS creation area (National Wetland Soil Indicators: F3).**

<u>Depth</u>	<u>Horizon</u>	<u>Matrix</u>	<u>Redox</u>	<u>Texture</u>
0-14	A	2.5Y 4/1	5Y 4/3 – 7%	CL
14-22+	B	10YR 4/1	10YR 3/3 – 5%	LS

**Table 3. Soil profile 3 in PFO creation area (New England Wetland Soil Indicators: VII).**

<u>Depth</u>	<u>Horizon</u>	<u>Matrix</u>	<u>Redox</u>	<u>Texture</u>
0-14	A	10YR 3/2	10YR 3/6 – 3%	SL
14-20+	B	5Y 5/1	10YR 5/5 – 15%	fS

**Table 4. Soil profile 4 in PFO creation area (National Wetland Soil Indicators: A11).**

<u>Depth</u>	<u>Horizon</u>	<u>Matrix</u>	<u>Redox</u>	<u>Texture</u>
0-12	A	10YR 3/2	10YR 3/4 – 2%	fSL
12-20	B	5Y 5/2	10YR 4/6 – 5%	CL

Table 5: Fauna Species List April 2008 through October 2011 (wetland creation and vernal pool creation areas)

Common Name	Scientific Name	Field ID Methodology	Observed Use
<b>Birds:</b>			
American crow	<i>Corvus brachyrhynchos</i>	visual	feeding, roosting
American goldfinch	<i>Carduelis tristis</i>	song	feeding, nesting
American robin	<i>Turdus migratorius</i>	visual	feeding
American woodcock	<i>Solopax minor</i>	visual	feeding, roosting
Bald Eagle	<i>Haliaeetus leucocephalus</i>	visual	feeding
Black duck	<i>Anas rubripes</i>	visual	feeding
Black-capped chickadee	<i>Parus atricapillus</i>	song	feeding, nesting
Barn swallow	<i>Hirundo rustica</i>	visual	feeding
Broad-winged Hawk	<i>Buteo platypterus</i>	visual	feeding
Cedar waxwing	<i>Bombycilla cedrorum</i>	visual, song	feeding
Downy woodpecker	<i>Picoides pubescens</i>	song	feeding, nesting
Eastern bluebird	<i>Sialia sialis</i>	visual	feeding
Eastern phoebe	<i>Sayornis phoebe</i>	visual	feeding
European starling	<i>Sturnus vulgaris</i>	visual	feeding
Great blue heron	<i>Ardea herodias</i>	visual	feeding
Killdeer	<i>Charadrius vociferus</i>	visual	feeding, nesting
Lesser yellowlegs	<i>Tringa flavipes</i>	visual	feeding, nesting
Mallard	<i>Anas platyrhynchos</i>	visual	feeding
Mourning dove	<i>Zenaida macroura</i>	visual	roosting
Northern harrier	<i>Circus cyaneus</i>	visual	feeding
Palm warbler	<i>Dendroica palmarum</i>	visual	feeding
Red-tailed hawk	<i>Buteo jamaicensis</i>	visual, song	feeding
Red-winged blackbird	<i>Agelaius phoeniceus</i>	visual	feeding, nesting
Savannah sparrow	<i>Passerculus sandwichensis</i>	visual	feeding
Solitary sandpiper	<i>Tringa solitaria</i>	visual	feeding
Song sparrow	<i>Melospiza melodia</i>	visual	feeding, nesting
Tree swallow	<i>Tachycineta bicolor</i>	visual	feeding
Turkey vulture	<i>Cathartes aura</i>	visual	feeding
White-breasted nuthatch	<i>Sitta carolinensis</i>	visual	feeding
Wild turkey	<i>Meleagris gallopavo</i>	visual	feeding
Yellow-rumped warbler	<i>Dendroica coronata</i>	visual	feeding
<b>Mammals:</b>			
Grey squirrel	<i>Sciurus carolinensis</i>	visual	feeding
Moose	<i>Alces alces</i>	tracks	feeding
Raccoon	<i>Procyon lotor</i>	tracks	feeding
Red fox	<i>Vulpes vulpes</i>	visual	feeding
Red squirrel	<i>Tamiasciurus hudsonicus</i>	visual	feeding
Skunk	<i>Mephitis mephitis</i>	tracks	feeding
White-tailed deer	<i>Odocoileus virginianus</i>	scat, tracks	feeding

**Table 5. Continued...**

Common Name	Scientific Name	Field ID methodology	Observed Use
<b>Insects:</b>			
American bumble bee	<i>Bombus pennsylvanicus</i>	visual	feeding, breeding, shelter
Backswimmer	<i>Notonectidae</i> family	visual, nest	feeding, breeding, shelter
Bald-faced hornet	<i>Vespula maculate</i>	visual	feeding, breeding, shelter
Beetles	Order Coleoptera	visual	feeding, breeding, shelter
Caddisfly	<i>Limnephilidae</i> family	visual	feeding, breeding, shelter
Clouded sulphur	<i>Colias philodice</i>	visual	feeding
Dragonflies	Order Odonata	visual	feeding, breeding
Monarch butterfly	<i>Danaus plexippus</i>	visual	feeding
Mosquitoes	<i>Culicidae</i> family	visual	feeding, breeding
Water boatman	<i>Corixidae</i> family	visual	feeding, breeding, shelter
Water strider	<i>Gerridae</i> family	visual	feeding, breeding, shelter
<b>Arachnids:</b>			
Goldenrod spider	<i>Misumena vatia</i>	visual	feeding, breeding, shelter
American dog tick	<i>Dermacentor variabilis</i>	visual	feeding, breeding
Garden spider	<i>Argiope aurantia</i>	visual	feeding
Deer tick	<i>Ixodes scapularis</i>	visual	feeding, breeding
<b>Amphibians:</b>			
American toad	<i>Bufo americanus</i>	visual	feeding, breeding
Green frog	<i>Rana clamitans</i>	visual	feeding, breeding
Snapping turtle	<i>Cheyladra serpentine</i>	visual	feeding
Spotted salamander	<i>Ambystoma maculatum</i>	egg masses	feeding, breeding
Wood frog	<i>Rana sylvatica</i>	visual, egg masses	feeding, breeding



**Table 6a. 2011 MDOT Mitigation Created Vernal Pool Survey Information from 3 Site Visits in April/May 2010 (max # observed in bold). Pool 4 was newly created in the spring of 2010, 2011 is the first full monitoring of this pool.**

POOL #	DATE	Egg Masses			Max Depth (ft.)	pH	Temp (°C)	General Observations*
		Wood Frog	Spotted Salamander	Bl. Spotted Salamander				
1	4-15	<b>71</b>	2	0	2.4	5.75	14.7	Wood frog EM's were of advanced maturity at this date.
	4-27	2	<b>22</b>	0	2.5	5.5	15.0	Wood frog EM's were hatched at this date and tadpoles were seen throughout the pool.
	5-13	0	22	0	1.7	5.5	21.0	
2	4-15	<b>63</b>	5	0	2.0	4.5	12.8	
	4-27	0	<b>8</b>	0	1.8	4.8	19.5	Two broadwing hawks seen over pool, peepers chorusing in pool. Wood frog EM's hatch, tadpoles seen throughout pool.
	5-13	0	8	0	1.3	5.2	21.0	
3	4-15	<b>95</b>	21	0	2.5	5.5	15.0	
	4-27	0	<b>22</b>	0	2.3	5.1	18.8	Wood frog EM's all hatched as of this date.
	5-13	0	20	0	1.5	5.0	21.0	
4	4-15	0	0	0	1.3	6.3	7.4	Pool very cold due to thick hemlock overstory. 46 spotted salamander spermatophores observed.
	4-27	0	5	0	1.3	5.4	12.0	
	5-13	0	<b>8</b>	0	1.2	5.7	13.5	

\*See previous year data for plant species found in/around pool and other general observations.

**Table 6b. 2008-2010 MDOT Mitigation Created Vernal Pool Survey Information - Maximum Number of Egg Masses Observed**

POOL #	Year	Egg Masses			Pool Conditions			General Observations			
		Wood Frog	Spotted Salamander	Bl. Spotted Salamander	Max Depth (Ft.)	pH	Temp (°C)	Substrate	Vegetation In Pool*	Vegetation Around Pool	Other Species Observed
1	2010	69	23	0	5.0	5.5	12.1	Mineral	Ace rub, Jun sp.	Same as previous years	Same as previous years
	2009	96	9	0	2.0	5.51	11.7	Leaf litter/muck/mineral	Ace rub, Jun eff, Sci cyp	Abi bal, Pin str, Kal ang	Green frog tadpoles (hundreds), water striders, water boatman, whirligig beetles
	2008	69	8	0	2.0	5.50	12.5	Mineral	Ace rub, Jun sp.	Pin str, Abi bal, Gau pro, Kal ang, Que rub, Ace rub	Backswimmer, green frog tadpoles
2	2010	84	4	0	3.0	4.60	10.2	Mineral	Car. sp.	Same as previous years	Same as previous years
	2009	11	0	0	2.2	4.60	9.5	Leaf litter/mineral/muck	Jun eff, Car sp.	Tsu can, Gal pro, Pin str, Que rub, Ace rub, Ham vir, Abi bal, Vac ang, Rub sp., Pan sp.	Green frog tadpoles, water striders, mosquito larvae
	2008	17	0	0	2.0	4.60	17.6	Mineral	None	Pin str, Abi bal, Gau pro, Kal ang, Que rub, Ace rub	Adult wood frogs (10), water striders, water boatman
3	2010	62	27	1	2.0	4.75	9.0	Mineral	Car sp.	See previous years	See previous years
	2009	33	17	0	3.0	4.75	8.9	Leaf litter/organic/muck	Car sp.	Pte aqu, Pin str, Vac ang, Abi bal, Kal ang, Pic mar, Ace rub, Que rub, Rub sp., Fag gra, Pan sp.	Green frog tadpoles, mosquito larvae
	2008	63	9	0	2.25	5.04	11.7	Leaf litter/mineral	None	Pin str, Abi bal, Gau pro, Kal ang, Que rub, Ace rub	

**Table 7. MDOT Wetland Mitigation Year Four Monitoring Results - 2011**  
**Scrub/Shrub and Forested Wetland Areas**

Plot #	Mitigation Type (Date Surveyed)	Radius (ft)	Area (plot acreage)*	Plants	Number of Plants	Tree & Shrub Species/Acre
1	PSS Creation (6/14/2011)	30	0.062	Alin	9	323
				Cose	3	
				Ilve	1	
				Sadi	5	
				Vide	2	
				<b>Total</b>	<b>20</b>	
2	PSS Creation (6/14/2011)	30	0.062	Alin	12	484
				Arme	8	
				Cose	2	
				Ilve	3	
				Sadi	3	
				Vide	2	
				<b>Total</b>	<b>30</b>	
3	PFO Creation (6/14/2011)	50	0.173	Abba	21	659
				Acru	5	
				Frpe	38	
				Lala	39	
				Pist	2	
				Sani	9	
				<b>Total</b>	<b>114</b>	
4	PFO Creation (6/17/2011)	50	0.173	Abba	19	549
				Frpe	26	
				Lala	41	
				Pist	5	
				Sani	4	
				<b>Total</b>	<b>95</b>	
5	PFO Creation (6/14/2011)	50	0.173	Abba	13	376
				Bepo	1	
				Frpe	25	
				Lala	21	
				Pist	5	
				<b>Total</b>	<b>65</b>	
6	PFO Creation (6/17/2011)	50	0.173	Abba	40	601
				Acru	4	
				Bepo	5	
				Frpe	13	
				Lala	26	
				Pist	6	
				Sani	10	
				<b>Total</b>	<b>104</b>	
7	PFO Creation (6/14/2011)	50	0.173	Abba	21	474
				Frpe	31	
				Lala	21	
				Sani	9	
				<b>Total</b>	<b>82</b>	
8	PFO Creation (6/17/2011)	50	0.173	Abba	12	324
				Acru	1	
				Bepo	1	
				Frpe	22	
				Lala	13	
				Pist	3	
				Sani	4	
				<b>Total</b>	<b>56</b>	
9	PFO Creation (6/17/2011)	50	0.173	Abba	12	156
				Frpe	12	
				Lala	2	
				Pist	1	
				<b>Total</b>	<b>27</b>	

Plot # Mitigation Type (Date Surveyed)	Radius (ft)	Area (plot acreage)*	Plants	Number of Plants	Tree & Shrub Species/Acre
<b>10</b>	50	0.173	Abba	24	<b>335</b>
<b>PFO Creation</b>			Alin	1	
(6/17/2011)			Frpe	17	
			Lala	11	
			Pist	5	
			<b>Total</b>	<b>58</b>	
<b>11</b>	50	0.173	Abba	19	<b>329</b>
<b>PFO Creation</b>			Frpe	11	
(6/15/2011)			Lala	11	
			Pist	5	
			Sani	11	
			<b>Total</b>	<b>57</b>	
<b>12</b>	50	0.173	Abba	16	<b>370</b>
<b>PFO Creation</b>			Acru	1	
(6/17/2011)			Bepo	4	
			Frpe	14	
			Lala	22	
			Pist	7	
			<b>Total</b>	<b>64</b>	
<b>13</b>	50	0.173	Abba	18	<b>439</b>
<b>PFO Creation</b>			Bepo	2	
(6/17/2011)			Frpe	18	
			Lala	26	
			Pist	6	
			Sani	6	
			<b>Total</b>	<b>76</b>	
<b>14</b>	50	0.173	Abba	23	<b>393</b>
<b>PFO Creation</b>			Frpe	20	
(6/15/2011)			Lala	15	
			Pist	5	
			Sani	5	
			<b>Total</b>	<b>68</b>	
<b>15</b>	50	0.173	Abba	44	<b>543</b>
<b>PFO Creation</b>			Alin	1	
(6/17/2011)			Frpe	39	
			Lala	6	
			Pist	4	
			<b>Total</b>	<b>94</b>	
<b>16</b>	50	0.173	Abba	13	<b>197</b>
<b>PFO Creation</b>			Alin	1	
(6/17/2011)			Frpe	2	
			Lala	13	
			Pist	1	
			Sani	4	
			<b>Total</b>	<b>34</b>	
<b>17</b>	50	0.173	Abba	4	<b>104</b>
<b>PFO Creation</b>			Frpe	2	
(6/15/2011)			Lala	5	
			Sani	7	
			<b>Total</b>	<b>18</b>	
<b>18</b>	50	0.173	Abba	19	<b>358</b>
<b>PFO Creation</b>			Frpe	14	
(6/15/2011)			Lala	20	
			Pist	4	
			Sani	5	
			<b>Total</b>	<b>62</b>	
<b>19</b>	50	0.173	Abba	20	<b>324</b>
<b>PFO Creation</b>			Frpe	13	
(6/15/2011)			Lala	16	
			Pist	6	
			Sani	1	
			<b>Total</b>	<b>56</b>	

Plot # Mitigation Type (Date Surveyed)	Radius (ft)	Area (plot acreage)*	Plants	Number of Plants	Tree & Shrub Species/Acre
<b>20</b>	30	0.062	Alin	15	<b>548</b>
<b>PSS Creation</b>			Arme	1	
(6/17/2011)			Cose	2	
			Ilve	3	
			Sadi	13	
			<b>Total</b>	<b>34</b>	
<b>21</b>	30	0.062	Abba	2	<b>694</b>
<b>PSS Creation</b>			Alin	23	
(6/15/2011)			Arme	4	
			Bepo	3	
			Sadi	6	
			Vica	3	
			Vide	2	
			<b>Total</b>	<b>43</b>	
<b>PSS Creation Area Average Plants/Acre</b>					512
<b>PFO Creation Area Average Plants/Acre</b>					384
Overall Average # Woody Plants per Acre					409
Total PSS surveyed (ac)				0.25	
Total PFO surveyed (ac)				2.94	
Total acreage surveyed (ac):				3.19	
Percentage of total planted area* (14.3 acre) surveyed:				22.3%	
Percentage of total PSS area planted (1.1 acre) surveyed:				22.5%	
Percentage of total PFO area planted (13.2 acre) surveyed:				22.3%	

\*Calculated plot area excludes "planned non-planted areas" or approximately 4% (e.g. ephemeral pools, nesting islands, and coarse woody debris.)

**Table 8. Herbaceous Vegetation Findings by  
Transect (MDOT Wetland Creation Area 2011)**

Species average % cover over area surveyed

Scientific Name	Common Name	Indicator Status	Species average % cover over area surveyed										PEM				
			T1	T2	T3	T4	T5	T6	T7	T8	T9	T10					
<i>Alopecurus species</i>	Foxtail species	FACW or OBL															1
* <i>Agrostis alba</i>	Redtop	FACW						1									
<i>Agrostis perennans</i>	Upland bentgrass	FACU															
* <i>Agrostis stolonifera</i>	Creeping Bentgrass	FACW	25	10	25	35	35	30	15	25	15	25	25				
<i>Bidens cernua</i>	Nodding Beggertick	OBL									1						
<i>Bidens frondosa</i>	Devil's Beggar-ticks	FACW		2													3
<i>Carex lurida</i>	Shallow Sedge	OBL	10	7	7	2	5	10	10	5	10	5	3				
<i>Carex scoparia</i>	Pointed Broom Sedge	FACW	5	5	3	5	2	5	5	5	2	2	2				
* <i>Carex vulpinoidea</i>	Fox Sedge	OBL	5	10	5	8	5	8	20	20	2	15	15				
<i>Eleocharis acicularis</i>	Least Spikerush	OBL						1		1							
<i>Echinochloa crusgalli</i>	Barnyard Grass	FACU															
* <i>Elymus virginicus</i>	Virginia Wild Rye	FACW-					5	1		1	2						5
<i>Epilobium ciliatum ssp.glandulosum</i>	Fringed willowherb	FAC			5	1		10	2	2	1						1
* <i>Eupatorium perfoliatum</i>	Common Boneset	FACW	7	10	5		8	5	3	8	3	2	7				
* <i>Euthamia graminifolia</i>	Grass-leaved Goldenrod	FAC	5	5	5	5	5		2	3	5	5	3				
<i>Festuca rubra</i>	Creeping Red Fescue	FACU				2				1	2						
<i>Glyceria canadensis</i>	Rattlesnake Mannagrass	OBL			2			2									
<i>Juncus bufonius</i>	Toad Rush	FACW			3				2	1	2	2	1				
<i>Juncus canadensis</i>	Canada Rush	OBL		3				1	1								
* <i>Juncus effusus</i>	Soft Rush	FACW	35	30	30	30	25	30	30	10	10	10	15				
<i>Lolium perenne</i>	Perennial Ryegrass	FACU										1					
<i>Lotus corniculatus</i>	Bird's-foot Trefoil	FACU	5	2	1	1	2	1	3	8	5	10					
<i>Lupinus sp.</i>	Lupine species	NI															
* <i>Panicum virgatum</i>	Switchgrass	FACW		5	20	5				5	15	15	2				
<i>Phalaris arundinacea</i>	Reed canary-grass	FACW				2	3	1	1	1							1
<i>Polygonum pennsylvanicum</i>	Pennsylvania Smartweed	FACW						2									2
<i>Potamogeton epihydrus</i>	Ribbon-leaf Pondweed	OBL															1
<i>Scirpus atrovirens</i>	Green Bulrush	OBL								1			2				
<i>Scirpus cyperinus</i>	Woolgrass	FACW	10	10	3	3		5	3	5	5	8	1				
<i>Schizachyrium scoparium</i>	Little Bluestem	FACU	2	5	2								3				
<i>Solidago rugosa</i>	Rough-Stemmed Golden Rod	FAC										2					
<i>Symphyotrichum novae-angliae</i>	New England Aster	FACW	5		2	2	1					1					
<i>Symphyotrichum racemosum</i>	Smooth White Oldfield Aster	FACW	7	2	2	3		2	2	2	4		2				
<i>Trifolium arvense</i>	Haresfoot Clover	NI	2				1		1		1						
<i>Trifolium pratense</i>	Red Clover	FACU			1		1		1	1	1						
<i>Trifolium repens</i>	White Clover	FACU					1		1	1	1	1					
<i>Typha latifolia</i>	Broad-leaved Cattail	OBL	20	5	10	15	10	30	10	8	5	35					
* <i>Verbena hastata</i>	Blue Vervain	FACW	10	7	2	5	5	2	1	3	2						5
<i>Vicia cracca</i>	Cow Vetch	UPL				1			1	1							
<b>% aerial cover by herbaceous vegetation in plot</b>			<b>153</b>	<b>118</b>	<b>133</b>	<b>125</b>	<b>115</b>	<b>146</b>	<b>115</b>	<b>118</b>	<b>97</b>	<b>105</b>	<b>130</b>				
<b>% cover of non-invasive herbaceous vegetation in plot</b>			<b>128</b>	<b>111</b>	<b>122</b>	<b>107</b>	<b>100</b>	<b>114</b>	<b>101</b>	<b>101</b>	<b>87</b>	<b>95</b>	<b>94</b>				
<b>% cover of hydrophytic non-invasive herb. vegetation in plot</b>			<b>124</b>	<b>106</b>	<b>119</b>	<b>104</b>	<b>97</b>	<b>114</b>	<b>97</b>	<b>97</b>	<b>81</b>	<b>91</b>	<b>94</b>				
<b>% cover of planted woody vegetation in plot</b>			<b>10</b>	<b>8</b>	<b>15</b>	<b>20</b>	<b>15</b>	<b>6</b>	<b>15</b>	<b>10</b>	<b>15</b>	<b>12</b>	<b>0</b>				
<b>% cover of planted woody hydrophytes in plot</b>			<b>10</b>	<b>8</b>	<b>15</b>	<b>20</b>	<b>15</b>	<b>6</b>	<b>15</b>	<b>10</b>	<b>12</b>	<b>10</b>	<b>0</b>				
<b>% aerial cover of non-invasive herbaceous &amp; woody veg in plot</b>			<b>138</b>	<b>119</b>	<b>137</b>	<b>127</b>	<b>115</b>	<b>120</b>	<b>116</b>	<b>111</b>	<b>102</b>	<b>107</b>	<b>94</b>				
<b>% aerial cover of non-invasive herbaceous &amp; woody veg in plot</b>			<b>134</b>	<b>114</b>	<b>134</b>	<b>124</b>	<b>112</b>	<b>120</b>	<b>112</b>	<b>107</b>	<b>93</b>	<b>101</b>	<b>94</b>				

Red = Invasive or noxious species

Green = hydrophyte

\* = in seed mix

**Appendix E: Permits**

Submitted in earlier reports. Available upon request.