Appendix A:

Results of Phase I and II Bog Turtle and Redbelly Turtle Surveys at the Geryville Materials Site in Lower Milford Township, Lehigh County, Pennsylvania

3914030/

SIR # 21405 / USFWS Project # 2006-0390
HA File # PA06.09a

Results of Phase I and II Bog Turtle and Redbelly Turtle Surveys at the Geryville Materials Site in Lower Milford Township, Lehigh County, Pennsylvania

Submitted February 7, 2007

to

EarthRes Group, Inc.
P.O. Box 468
7137 Old Easton Road
Pipersville, PA 18947

by

Michael E. Torocco, Tessa M. Bickhart, and Robert T. Zappalorti

Herpetological Associates, Inc.
Plant and Wildlife Consultants
110 Brandywine Avenue (Route 322)
Downingtown, Pennsylvania 19335

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Herpetological Associates, Inc. (HA) was contracted by EarthRes Group, Inc. on behalf of Geryville Materials, Inc. to conduct bog turtle (*Glyptemys muhlenbergii*) and redbelly turtle (*Pseudemys rubriventris*) habitat evaluations (Phase I) and presence/absence surveys (Phase II) at the Geryville Materials site in Lower Milford Township, Lehigh County, Pennsylvania (SIR# 21405, USFWS Project #2006-0390; **Appendix A**).

MATERIALS AND METHODS

LOCATION OF THE STUDY SITE

The Geryville Materials Site is comprised of eight contiguous properties located in Lower Milford Township, Lehigh County, Pennsylvania (Lat: 40° 26' 22.4"N / Long: 75° 30' 0.4"W; **Figures 1**). The study site is found on the East Greenville and Milford Square USGS 7.5-minute quadrangle maps.

SURVEYORS

The following HA staff were present during some or all of the surveys: Michael Torocco (PA Qualified Bog Turtle Expert), Tessa Bickhart (PA Qualified Bog Turtle Expert), William Callaghan (Field Biologist), Mark A. Myers (Field Biologist), and Michael J. McGraw (Field Biologist).

HABITAT EVALUATION METHODS

On a broad scale, HA has three criteria for judging the value of the existing conditions and habitat available for bog turtles and redbelly turtles. These are:

1. **Structure of Available Habitat:** Both the biotic and abiotic components are considered. These are good indicators for the possible occurrence of bog turtles or redbelly turtles within a particular study area or ecosystem (Zappalorti, 1976; Ernst, Lovich, and Barbour, 1994). This category is described in greater detail below.

2. **Historic Evidence:** The overall range of the bog turtle and redbelly turtle as well as historic records on or near a study site are examined. Historic records are important to the overall evaluation of a site.

3. **Indicator Species:** The presence of plant and animal species that are often found in association with bog turtles or redbelly turtles is highly informative when evaluating a site. Such species may include food/prey organisms, or species that typically occur in similar or identical habitats as the target species. The presence of indicator species will often increase the ranking of a study site. These criteria are valuable for identifying habitats that could support bog turtles.

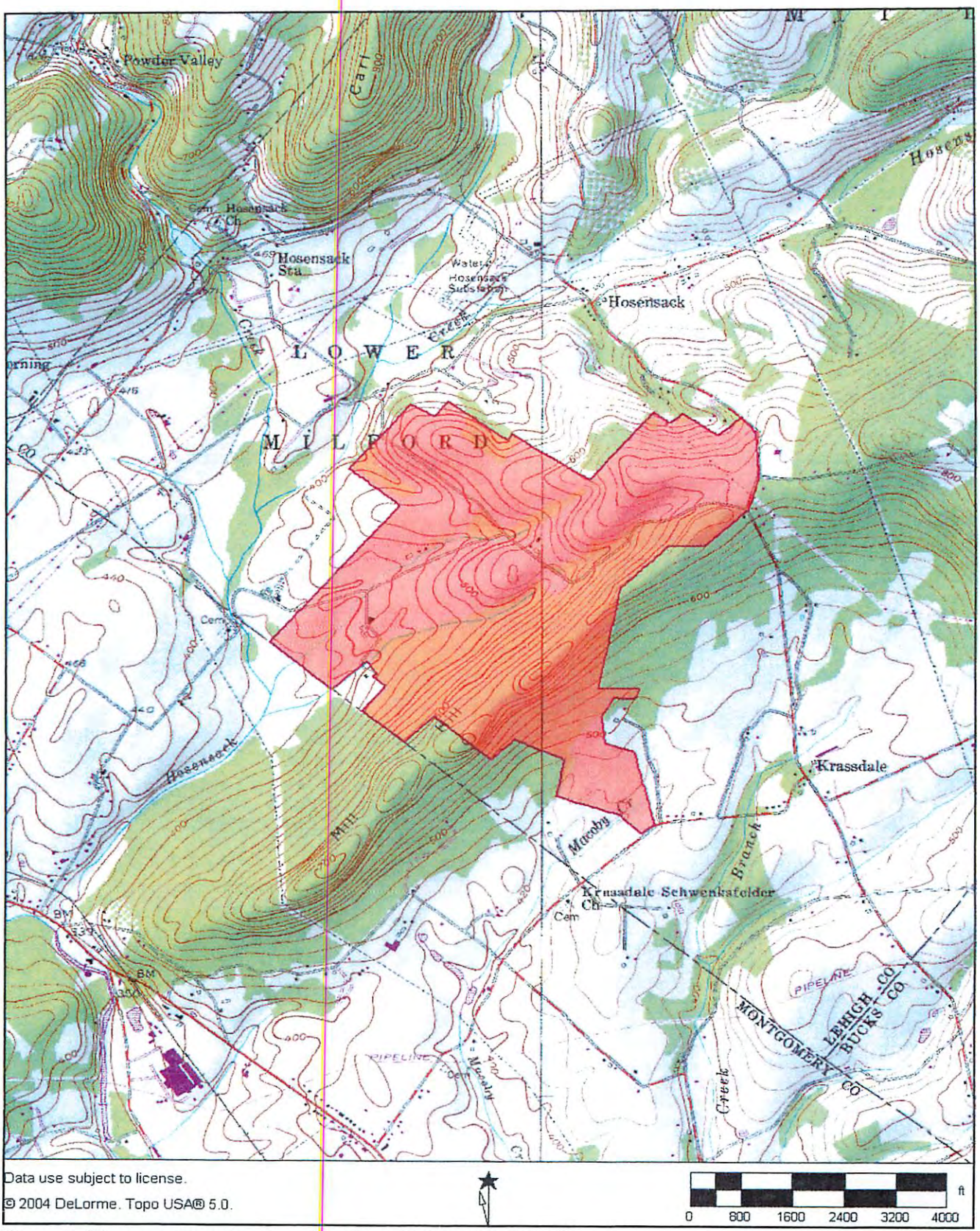

Figure 1. The approximate location of the Geryville Materials, Inc. Site.

Once potential habitats are found, it becomes necessary to rank the habitats as to their overall value for bog turtles. At this stage in the evaluation, specific aspects of the habitat structure are examined. Important characteristics of bog turtle habitat are derived from HA's research and published data on the bog turtles. The incorporation of this information into HA's ranking system is described below.

Bog turtles inhabit unpolluted, open bogs, marshes, and wet meadows with shallow water and a soft, deep muddy substrate. Their habitat is usually vegetated with various sedges, cattail, jewelweed, skunk cabbage, red maple, and alder (Kiviat, 1978; Zappalorti and Zanelli, 1978; Zappalorti et al., 1979; Herman 1994). The habitat characteristics can be grouped into three main features: hydrology, substrate, and vegetation. These are considered significant components of bog turtle habitat and are typically found in distinct combinations, forming a characteristic ecological community (Zappalorti, 1976; Chase et al.,1989). The wetland sites were then compared with confirmed bog turtle habitat located elsewhere in eastern Pennsylvania (Zappalorti et al., 1998a; Zappalorti et al., 1998b). In order to standardize the results of bog turtle habitat evaluations, each wetland was given a numerical score or rank using HA's revised wetland habitat ranking system for bog turtles (**Table 1**).

Table 1. HA's Standardized Bog Turtle Habitat Ranking System.

Rank		Description
Phase II Not Required	1	Not suitable: Site lacks all of the three main features of bog turtle habitat: hydrology, soil, and vegetation.
	2	Atypical: Site contains two of the three habitat features, one of which must be vegetation.
Phase II Required: Potential Habitat	3	Marginal: Site contains hydrology and soils, but does not contain the ideal vegetation.
	4	Typical: Site contains all three features of bog turtle habitat.
	5	Ideal: Site has all three features of bog turtle habitat, and has numerous rivulets, seeps, and/or springs; area of perceived bog turtle habitat is large with multiple interconnected cores; area may be hydrologically connected with confirmed bog turtle populations.

In reality, some sites may not fall perfectly into one of the five categories. However, for simplicity, each wetland was ranked to best represent the existing conditions of the area as bog turtle habitat. Of the three main features of bog turtle habitat (i.e., hydrology, soil, and vegetation), hydrology and soils are considered the most important by HA. Without the combination of these two features, it is highly unlikely that bog turtles can persist at a site. Vegetation, while an important feature of bog turtle habitat, is the most variable and therefore the least important in this ranking system. Situations where natural succession have turned a typical bog habitat into a shrub or hardwood dominated swamp are often encountered, but bog turtles may still persist. With management, these types of sites may become productive bog turtle habitats. Therefore, wetlands that lack vegetation but have suitable soils and hydrology are ranked higher than sites that have indicator plants but lack either soils or hydrology.

This revised ranking system is provided for the convenience of the Pennsylvania Fish and Boat Commission (PFBC), U.S. Fish and Wildlife Service (USFWS), and HA's clients. This system provides a standardized method for ranking bog turtle habitat based on HA's 30 years of bog turtle experience. These rankings closely follow the recommendations of the USFWS's "Guidelines for Bog Turtle Surveys" (revised April 2006).

BOG TURTLE SURVEY METHODS

Searching for this species is performed by a team of experienced herpetologists in a systematic fashion. This consists of walking through a wetland and carefully looking for basking turtles. Searches are also conducted in shallow, muddy water; atop or amid tussock grasses; and in or on dead/decaying plant debris. Probing sticks (wood broom handles) are used to move sedge grass and other vegetation aside and to probe into soft mud in search of hidden turtles (Zappalorti, 1976). Additionally, shallow water and the muddy substrate may be searched by muddling, or feeling around in the mud by hand (Ernst and Bury, 1977).

Two standard sampling methods for reptiles and amphibians were used to survey the sites in this study: random opportunistic sampling (ROS), which examines an entire site, including both high and low potential areas; and time-constrained searching (TCS), which focuses on highly potential habitats within a site. ROS was used primarily during the initial surveys, enabling HA to observe all habitats on the site and determine the locations of any highly potential habitats. TCS was used in later surveys, after highly productive bog turtle areas were found within a site. Details of these two methods follow.

ROS (*Random Opportunistic Sampling*). A relatively simple method for the trained herpetologist, ROS can be employed while other sampling techniques are being performed on the study site. It involves searching all areas of a site, whether they show potential habitat for the bog turtle or not. This allows for the identification of highly suitable habitat patches within a site. All herptiles encountered are recorded to supplement the species list generated by other field methods. This method is effective if there are no time constraints on the survey and more detailed follow-up surveys will be performed. Qualitative impressions can be developed as to the relative abundance and habitat use of certain species (Campbell and Christman, 1982; Karns, 1986).

TCS (*Time-constrained Searching*). The TCS method is most effective when searching for very secretive forms of wildlife (e.g., bog turtles). A specific habitat (e.g., cattail swamp or spring-fed meadow) is selected, and an experienced team of 3 or 4 persons conducts an intensive timed search within it. Depending on the number of times an area is to be searched, all individual reptiles and amphibians encountered may be uniquely marked to avoid counting animals twice or to obtain a population estimate. Spatial boundaries for each search are limited to the selected habitat. During times of the year when target species are known to congregate in particular habitats (e.g., nesting area, stream, spring) for some aspect of their life history (e.g., egg laying, hibernating), TCS is highly productive and superior to other types of surveys. Time limits ensure that each habitat is adequately, but not excessively, examined (Campbell and Christman, 1982; Karns, 1986).

REDBELLY TURTLE NESTING HABITAT SURVEY METHODS

Surveys for nesting habitat and turtle nests are conducted by first identifying all potential aquatic turtle habitat (ponds, lakes, and large, slow-moving streams). Once each aquatic habitat is evaluated for redbelly turtle potential, the areas surrounding the open water habitat are examined for potential nesting habitat. Areas within 1,000 ft of the aquatic habitat with ample sun exposure and well-drained soils are considered potential nesting habitat. Conversely, habitat that surrounds the open water habitat but has heavy canopy cover, has poorly drained (wetland) soils, or contains impervious surfaces (e.g., concrete, asphalt) is not considered potential redbelly turtle nesting habitat.

All potential redbelly turtle nesting habitat is carefully examined by a team of experienced biologists using systematic visual searches. Beginning at the pond edge, searches are conducted by walking around the open water habitat. The search radius is expanded until a distance of 1,000 ft is reached, or the habitat becomes unsuitable for nesting. All signs of turtle nesting are recorded. This evidence includes turtles caught in the act of nesting, destroyed turtle nests, and viable turtle nests. All nest locations are documented by taking photographs and by recording latitude and longitude using a Trimble GeoExplorer 3 GPS receiver or a Garmin Etrex GPS receiver. Nests are identified to species by recording the size and shape of nest cavity and size and shape of eggs.

REDBELLY TURTLE PRESENCE/ABSENCE SURVEY METHODS

Redbelly turtles are most often seen while they bask on logs or other debris, and may share the same basking locations with other "basking turtles" such as painted turtles and red-eared sliders. They can be easily identified when examined in-hand by noting shell and body coloration, pattern, and other characteristics (Conant and Collins, 1998). Identification from a distance using binoculars or a spotting scope is also possible, but is more difficult because key characteristics are harder to discern. For this reason, positive identification of redbelly turtles should only be made by an experienced biologist. Despite their large size, redbelly turtles are wary, and often slide quickly into the water at the slightest sign of disturbance. This species may therefore go undetected unless surveys are carefully designed and executed by experienced biologists.

Surveys are conducted by establishing viewing sites at the edge of potential aquatic habitats. From these vantage points, a qualified biologist carefully scans the pond and basking sites using binoculars and/or a spotting scope. Identification is confirmed by recording multiple characteristics that are useful for distinguishing species. Visual surveys are conducted when air temperature and weather conditions are suitable for basking.

PROJECT AND SITE INFORMATION

PROPERTY OWNER: Geryville Materials, Inc., P.O. Box 193, Eagleville, PA 19408, (610) 631-1100.

PROJECT ENGINEERS: EarthRes Group, Inc., P.O. Box 468, Pipersville, PA 18947, (215) 766-1211.

PROJECT / PROPERTY NAME: Geryville Materials, Inc. Noncoal Surface Mine

PROJECT AREA AND PROJECT DESCRIPTION: The proposed project is noncoal surface mining of 308.49 acres of the 628.50 acre site for the recovery of bedrock, diabase and fanglomerate. Mining is proposed in the areas of the highest topographic relief including the area south of West Mill Road, Mill Hill, the area north of the intersection of West Mill Road and Kings Highway (S.R. 2027), and the area north of Buhman Road.

PERMIT AREA (FOR WETLAND/STREAM ENCROACHMENTS): Two wetland areas are within the permit area for wetland/stream encroachment. The first is 0.78 acres of Wetland F (see Wetland Description below). The second involves approximately 450 feet of isolated stream that will be eliminated along with an estimated 0.005 acre of isolated pockets of wetland vegetation that exists along the fringe of the channel at a point located on the north slope of Mill Hill, some 500 feet east of the site's western property line. A Mitigation Proposal will be introduced as part of the Application for Noncoal Surface Mining to compensate for the wetland that are proposed to be impacted.

CURRENT LAND USE AND SETTING: The majority of the subject property is currently active agricultural fields and upland deciduous forest. The northern portion of Mill Hill is within the property boundary. Several existing dwellings/farms are also on site.

WATERSHED: The on-site Wetlands A through D are associated with the headwaters of Macoby Creek and Wetlands E, F, and H through P are associated with unnamed tributaries of Hosensack Creek. Please note that during the re-flagging of wetland boundaries, the originally delineated Wetland G was incorporated into Wetland F as continuous wetland. Both the Macoby Creek and the Hosensack Creek are tributaries of Perkiomen Creek, which is within the Schuylkill River Basin (Delaware Bay Basin).

AREA INVESTIGATED: The entire 628.50 study site was investigated for bog turtle and redbelly turtle habitat, as well as adjacent wetlands within a powerline ROW and an off-site farm property. **Figure 2** shows the on-site wetlands, the property boundary, and the direction and location of the habitat photographs in this report.

WETLAND INFORMATION

The wetland delineation was performed in July 2006 by Water's Edge Hydrology, Inc. 800 Leondard Street, Suite 2, Clearfield, PA 16830. The 1987 Corps of Engineers Wetlands Delineation Manual was used to delineate the wetlands. All on-site wetlands were identified and delineated. Total wetland area is calculated to be 39.72 acres.

Table 2. Wetland Information.

Wetland ID	Wetlands Size (acres)	Latitude*	Longitude*	Is the entire wetland on-site?
A	0.03	40° 25' 58.3"N	75° 29' 54.4"W	Yes
B	0.17	40° 25' 58.2"N	75° 29' 57.5"W	No
C	0.13	40° 25' 58.0"N	75° 29' 56.0"W	Yes
D	2.59	40° 25 ' 48.6"N	75° 29' 41.0"W	No
E	0.10	40° 26' 13.4"N	75° 30' 33.6"W	Yes
F	13.07	40° 26' 18.7"N	75° 30' 21.2"W	Yes
H	2.64	40° 26' 28.7"N	75° 29' 51.6"W	Yes
I	1.67	40° 26' 32.5"N	75° 29' 41.6"W	Yes
J	6.45	40° 26' 15.5"N	75° 30' 46.4"W	No
K	3.49	40° 26' 24.9"N	75° 30' 39.7"W	No
L	3.36	40° 26' 30.4"N	75° 30' 24.0"W	Yes
M	1.21	40° 26' 35.2"N	75° 30' 4.2"W	Yes
N	1.88	40° 26' 55.3"N	75° 29' 34.7"W	No
O	2.76	40° 26' 46.8"N	75° 30' 33.6"W	No
P	0.17	40° 26' 12.8"N	75° 30' 33.4"W	Yes

*Approximate locations derived from mapping.

RESULTS

WETLAND EVALUATION

An initial habitat assessment was performed by Andrea M. Teti, Inc. (AMT) during the week of February 6, 2006. At that time AMT found "great habitat" within two on-site wetlands (Wetlands D and J), and "excellent" bog turtle habitat along the Hosensack Creek in several off-site wetlands (**Appendix B**).

A follow-up Phase I Bog Turtle Habitat Evaluation and an initial Phase I Redbelly Turtle Habitat Evaluation was conduct on April 6, 2006 by Herpetological Associates, Inc. All on-site wetlands were investigated for bog turtle and redbelly turtle habitat. Wetlands D, J, and K were determined to have characteristics that are typically found in bog turtle habitat; these wetlands were determined to provide suitable habitat for bog turtles. Wetlands D and J are given a rank of 4 (Typical) due to the presence of mucky soil, deep springs, and low-growing herbaceous vegetation. Wetland K is given a rank of 3; although this wetland has suitable soil, hydrology, and vegetation, it lacks deep springs and the coverage of mucky soil is patchy.

Two known bog turtle populations (wetlands) are located upstream and downstream from the project site. These wetlands were viewed from the road, but due to their distance from the on-site wetlands, HA did not include these wetlands in the overall site evaluation.

HA also investigated the wetlands directly downstream and adjacent to the project site. Two additional areas of suitable bog turtle habitat were observed. One within a powerline ROW along the western edge of the site, nearest to Wetland J (hydrologically connected by the Hosensack Creek), and the other in an off-site portion of Wetland D (directly contiguous with Wetland D). Detailed descriptions of the investigated wetlands are provided in the Wetland Description.

A man-made pond within Wetland L provides potential redbelly turtle habitat. The pond is associated with an existing farm house, and is dammed at its southwestern end. Overflow is diverted beneath a gravel driveway into the tributary. The pond contains aquatic vegetation (a potential food source). The pond is not easily accessible for redbelly turtles via the stream corridor due to the size of the tributary and the presence of an elevated culvert; access is limited to overland travel. Suitable nesting habitat is present along the banks and in the surrounding farmland.

Table 3. Habitat Evaluation (Phase I Survey) Summary.

Wetland ID	Wetlands Size (acres)	Wetland Type & Amount (%)	Extent of Mucky Soils	Survey Effort (person hours)	Potential Bog Turtle Habitat?
A	0.03	PFO - 100	PFO - 0	0.5	No
B	0.17	PFO - 100	PFO - 10	0.5	No
C	0.13	PFO - 100	PFO - 0	0.5	No
D	2.59	PEM - 20 PSS - 40 PFO - 40	PEM - 30 PSS - 10 PFO - 0	1.0	Yes
E	0.10	POW - 30 PEM - 70	POW - 0 PEM - 0	0.1	No
F	13.07	PFO - 100	PFO - 10	1.0	No
H	2.64	PFO - 50 PSS - 50	PFO - 0 PSS - 10	0.5	No
I	1.67	PFO - 100	PFO - 10	0.5	No
J	6.45	PFO - 10 PSS - 30 PEM - 60	PFO - 10 PSS - 50 PEM - 80	2.0	Yes
K	3.49	PFO - 33 PSS - 33 PEM - 33	PFO - 0 PSS - 20 PEM - 20	1.0	Yes
L	3.36	POW - 40 PFO - 50 PEM - 10	POW - 0 PFO - 0 PEM - 50	1.0	No
M	1.21	POW - 10 PFO - 90	POW - 0 PFO - 0	1.0	No
N	1.88	PFO - 100	PFO - 5	0.5	No
O	2.76	PFO - 100	PFO - 0	0.5	No
P	0.17	PFO - 100	PFO - 0	0.1	No

WETLAND DESCRIPTION

Wetlands A, B and C (Figures 3 and 4): Located in the southeastern portion of the site are several rocky seeps, which are associated with a headwaters branch of Macoby Creek. The seeps emerge beneath rocks and boulders and are under a dense canopy of oaks (*Quercus* spp.) and maples (*Acer* spp.). Skunk cabbage (*Symplocarpus foetidus*) is dominant within the wetland area. This area lacks appreciable muck, open canopy, and tussock-forming vegetation.

Wetland D (Figures 5-7): Located to the south of Wetlands A-C is another headwater branch of Macoby Creek. The branch originates within off-site active agricultural fields to the north which HA was unable to evaluate. The approximately 180 m (600 ft) on-site portion of the branch is primarily forested, but areas of emergent and shrub/scrub wetland are also present. The dominant vegetation within the forested wetland areas includes skunk cabbage, sensitive fern (*Onoclea sensibilis*), multiflora rose (*Rosa multiflora*), honeysuckle (*Lonicera* spp.), speckled alders (*Alnus rugosa*), arrow wood (*Viburnum*

recognitum), and raspberry (*Rubus* spp.). Deep, mucky substrate is limited, but subsurface tunnels are abundant. A periodically mowed portion of Wetland D are dominated by low growing grasses (*Poa* and *Alopecurus* spp.), sedges (*Carex* spp.), rushes (*Juncus* and *Eleocharis* spp.), and new york ironweed (*Vernonia noveboracensis*).

The headwater branch continues off-site to the southwest where it is bordered by active farm fields, currently planted with corn. This off-site portion if the wetland is primarily emergent wetland. Although relatively small in area, the off-site emergent wetland contains deep, mucky substrate (up to 40 cm deep), and is vegetated by low-growing herbaceous species including rice cutgrass (*Leersia oryzoides*), grasses, and tussock sedge (*Carex stricta*).

Wetland E (Figure 8): This wetland, located adjacent to a gravel driveway of an off-site property, includes emergent wetland and a small pool of water which is channeled into an unnamed tributary of Hosensack Creek. The emergent wetland is dominated by grasses and sedges and has a dry and hard-packet substrate.

Wetland F (Figures 9 and 10): Wetland F is the forested wetlands adjacent to the central unnamed tributary to Hosensack Creek. Rocky seeps line the tributary, which is under a dense canopy of oaks and maples. Dominant vegetation within the wetland areas includes skunk cabbage and spice bush (*Lindera benzoin*). The substrate within this large wetland area is flooded but lacks appreciable muck.

Wetlands H and I: The central unnamed tributary to Hosensack Creek originates northeast of West Mill Hill Road from Wetland F. The two delineated wetland areas in this portion of the tributary are also separated by West Mill Hill Road. Wetland I is located to the east of the road and is a forested wetland dominated by skunk cabbage and oaks. Wetland H is the shrub and tree lined bank of the tributary. Wetland H (and a portion of Wetland F) were subject to recent disturbance from the clearing of the shrub thicket which lined the banks of the tributary. This caused deep, mucky tire ruts throughout the wetland area; the muck did not persist throughout the season. The substrate within this wetland became dry and hard-packed by early May. Dominant vegetation is skunk cabbage, alders, jewel weed (*Impatiens capensis*), and multiflora rose, which were slowing reestablishing.

Wetland J (Figures 11-13): Wetland J is an open-canopy emergent wetland with areas of shrub/scrub and forested wetland dispersed throughout. The wetland originates along a tributary in a dry, grassy field, but transitions into a wet meadow dominated by tussock sedge (*Carex stricta*)and continues off-site. Two main tributary channels drain this wetland, however, in this area several tributary branches are channeled from the surrounding farmland to the Hosensack Creek. Large portions of the wetland are drained rapidly by the existing channels. The substrate varied from deep muck (up to 0.5 m deep) to dry and hard-packed. The central portion of the tussock sedge wet meadow remained saturated throughout the season due to the presence of a deep spring. Other dominant vegetation includes cattail (*Typha latifolia*), skunk cabbage, alders, and reed canary grass (*Phalaris arundinacea*).

Off-site Powerline ROW Wetland (Figure 14): Located to the south of the study site, along the east bank of Hosensack Creek and within a powerline ROW, is an off-site, open-canopy emergent wetland. The wetland is dominated by skunk cabbage, grasses, and sedges. Several seeps form mucky rivulets

which flow into the Hosensack Creek. To the south of the ROW, the wetland is under a dense canopy of red maple swamp, with numerous seeps and patchy areas of deep muck (up to 30 cm deep). Dominant vegetation within the forested portion of the wetland is red maple, skunk cabbage, and jewelweed. Although off-site, this wetland is described here due to its proximity to Wetland J.

Wetland K (Figure 15): Located north of West Mill Hill Road from Wetland J is an another unnamed tributary of Hosensack Creek. Wetland K is the forested and shrub/scrub seepage areas bordering the tributary. The tributary has a rock/gravel/silt substrate, but the adjacent wetland areas have patches of muck (up to 30 cm deep). Dominant vegetation includes skunk cabbage, sensitive fern, grasses, sedges, oaks, and multiflora rose.

Wetland L (Figures 16-18): Wetland L is northeast of Wetland K and hydrologically connected via the unnamed tributary, but separated by a gravel driveway. A man-made pond is situated at the southwestern terminus of Wetland L, adjacent to the West Mill Hill Road. The banks of the pond are mowed, but cattail and *Phragmites communis* line the edges. An emergent wetland is located at the northeastern edge of the pond, and is separated from the pond by a berm. The emergent area is approximately 0.10 acres, and is a shallow pool with deep silt and shallow water. Dominant vegetation is water cress (*Nasturtium officinale*) and smart weed (*Polygonum* spp.). The remaining length of the tributary associated with Wetland L is a narrow, rocky channel lined with trees and shrubs.

Wetland M (Figures 19-21): The unnamed tributary associated with both Wetland K and L originates north of West Mill Hill Road, at the Buhman Road intersection. Wetland associated with this portion of the tributary is designated as Wetland M. The tributary in this area is a narrow, forested channel through open farmland. Located just north of the road is a spring house and a shallow, 0.2 ac pond. The pond and a portion of the tributary are bordered (and impounded) by a stone wall. The banks of the open water is lined with trees and shrubs. Watercress and duckweed (*Lamna minor*) are dominant within the pool.

Wetland N: Within the northeastern corner of the study site is a short stretch of an unnamed tributary to Hosensack Creek. The tributary originates from a small spring located on the property border. The banks of the tributary are sparsely bordered by trees and shrubs. No emergent wetland was observed on or immediately adjacent to the site.

Wetland O (Figure 22): An unnamed tributary to Hosensack Creek, located within the northwestern corner of the study site, is banked by steep slopes on either side. The forested floodplain of this tributary is designated as Wetland O. Dominant vegetation includes oaks, maples, and skunk cabbage. This wetland lacks appreciable muck.

Wetland P: Wetland P is a small forested rocky seep, adjacent to the southwestern property boundary, which drains onto an off-site property. Dominant vegetation includes skunk cabbage and oaks. Although permission was not obtained to enter the off-site property, no emergent wetland was visible within the vicinity of the western property boundary.

Figure 3. Wetland B.

Figure 4. Wetland C.

Figure 5. The open canopy wet meadow along the southern edge of Wetland D.