III. INVESTIGATION RESULTS

All wetlands identified within the project area were described according to Cowardin et al. (1979). The primary vegetative community types found within the project study area include: palustrine emergent (PEM), palustrine scrub-shrub (PSS), and palustrine forested (PFO) wetlands. Brief descriptions of each wetland are provided in Section III.B, and detailed information on each wetland can be found in the field data sheets located in Appendix B.

Table 2 provides a summary of individual wetland characteristics, including Cowardin classifications and the sizes of the wetlands within the property. As shown in this table, 37 wetlands with a total area of 158 acres were delineated within the property. In general, the wetland communities within the study area are moderately disturbed as a result of various installation activities, including: deforestation; manipulation of natural hydrologic/stream patterns; and a variety of soil disturbances, such as filling and excavation for land development.

A. Wetland Communities

The wetlands identified on-site were characterized using the *Wetlands and Deepwater Habitats Classification System* (Cowardin et al. 1979), which classifies wetlands based on vegetative habitats and water regime. Although an extensive classification of plant communities was not conducted as part of the wetland delineation, it was noted that many of the wetlands at TYAD fit the description of Acidic Glacial Peatland Complex. This is a common wetland complex that forms in glaciated areas (Fike 1999). This wetland complex occurs in valleys, depressions, and kettleholes where shallow or compact glacial till causes a perched water table and primary hydrology occurs through direct rainfall and runoff from the surrounding uplands (Damman 1987). Being large in size, these wetlands host a variety of habitat types, including open water areas and PFO, PSS, and PEM vegetation. In general, the central portion of these wetlands is open water or consists of a floating sphagnum mat that serves as a growing medium for PEM vegetation. PSS and PFO vegetation is typically found along the fringes of the wetland where water is shallow or subsurface. Dominant vegetation identified in this complex includes evergreen and semi-evergreen shrubs and a continuous layer of sphagnum mosses. Vegetation

Table 2. Wetland Summaries and Descriptions.

Wetland ID #	Watershed	NWI Classification (s)	Field-Confirmed Classification(s) *	Wetland Size		Map Sheet No.	Photograph (Appendix D)
				Square Feet	Acre(s)		
A	Tobyhanna Creek	--	PSS1 (50%), PEM1B (50%)	7,825	0.18	7	1
B	Tobyhanna Creek	PSS1/EM1E	PFO1 (50%), PSS1 (30%), PEM1E (20%)	235,942	5.42	6	2, 3
C	Tobyhanna Creek	PSS1/EM1E	PSS1 (80%), PFO1E (20%), O.E.	67,254	1.54	6	4, 5, 6
D	Tobyhanna Creek	PSS1/EM1E	PSS1 (90%), PFO1 (10%), PEM1E (10%)	489,240	11.23	6	7, 8
E	Lehigh River	PFO5/UBHh, PEM1Fh, PFO1/UBHh	PUBHh (40%), PFO1 (10%), PSS1 (10%), PEM1Fh (40%)	2,225,475	51.09	2, 4, 5	9, 10, 11, 12, 13, 14, 15
F	Hummler Run	PFO1/4E, PSS1/EM1E, PFO1E, PUBHh, PFO1B	PUBHh (30%), PFO1/4B (50%), PSS1B (10%)	1,320,014	30.30	7, 8, 9	16, 17, 18, 19, 20
G	Hummler Run	PEM1/PSS1C	PFO4 (90%), PEM1B (10%)	80,443	1.85	9	21, 22
H	Hummler Run	PFO1E	PEM1E (60%), PFO1/4B (40%), O.E.	62,500	1.44	8, 9	23, 24, 25, 26
I	Hummler Run	PEM1C	PSS1C (50%), PEM1C (50%)	11,553	0.27	9	27, 28
J	Hummler Run	--	PFO1C	35,346	0.81	9	29, 30
K	Hummler Run	PEM1C	PFO1B (70%), PEM1C (30%)	54,830	1.26	9	31, 32
L	Hummler Run	--	PFO1B (20%), PEM1C (80%)	14,950	0.34	9	33, 34
N	Hummler Run	--	PSS1E (50%), PEM1E (50%)	11,452	0.26	7	35, 36
O	Lehigh River	PEM1/SS1Fb	PUBHh (80%), PEM1Fh (10%), PSS1E (10%)	35,722	0.82	1	37
Q	Lehigh River	PFO1/EM1Fb, PSS1/EM1Fx	PEM1Ff (75%), PSS1E (25%)	52,265	1.20	1	38, 39
R	Pole Bridge Run/Lehigh River	PSS1E	PSS1B (80%), PFO1B (20%)	40,326	0.93	1	40
S	Lehigh River	PEM1B	PEM1B	96,304	2.21	3	41, 42
T	Lehigh River	PEM1F, PSS1E, PEM1E, PUBHh	PUB1H (20%), PEM1F (60%), PSS1E (10%), PFO1E (10%)	1,126,337	25.86	2, 3	43, 44, 45, 46, 47, 48, 49, 50
U	Lehigh River	PSS1E	PSS1E	103,410	2.37	2, 3	51
V	Lehigh River	--	PEM1B	2,136	0.05	3	52
W	Lehigh River	--	PSS1B	722	0.02	3	53, 54
X	Lehigh River	PEM1E	PEM1E (80%), PSS1E (20%)	12,129	0.28	2	55, 56
Y	Lehigh River	PSS1/EM1F, PFO1E, PFO1/PSS1F, PUBHh	PUB1Hh (75%), PFO1F (10%), PSS1F (10%), PEM1F (5%)	548,007	12.58	2, 3, 5	57, 58, 59, 60, 61, 62
Z	Lehigh River	--	PUB4E	1,031	0.02	1	63
AA	Pole Bridge Run	--	PFO1F	7,798	0.18	1	64, 65
BB	Lehigh River	PSS1/EM1B	PEM1B (50%), PSS1B (50%)	8,223	0.19	4	66
CC	Lehigh River	--	PFO1A	30,280	0.70	5	67, 68
DD	Lehigh River	PSS1Bx	PSS1Bx (90%), PEM1C (10%), PFO1 (80%)	141,527	3.25	2, 3, 5	69, 70, 71, 72
EE	Hummler Run	--	PSS1Bx (90%), PEM1B (10%)	9,973	0.23	8, 9	73
FF	Tobyhanna Creek	--	PSS1C (70%), PEM1C (30%)	5,388	0.12	7	74
GG	Tobyhanna Creek	--	PEM1B	1,709	0.04	7	75
II	Lehigh River	--	PFO1B	1,591	0.04	1	77
JJ	Lehigh River	--	PEM1B/PSS1B	6,688	0.15	3	--
KK	Lehigh River	--	PEM1B	1,591	0.04	3	78
LL	Hummler Run	--	PSS1B	12,255	0.28	8	79, 80
MM	Hummler Run	--	PFO1B	19,390	0.45	8, 9	81, 82
NN	Lehigh River	--	PEM1B/PSS1B	2,026	0.05	2, 5	--

** O.E.: Open-ended wetlands extend outside the project study area*
Source: Cowardin et al. 1979

often forms concentric rings with the open water in the center surrounded by a shrub community and finally giving way to trees at the upland transition.

1. Vegetative Habitat

a. Palustrine Emergent (PEM)

Most of the herbaceous vegetative species found in the PEM wetlands are persistent species that are native or naturally occur in the region. Some of the typical native species found in the wetlands include: *Onoclea sensibilis* (sensitive fern), *Typha latifolia* (broad-leaved cattail), *Impatiens capensis* (jewelweed), *Juncus effusus* (soft rush), *Phalaris arundinacea* (reed canarygrass), *Scirpus cyperinus* (woolgrass), *Scirpus atrovirens* (green bulrush), *Osmunda cinnamomea* (cinnamon fern), and various *Carex* sedge and grass species. The primary invasive/introduced species found throughout some of the PEM wetlands on the TYAD property is *Phragmites australis.*

b. Palustrine Scrub-Shrub (PSS)

Two subclasses of PSS communities are present in the project study area: broad-leaved deciduous and broad-leaved evergreen. Most of the PSS plant species found in the PSS wetlands are native or naturally occur in the region. By far, the most common native shrub species found in the wetlands are *Spiraea tomentosa* (steeplebush) and *Vaccinium corybosum* (highbush blueberry). Other notable shrub species include *Chamaedaphne calyculata* (leatherleaf), *Rhododendron canadense* (rhodora), and *Spiraea alba* (white meadowsweet).

c. Palustrine Forested (PFO)

Two subclasses of PFO communities are present in the project study area: broad-leaved deciduous and needle-leaved evergreen. The most common tree species present in these PFO communities are *Betula populifolia* (gray birch), *Acer rubrum* (red maple), and *Tsuga canadensis* (eastern hemlock). Although eastern hemlock is listed as a facultative upland (FACU) species, it can also be found in wetland habitats. *Picea rubens* (red spruce) and *Betula alleghaniensis* (yellow birch) are also present, but less common. In some PFO wetlands, the shrub and herbaceous community is very sparse due to shade and heavy leaf litter, creating an open understory.

2. Water Regime

Listed below are the special water regime modifiers that accompany the wetland vegetative classifications and further define the type of wetlands identified. The letter in parentheses following the water regime corresponds with the modifiers as they are listed in the Cowardin classification system (Cowardin et al. 1979). A copy of the Wetlands and Deepwater Habitats Classification chart in Appendix E further details the modifiers listed below and any additional modifiers not listed. A brief description of each water regime is detailed below.

- Temporarily flooded (A) – This water regime is defined by the presence of surface water that is present for brief periods during the growing season, but has a water table that usually lies well below the soil surface for most of the growing season. Plants that grow both in uplands and wetlands may be characteristic of this water regime.
- Saturated (B) – The wetland substrate of this water regime is saturated to the surface for extended periods during the growing season, but with surface water seldom being present.
- Seasonally flooded (C) – Surface water in this regime is present for extended periods, especially early in the growing season, but is absent by the end of the growing season in most years. The water table after flooding ceases is variable, extending from saturated to the surface to a water table well below the ground surface.
- Seasonally flooded/saturated (E) – In this water regime, surface water is present for extended periods, especially early in the growing season and when surface water is absent; substrate remains saturated near the surface for much of the growing season.
- Semipermanently flooded (F) – In this water regime, surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land's surface.
- Permanently flooded (H) – This water regime is defined by the presence of water that covers the land surface throughout the year in all years. (USFWS-NWI Wetland Code Interpreter 2010)

Although a majority of the wetlands within the TYAD property are within the UXO Restrictive area and were not excavated, it is assumed the supporting hydrology of the wetlands is driven by

a perched water table underlain by a glacial till fragipan. This type of environment commonly results in the development of peatlands that receive little or no groundwater and limited overland flow. These wetlands are often nutrient poor and highly acidic.

Cowardin descriptions, which include plant community and water regime, for each wetland identified on the TYAD property are detailed in Table 2. The NWI classifications presented in Table 2 are the same as those identified on the Figure 3 NWI map, which is used as a secondary resource. The Field-Confirmed Classifications are the Cowardin descriptions that were field identified during the wetland investigation. The percentages presented with the Cowardin descriptions are the field estimated coverages for each plant community within the wetland system.

B. Brief Descriptions of Delineated Wetlands

The wetlands are described below in relation to their watershed basin. The TYAD property is in the headwaters of the Lehigh River watershed. The upper Lehigh River drains the western portion of the property, and Tobyhanna Creek and its tributaries, Pole Bridge Run and Hummler Run, drain the eastern portion. These creeks are all within the Lehigh River watershed, which is part of the greater Delaware River basin. Tobyhanna Creek, as well as its tributaries (Pole Bridge Run and Hummler Run), are classified as High Quality - Cold Water Fisheries (HQ-CWF) with Migratory Fishes (MF; PA Code, Title 25, Chapter 93). The Lehigh River basin, from its source to Tobyhanna Creek, is listed as Exceptional Value (EV) waters with MF. Wetlands that are located in or along the floodplain of the reach of a wild trout stream or waters listed as EV under Chapter 93 are considered EV wetlands (PA Code, Title 25, Chapter 105). Therefore, those wetlands on the TYAD property that fall within the Lehigh River watershed are considered EV wetlands.

A description of the following information is given for each plant community identified: general vegetative composition, soil characteristics as determined in the field or based on soil survey data, and general indications of the presence or absence of wetland hydrology. Detailed field data sheets of each individual wetland are located in Appendix B. The location of each wetland and data collection point is shown on the Wetlands and Waterways Mapping in Appendix A.

Photographs of each wetland are included in Appendix D. Wetland photographs are listed in alphabetical order.

1. Lehigh River Watershed

Wetlands E, Y, and T. These three wetlands combine to form the large wetland complex identified on the USGS mapping (Figure 1) as Oakes Swamp. Oakes Swamp is identified as an ecologically significant area that contributes an important function in supporting the EV of the Lehigh River watershed (PADEP 2010). This wetland is also noted in the Monroe County Natural Areas Inventory as a core habitat containing species of special concern. The wetlands are segmented by dirt road berms but maintain a hydrologic connection through culverts beneath these roadways. Drainage from the wetlands flows west. Wetland E is the largest in size and is the largest wetland on the TYAD property (51 acres). All three wetlands are associated with the acidic glacial peatland complex that supports a variety of habitat types, including open water, PFO, PSS, and PEM. These wetlands are also permanently flooded (H) and are diked/impounded (d). Open water and PEM vegetation make up the majority of the wetland coverage. Wetland E shares a hydrologic connection with Wetland Y through a pipe centered within a gravel road embankment that separates the adjoining wetlands. Primary hydrology for the wetland is through upland runoff and a perched water table. Dominant soils within this wetland complex predominantly consist of mucky peat and Chippewa/Norwich soils, which are listed as hydric soils. Typical dominant vegetation common throughout these wetlands across all vegetative strata include red maple, gray birch, steeplebush, highbush blueberry, soft rush, broad-leaved cattail, woolgrass, jewelweed, green bulrush, cinnamon fern, and sphagnum moss. The boundaries for Wetland E were consistent with the 1998 JD and were not modified.

Wetland CC. Wetland CC is a small PFO wetland (0.70 acre) that connects to the larger Wetland E wetland system at the southeastern corner. Wetland CC is not included in the acidic glacial peatland complex due to its small size and limiting vegetative structure. During the previous JD, this wetland was adjoined to the southeastern boundary of Wetland E. This boundary connection was field confirmed during the May survey. Drainage from the surrounding uplands, as well as a seasonal high water table, collects in Wetland CC and then drains northwest into Wetland E. Dominant vegetation within this PFO wetland includes red maple, highbush blueberry,

steeplebush, and *Carex scoparia* (broom sedge). The mapped soil type for Wetland CC is OxC, a non-hydric soil. The boundaries for Wetland CC were consistent with the 1998 JD and were not modified.

Wetland DD. Wetland DD is a PEM/PSS/PFO wetland (3.25 acres) that sits atop a high slope just south of Wetland E. Wetland DD is not included in the acidic glacial peatland complex due to its small capacity and limiting vegetative structure. The majority of the wetland consists of PSS vegetation and extremely rocky soils. Multiple large boulders scattered throughout the area created "egg-carton" topography in the wetland. Several pools varying from 1 to 3 feet were noted throughout the low-lying areas of the wetland. Dominant vegetation within the PSS portion of the wetland includes highbush blueberry with red maple and gray birch saplings. The PEM portion of the wetland occurs along the south and southwest edges of the wetland near the adjacent building complex and includes species such as *Carex annectans* (sedge) and soft rush. Vegetation in this area shows signs of periodic maintenance. Primary hydrology for this wetland occurs through a perched water table. Overflow from the wetland flows downslope to discharge into Wetland E. The mapped soil type for Wetland DD is Cut and Fill land (Cy), a non-hydric soil. The boundaries of the wetland were modified along the south and southwestern boundaries to include the PEM portions of the wetland that have expanded since the previous delineation.

Wetland S. Wetland S is a PEM wetland (2.21 acres) that persists on the surface of a landfill at the western edge of the TYAD property. Primary hydrology is driven through a perched water table and upland runoff. Soils were not observed in this wetland, as a soils pit was not excavated due to the underlying subsurface landfill. Although the mapped soil type for Wetland S is Mp, a hydric soil, the disturbances associated with the construction of the landfill have most likely changed the soil type to be consistent with Cut and Fill land (Cy). Hydrophytic vegetation in the wetland was concentrated in the lower-lying pockets of the wetland, while the vegetation along the drier outer fringes of the wetland boundary is marginal. Dominant vegetation throughout the wetland includes soft rush and sensitive fern. The delineated boundaries for Wetland S were consistent with the JD and were not modified.

Wetland U. Wetland U is a PSS wetland (2.37 acres) that is seasonally flooded. Primary hydrology for Wetland U is through a high water table and upland runoff. Chippewa/Norwich (CnB) soils are mapped as the dominant soils type throughout the wetland and are listed as hydric soils. Highbush blueberry dominated the PSS layer and overall vegetative coverage in the wetland. No defining outlet to the wetland was identified. The delineated boundaries for Wetland U were consist with the 1998 JD and were not modified.

Wetland V. Wetland V is a PEM wetland (0.05 acre) that occurs in a small topographic depression. Although Wetland V is in close proximity to Wetland T, it lacks a surface connection due to a small berm that divides the wetland. During field reconnaissance, Wetland V lacked surface water and visible surface saturation; however, through the presence of water-stained leaves, microtopographic relief, and close proximity (geomorphic position) to Wetland T, indicators of wetland hydrology are present. The mapped soil type for Wetland V is MoB, which has hydric inclusions of Norwich soils. Vegetative cover throughout the wetland was relatively sparse, as several brush piles and downed trees dominated the majority of the wetland. The delineated boundaries for Wetland V were consistent with the 1998 JD and were not modified.

Wetland W. Wetland W is a PSS wetland (0.02 acre) just east of the southern section of Wetland T. Wetland W was modified in the field from the original wetland boundaries to call out a channel with defined bed and banks. This channel was identified as Stream 2 and is discussed in further detail in Section C. The boundaries for Wetland W were reduced to a small bench area along the southwestern bank of Stream 2. This area was dominated by steeplebush and also contained red maple, highbush blueberry, and *Salix nigra* (black willow). Primary hydrology for the wetland includes overland flow from surrounding uplands and flooding from Stream 2. The mapped soil type for Wetland W consists of Cut and Fill land (Cy), which is not a hydric soil or has hydric inclusions.

Wetland X. Wetland X is a small PEM/PSS wetland (0.28 acre) located just west of the vehicle test track. Primary hydrology for the wetland is through a high or perched water table and upland runoff. At the northern edge of the wetland, between flags 3 and 4, the boundary was extended to include a small area with standing water that was dominated by sphagnum and soft rush. The

mapped soil type for Wetland X is MoB, which has hydric inclusions of Norwich soils. Typical vegetation throughout the wetland includes highbush blueberry and gray birch in the PSS and sapling strata; and soft rush, steeplebush, and woolgrass in the PEM strata.

Wetland KK. Wetland KK is a small PEM wetland (0.04 acre) that lies south of the vehicle test track and adjacent to the dirt road paralleling Wetland T. Wetland KK is an additional wetland added during the field reconnaissance that was not included in the approved JD wetland boundaries. East and directly upslope of Wetland KK is a clear-cut corridor cleared to accommodate the sight distance required for transmitting long-distance radio frequencies for the indoor radar testing dome. Given the location of the wetland and upslope clearing, Wetland KK most likely formed as a result of the recent clear-cut. Upland runoff and a perched water table are the primary sources of hydrology for the wetland. No defined outlet for the wetland was identified; however, during heavy precipitation events, overflow from Wetland KK crests the top of the adjacent dirt road and flows downslope to drain into Wetland T. The mapped soil type for Wetland KK is CnB, a hydric soil. Dominant vegetation throughout the wetland consists of soft rush and woolgrass.

Wetland O. Wetland O (0.82 acre) is an unconsolidated bottom wetland consisting of cobble and gravel that is permanently flooded and diked/impounded (PUB1Hh) with a minor PEM/PSS component around in the outer fringes of the wetland. Occurring at the northern edge of the TYAD property, Wetland O shares a hydrologic connection with the adjacent Wetland Q and a larger wetland system to the north on the adjacent Tobyhanna State Park property. The extent of this adjacent wetland is evident on the aerial mapping. The boundaries of this wetland were not reviewed since the wetland occurs outside the TYAD property fence. The northern and eastern sides of Wetland O are dammed by two adjoining dirt roads. A pipe beneath the road embankment to the west directly connects with Wetland Q, and a pipe to the north allows for a direct connection with wetlands to the north. The majority of Wetland O consists of open water that was approximately 3 to 4 feet in depth during field reconnaissance. The mapped soil type for Wetland O is Ms, a hydric soil. Dominant vegetation throughout the PEM/PSS portion of the wetland consists of steeplebush, highbush blueberry, woolgrass, and various sedge species. The delineated boundaries for Wetland O were consistent with the 1998 JD and were not modified.

Wetland Q. Wetland Q is a primarily PEM wetland (1.20 acres) that is located directly east of Wetland O. The northern and western sides of Wetland Q are dammed by two adjoining dirt roads. A pipe beneath the road embankment to the east directly connects Wetland Q with Wetland O. The majority of the wetland consists of partially inundated PEM vegetation, with PSS vegetation occurring along the wetland fringes. Remnant snags throughout the central portion of the wetland serves as an indicator that this area was once forested but has since transitioned into a PEM wetland. The southern boundary line of the wetland was extended south between points 4C and 4D to include the expansion of the PSS portion of the wetland. Shallow surface water was noted throughout most of the wetland, with deeper pools occurring along the western edge measuring approximately 1 foot in depth. The mapped soil type for Wetland Q is Ms, a hydric soil. Dominant vegetation throughout the PEM portion of the wetland consists of green bulrush, *Glyceria striata* (fowl mannagrass), soft rush, and steeplebush.

Wetland Z. Wetland Z is a small (0.02 acre) unconsolidated bottom wetland that consists of an organic substrate that is seasonally flooded and saturated (PUB4E). Occurring at the northeastern corner of the TYAD property, Wetland Z is a small seep area within a large boulder field that is surrounded by an upland forested canopy. Wetland Z lacked vegetation, as it is inundated throughout most of the year. The mapped soil type for Wetland Z is MoB, a soil with hydric inclusions of Norwich soils. The delineated boundaries for Wetland Z were consistent with the 1998 JD and were not modified.

Wetland BB. Wetland BB is a small isolated wetland (0.19 acre) that sits high atop Powder Smoke Ridge. Vegetation within Wetland BB currently consists of PSS and PEM vegetation. The area surrounding the wetland was recently clear-cut for the construction and site clearance for the indoor radar testing dome. Vegetation within the wetland may have also been cut, as many of the shrubs were low growing. Dominant vegetation includes highbush blueberry, steeplebush, soft rush, and woolgrass. Primary hydrology for Wetland BB is through a perched water table. The mapped soil type for Wetland BB is OxB, a non-hydric soil. The delineated boundaries for Wetland BB were consistent with the 1998 JD and were not modified.

Wetland NN. Wetland NN originates as a PEM vegetated ditch that transitions into a PSS slope wetland. Wetland NN is approximately 0.05 acre in size and is located to the northwest of the improved grounds area of TYAD. A pipe under the perimeter road provides hydrology to the upper reaches of the vegetated ditch area of Wetland NN. The well-defined ditch portion of wetland NN opens up into a less defined slope wetland with no direct overland connection to Wetland E. Wetland NN was added during April 2013 preliminary JD. A data sheet is included in Appendix B, but a photograph was not taken during the preliminary JD.

Wetland JJ. Wetland JJ is a PEM and PSS vegetated ditch (0.15 acre) west of the perimeter road to the east of the landfill. The boundaries of Wetland JJ are a well-defined constructed swale with wetland vegetation. Wetland JJ provides hydrology in the upper reaches of Stream 2, which is connected to Wetland T. A pipe under the perimeter road connects Wetland JJ to Stream 2. The southern portion of the wetland consists of PEM vegetation, while the northern portion is PSS. This wetland was verified during the April 2013 preliminary JD; as such, there is no data sheet or photograph of this wetland. The original JD boundary was modified by adding flag 7A to exclude the southern portion as upland.

2. Tobyhanna Creek Watershed

Wetland A. Wetland A is a small PEM/PSS wetland (0.18 acre) and occurs along the fenced perimeter of Building 310. The dominant vegetation in the wetland consists of steeplebush, woolgrass, and soft rush. In wetter pockets of the wetland, the PEM vegetation was lush and hummocky. Young *Populus tremuloides* (quaking aspen) were filling in drier areas. Hydrology for Wetland A is supported through a perched water table and upland runoff. Fragments of terra cotta piping were noted throughout the wetland. The piping, in combination with uneven topography, suggests this area has previously been disturbed. The delineated boundaries for Wetland A were consistent with the 1998 JD and were not modified.

Wetlands B, C, and D. These three wetlands are an extension of the larger Tobyhanna Lake wetland complex immediately east of the TYAD property. Hydrology connections between these wetlands and Tobyhanna Lake persist via piping beneath the perimeter dirt road. Of the three wetlands, Wetland D is the largest at 11.23 acres. Each wetland supports the three vegetative

strata of PFO, PSS, and PEM vegetation and fits the classification of the acidic glacial peatland complex. These wetlands are similar to the wetland system in Oakes Swamp (Wetlands E, Y, and T), but in a much smaller capacity and with significantly less open water areas. Dominant vegetation in the PFO sections of the wetlands consists of red maple and red spruce. Highbush blueberry and steeplebush were the dominant species in the PSS areas. In Wetlands B and D, the presence of significant wetland hydrology was most noticeable in the PEM/PSS sections of the wetland where hummocky vegetation floats on a thick mat of sphagnum moss. Approximately 1 to 2 feet of water was beneath the floating mat during field reconnaissance in Wetland B. The mapped soil types for these wetlands consist predominantly of Ms and CnB soils, which are listed as hydric soils. The delineated boundaries for Wetland B were consistent with the 1998 JD and were not modified. The boundary for Wetland D was modified to exclude an area dominated by *Fagus grandifolia* (American beech) and other upland vegetation along the eastern side of the wetland. Wetland C was modified to accommodate a minimal boundary expansion along the northern and southern sections of the wetland.

Wetland FF. Wetland FF is a small wetland (0.12 acre) located in a topographic depression along the southern perimeter of the Building 310 fencing. Wetland FF is a PEM/PSS wetland that sits within a topographic depression. Approximately 2 inches of water were noted at the central portion of the wetland. A perched water table and upland runoff serve as the primary sources of hydrology. Excavation of a soil pit revealed disturbed/fill soils. These soils may be remnants associated with the construction of the adjacent building and fencing. Given the topographic bowl-shape of the wetland, it may have also served as a stormwater basin at one time. Dominant vegetation in Wetland FF consisted of steeplebush, highbush blueberry, and woolgrass. The mapped soil type for Wetland FF is Cut and Fill land (Cy), a non-hydric soil. The soil profile taken within the wetland was reflective of fill soils and was not used in making the wetland determination. The delineated boundaries for Wetland FF were consistent with the 1998 JD and were not modified.

Wetland GG. Wetland GG is a small PEM wetland (0.04 acre) that is adjacent to Wetland FF and Wetland A. Wetland GG is a concave basin with hummocky vegetation that suggests this area is frequently, but temporarily, inundated. During field reconnaissance in May, no surface water

was identified. A soil pit was dug to determine the presence/absence of hydric soils and signs of wetland hydrology. Although no signs of a water table or saturation were visible, the soils were damp. Given the geomorphic position, relatively sparse vegetation, and the presence of water-stained leaves, the hydrology criteria for this wetland was met. Furthermore, the soil profile revealed low chroma colors with 30 percent redoximorphic features. Hydrology for the wetland is primarily driven by upland runoff and a seasonal high water table. The northeastern section of the wetland is slightly higher in elevation and is supporting a mixture of wetland and upland species. The mapped soil type for Wetland GG is Cut and Fill land (Cy), a non-hydric soil. A soil profile taken within the wetland revealed the presence of hydric soils through the abundance of redoximorphic features and a Depleted Matrix. The delineated boundaries for Wetland GG were consistent with the 1998 JD and were not modified.

3. Pole Bridge Run Watershed

Wetland R. Wetland RR is a PFO/PSS wetland (0.93 acre) at the northeastern corner of the TYAD property. PSS vegetation, primarily highbush blueberry, dominates the wetland. Primary hydrology for the wetland is driven by a perched water table. Many boulders were scattered throughout the wetland, making soil saturation and surface water difficult to identify. In gaps between the boulders and ground surface, small pockets of water were noted, indicating the water table is shallowly subsurface. The mapped soil type for Wetland R is Ms, a hydric soil. The delineated boundaries for Wetland R were consistent with the 1998 JD and were not modified.

Wetland AA. Wetland AA is a PFO wetland (0.18 acre) occurring in a topographic depression at the northeastern corner of the TYAD property. During field reconnaissance, the western half of the wetland was inundated with 1 foot of surface water. The eastern half consisted of herbaceous vegetation and mosses scattered amongst boulders. Red maple was the dominant tree in the canopy and was more concentrated along the outer perimeter of the wetland. Wetland hydrology is driven by a perched water table and upland runoff. The mapped soil type for Wetland AA is WpB, a non-hydric soil. The delineated boundaries for Wetland AA were consistent with the 1998 JD and were not modified.

Wetland II. Wetland II is a PFO wetland (0.04 acre) occurring within a bowl-shaped depression adjacent to the perimeter dirt road at the northeastern corner of the property. Approximately 2 inches of surface water was identified in small pockets within the central low area of the wetland. Wetland hydrology is driven by a perched water table and upland runoff. Vegetation in the central portion of the wetland was sparse, as many large rocks and downed limbs were prevalent in the area. Red maple was the dominant tree in the canopy. The mapped soil type for Wetland II is MoB, a soil with hydric inclusions of Norwich soils. The delineated boundaries for Wetland II were consistent with the 1998 JD and were not modified.

4. Hummler Run

All the wetlands within the Hummler Run watershed are outside the UXO Restrictive area, allowing for soil pit excavation. A wetland identified as "Area M" during the previous JD was examined for wetland characteristics during the field view in May. This area lacked the combination of consistent hydrology and appropriate soils and vegetation to meet wetland criteria. Therefore, this area was excluded from the 2012 delineation boundaries.

Wetland F. Wetland F is a large wetland (30.30 acres) just east of the TYAD main entrance on Hap Arnold Boulevard. The southern section of the wetland is a dammed pond frequently used by anglers. A pipe beneath the adjacent dam road drains overflow from the wetland south into Hummler Run. North of the pond, Wetland F transitions into a deciduous PFO wetland. However, the easternmost edge of the wetland becomes hemlock dominated. This northern PFO section of the wetland is bisected by a powerline easement that connects between Souier Street and Cpl. Damato Street. The wetland continues within this easement as a PSS wetland, then transitions back to PFO north of the power lines. Several small ponded areas were noted throughout the wetland. Another powerline easement is present at the northern boundary of the wetland. *Phragmites australis* dominates the PEM vegetation stratum in this area. The dominant soil types mapped for Wetland FF are CnB and VxB; CnB is a hydric soil and VxB has hydric inclusions of Chippewa soils. Soil pits were dug to determine the presence of hydric soils. A Depleted Matrix and a Very Shallow Dark Surface served as the hydric soils indicators observed in the soil test pits. The delineated boundaries for Wetland F were consistent with the 1998 JD and were not modified.

Wetland G. Wetland G is a wetland (1.85 acre) located just east of the Wetland F pond. Wetland G is a PEM and PFO wetland whose hydrology is driven by a perched water table and upland runoff. The southern section of the wetland adjacent to the pond access road is the PEM portion of the wetland that contains dominant herbaceous vegetation such as green bulrush, woolgrass, and soft rush. The northern PFO portion of the wetland is an eastern hemlock-dominated wetland with boulders scattered throughout the area. Beneath and between these boulders were pockets of water indicating the height of the water table. Although soil excavation was permitted in this area, a soil test pit could not be dug due to the rocky soils and large boulders. A soil test pit was dug in the PEM portion of the wetland, revealing low chroma colors and redoximorphic features (mottles) and thus meeting the Depleted Matrix hydric soil indicator. The delineated boundaries for Wetland G were consistent with the 1998 JD and were not modified.

Wetland H. Wetland H is a PFO and PEM wetland (1.44 acre) at the southern edge of the TYAD property, just south of the pond access road. Hummler Run, a perennial stream, flows through the center of the PEM portion of the wetland. Primary hydrology for the wetland is through baseflow from Hummler Run in the PEM section and a perched water table in the PFO section. Secondary hydrology is provided through flooding of Hummler Run and upland runoff. The herbaceous vegetation in the PEM section of the wetland was diverse and consisted of *Carex crinita* (fringed sedge), *Poa palustris* (fowl bluegrass), soft rush, broom sedge, sedge, *Carex vulpinoides* (fox sedge), *Persicaria saggitatum* (tearthumb), cinnamon fern, sensitive fern, and reed canarygrass. The PFO section of the wetland was dominated by eastern hemlock and a few scattered red maple saplings. Soils within the PEM and PFO portions were saturated with low chroma colors and multiple redoximorphic features with a sandy texture. This description matches the Sandy Redox indicator for hydric soil. The southern boundaries of the wetland continues south, outside the TYAD property fence. The field delineation for Wetland H stopped at the fence and did not continue beyond the property boundary. The delineated boundaries for Wetland H were consistent with the 1998 JD and were not modified.

Wetland I. Wetland I is a PEM and PSS vegetated ditch (0.27 acre) south of the pond access road at the southern end of the TYAD property boundary. The boundaries of Wetland I are guided by

the toe-of-slope base of two access roads on either side of the wetland. These access roads were fully vegetated during field reconnaissance and do not appear to be used often. Wetland I shares a direct hydrologic connection with Wetland G through a pipe beneath the pond access road. The northern half of the wetland consists of PEM vegetation, while the southern half is PSS. Soils within the wetland were a loamy texture with low chroma colors and abundant redoximorphic features. This description matches the criteria of a Depleted Matrix indicator for hydric soil. The delineated boundaries for Wetland I were consistent with the 1998 JD and were not modified.

Wetland J. Wetland J is a PFO wetland (0.81 acre) located immediately west of the access road paralleling the western side of Wetland I. Hydrology for Wetland J is derived from a high water table that was observed in the soil test pit at 4 inches below the ground surface. Several small pockets of surface water up to 2 inches deep were noted throughout the wetland. Soils within the wetland consisted of a low chroma silt loam in the upper 4 inches of the soil pit. Between 4 and 5 inches of the pit was a rock fragipan. Below 5 inches, the soils were a sandy loam with low chroma colors and few redoximorphic features. This description matches the criteria of a Sandy Redox. Red maple was the dominant canopy cover in the wetland, with highbush blueberry and cinnamon fern dominant in the understory. The delineated boundaries for Wetland J were consistent with the 1998 JD and were not modified.

Wetland K. Wetland K is a PFO and PEM wetland (1.26 acre) immediately east of the access road paralleling Wetland I. The majority of the wetland is PFO with a thin canopy dominated by red maple. The PEM portion of the wetland mainly occurs along the edge of the access road to the west and in small patches throughout the wetland. Steeplebush and cinnamon fern comprise the majority of the understory species. Primary hydrology associated with the wetland is derived through a perched water table. The soil profile revealed a glacial till fragipan at 5 inches below the ground surface. Within the upper 5 inches of the pit, the soils consisted of a low chroma sandy loam lacking redoximorphic features. This description matches the criteria of the Thick Dark Surface indicator of hydric soils for the depth the pit could be excavated. The delineated boundaries for Wetland K were consistent with the 1998 JD and were not modified.

Wetland L. Wetland L is a PFO and PEM wetland (0.34 acre) that occurs within the southeastern corner of the TYAD property. The PFO portion of Wetland L occurs within the eastern lobe of the wetland that parallels the TYAD perimeter fence. The southern tip of Wetland L is the topographic low point of the wetland where runoff collects, causing this area to be frequently inundated. Approximately 6 to 10 inches of surface water was noted in this southern portion of the wetland during field reconnaissance. Vegetation in the remainder of the wetland consisted of PEM and low PSS vegetation. Steeplebush and soft rush were the primary dominant species in the PEM section of the wetland. Soils within Wetland L consisted of a low chroma silt loam with redoximorphic features in the upper 8 inches of the soil pit. Below 8 inches, a restrictive rock layer was encountered. The upper portions of the soil pit match the Depleted Matrix indicator criteria of a hydric soil. The delineated boundaries for Wetland L were consistent with the 1998 JD and were not modified.

Wetland N. Wetland N is a PEM and PSS wetland (0.26 acre) located within a powerline easement immediately west of McDonough Street. A pipe beneath the road at the eastern end of the wetland discharges upland and roadway runoff into the wetland as a secondary source of hydrology. The primary source of hydrology is derived from a high water table. PEM and PSS vegetation are intermixed throughout the wetland, with steeplebush and sensitive fern being the dominant vegetation. Soils within the wetland were a low chroma loam with distinct and abundant redoximorphic features. This description matches the criteria of a Depleted Matrix indicator of hydric soils. A rock layer was encountered in the soils pit 6 inches below the ground surface. The delineated boundaries for Wetland N were consistent with the 1998 JD and were not modified.

Wetland EE. Wetland EE is a PSS wetland (0.23 acre) located between the large ponded area of Wetland F and Hap Arnold Boulevard. Occurring within a topographic depression, Wetland EE collects upland runoff and encounters a high water table as primary sources of hydrology. Despite its close proximity to Wetland F, no visible surface connection was identified between the two wetlands. An area assumed to consist of fill material serves as a dividing berm between the two wetlands. The ground surface of the wetland consisted of large boulders with vegetation and small pockets of standing water interspersed throughout. Steeplebush was the dominant

species throughout the wetland. Soils were a low chroma silt loam with abundant and distinct redoximorphic features. This description matches the criteria of a Depleted Matrix indicator of hydric soils. A restrictive rock layer was encountered at 6 inches below the ground surface. The delineated boundaries for Wetland EE were consistent with the 1998 JD and were not modified.

Wetland LL. Wetland LL is a PSS wetland (0.28 acre) located along the southwestern edge of the TYAD property. Wetland LL was not part of the original wetland JD but was added during the May 2012 field delineation. Located between the paved perimeter road and the abandoned railroad tracks near Building 58, Wetland LL is a PSS wetland that persists within the abandoned railroad bed. Wood chips associated with the railroad covered the ground surface throughout most of the wetland. Steeplebush was the dominant shrub comprising most of the PSS vegetation layer. Dominant species within the PEM layer consisted of soft rush, woolgrass, and broom sedge. Primary hydrology for the wetland is driven by a high water table and surface runoff from the adjacent parking lot and perimeter road. A soil test pit revealed a sandy loam soil with low chroma colors and abundant redoximorphic features within 4 inches of the soil pit. This description matches the criteria of a Depleted Matrix indicator of hydric soils. Rock was encountered just below 4 inches of the soil pit, halting further excavation.

Wetland MM. Wetland MM is a PFO wetland (0.45 acre) located along the perimeter road toe-of-slope at the southern end of the TYAD property. Wetland MM was not part of the original wetland JD but was added during the May 2012 field delineation. Wetland MM lies within a moderately deep depression that receives primary hydrology through a high water table and upland runoff. Red maple dominates the canopy, providing approximately 80 percent cover. The understory of the wetland consists predominantly of highbush blueberry. Soils within the wetland consisted of a sandy texture with low chroma colors and abundant concentrations of redoximorphic features. This description matches the criteria of the Sandy Redox indicator of hydric soils.

C. Identified Waterways

Two watercourses with defined bed and banks were identified and delineated within the boundaries of the TYAD property. Hummler Run (Stream 1), a perennial watercourse, is located at the southern edge of the property and originates from the overflow structure of Barney's Lake (Wetland F). A second watercourse (Stream 2) is an intermittent stream channel that originates along the western boundary of the active base and provides hydrology to Wetland T. Stream Assessment Field Data Sheets, which provide detailed information on the watercourse habitat, were completed for each watercourse and are included in Appendix C. Below is a general description of the two watercourses identified on-site.

1. Stream 1 (Hummler Run)

Approximately 306 linear feet of Hummler Run is located within the TYAD property. Hummler Run originates from Barney's Lake, an impoundment of approximately 7 acres with depths estimated up to 8 feet, based off the dam height. The headwater section of Hummler Run on TYAD property averages 7 feet in width and an average water depth of 3 inches. The straight section of the stream on TYAD property is primarily run on a low gradient through Wetland H. Stream banks are shallow within the wetland and covered with PEM hydrophytes. Substrate is composed primarily of sand and gravel. Moderate diversity and abundance of macroinvertebrates were identified within the stream substrate, although no finfish were observed. Seven orders of macroinvertebrates, including the pollution-sensitive Trichoptera, were present. Hummler Run is a Chapter 93 designated high-quality cold water fishery, migratory fishery (H1Q-CWF, MF).

2. Stream 2 (Unnamed Tributary [UNT] to Lehigh River)

Approximately 172 linear feet of Stream 2 are located within the TYAD property. Stream 2 originates on the base and discharges under an access road into Wetland V. Stream 2 is an unnamed headwater tributary within the Lehigh River Basin. Lehigh River is a Chapter 93 basin delineation; as such, it includes all tributaries draining into the Chapter 93 designated stream segment of the Lehigh River, which is a EV stream. Stream 2 is an intermittent stream that averages 5 feet in width and water depths averaging 3 inches. No macroinvertebrates or finfish were observed within Stream 2. Stream 2 was initially grouped within the boundaries of Wetland W, although placement of fill within Wetland JJ upstream of Stream 2 has caused

excessive erosion of the channel within the original boundary of Wetland W. This erosion formed the defined bed and banks with rock substrate of Stream 2 that exist today. Based on the presence of defined bed and banks and rock substrate, the stream channel of Stream 2 was differentiated from the wetland boundary of Wetland W.

D. Wetland Boundary Changes

Below is a summary of wetland boundaries that were modified from the 1998 JD based on the April and May 2012 field delineation.

Table 3. Changes to Wetlands Since Previous Jurisdictional Determination (1998).

	Modified Boundaries	Added Wetlands	Removed Wetlands
Wetlands	C	KK	M
	D	LL	P
	E	MM	HH
	H	NN	
	K		
	P		
	Q		
	T		
	W		
	X		
	DD		
	JJ		

The wetlands listed in the Modified Boundary column in Table 3 include wetlands boundaries that were either increased or decreased since the previous delineation. The "Added Wetlands" are those wetlands not part of the original 1998 JD wetland boundaries, but were delineated during the 2012 field investigation. The "Removed Wetlands" are those wetlands that either fall outside of the TYAD property boundary (Wetland P) or no longer meet the three criteria indicative of a wetland (Wetlands M and HH).

Wetland HH was a small isolated wetland (0.01 acre) located just east of Wetland BB on Powder Smoke Ridge. It was determined during the preliminary JD that Wetland HH no longer meets the wetland soil criteria and was removed from jurisdiction. The basis for wetland HH being

removed is deforestation for mission workload on Powder Smoke Ridge, which has removed soil and vegetation from the area. Wetland M no longer met the hydrology criteria.