PPL NUCLEAR DEVELOPMENT

PPL Bell Bend Nuclear Power Plant

Luzerne County, Salem Township, Pennsylvania

401 Water Quality Supplement

BINDER 2
JPA Sections
Items 19-33

June 2012

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Binder 2:

JPA Documents

Bell Bend Nuclear Power Plant
Wetland Mitigation Design Report
Confers Lane Site

Salem Township, Luzerne County, PA




Prepared for:
PPL Bell Bend, LLC.
38 Bomboy Lane, Suite 2
Berwick, Pennsylvania 18603

Prepared by:

Land Studies

315 North Street
Lititz, PA 17543
717-627-4440
www.landstudies.com

Rev 1, November 2010, Revised January 2011

Bell Bend Nuclear Power Plant

Wetland Mitigation Design Report – Confers Lane Site

Rev 1, January 2011

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List of Figures

1 Introduction

The purpose of the Confers Lane Mitigation Project is to provide compensatory wetland mitigation for the proposed Bell Bend Nuclear Power Plant. The total created wetland acreage provided in this project is 0.36 acres and the total enhanced wetland acreage is 0.04 acres. The Confers Lane Mitigation Project consists of re-connecting the existing wetlands on either side of Confers Lane. A portion of Confers Lane east of the proposed plant will be removed as part of the Grading Plan for the PPL Bell Bend Nuclear Power Plant. The existing road bed berm will be graded to the elevation of the existing wetlands on either side, the soil will be amended and native species will be planted to remediate the area.

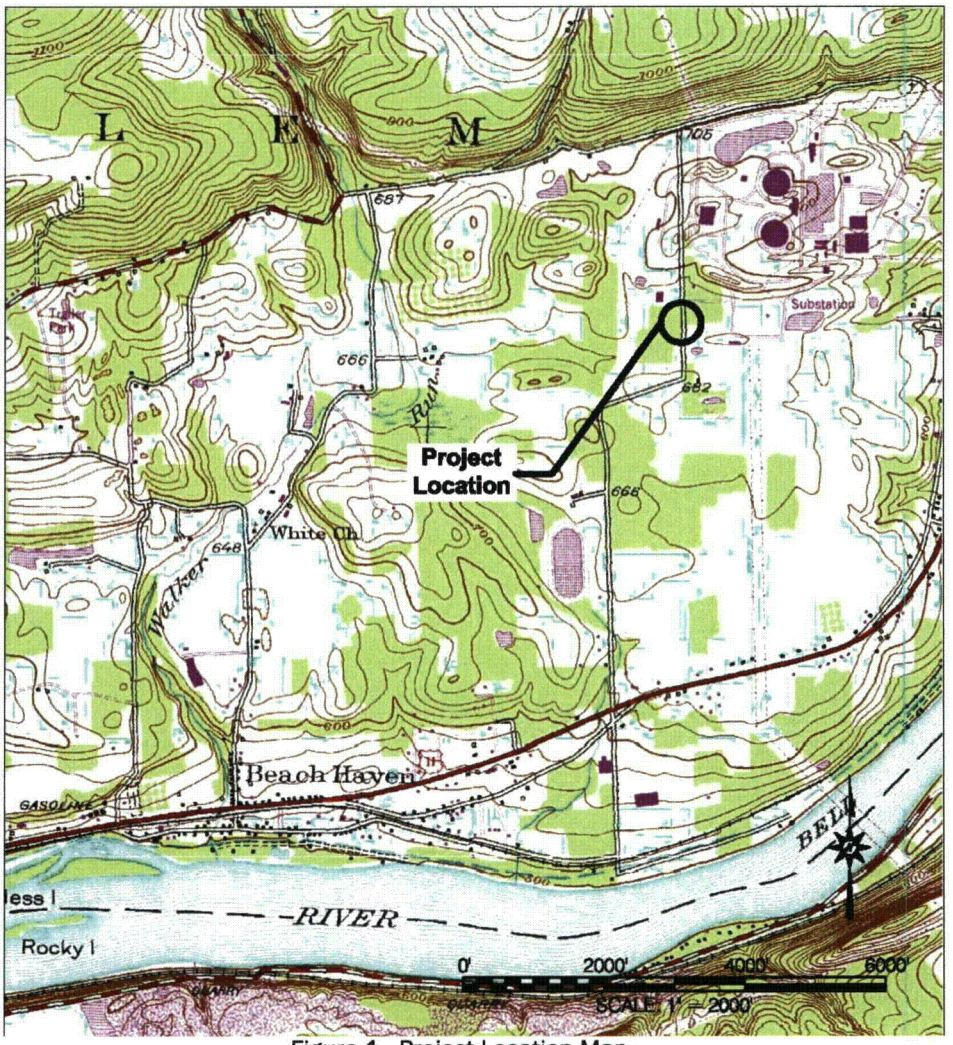


Figure 1 - Project Location Map
Wetland Mitigation Plan: Confers Lane Site
Location: 41°05'15" N 76°09'12"W, USGS 7.5 minute Quadrangle – Berwick, PA

2 Physiographic Region, Geology and Hydrology

2.1 Physiographic Region

The project site is part of the Susquehanna Lowland Section of the Ridge and Valley physiographic province (see Figure 2), which is characterized by a distinctive series of linear ridges and valleys that are the result of differential erosion of folded sedimentary rocks with varying degrees of resistance to weathering and erosion. Valleys are composed of less resistant rocks such as limestone and shale, whereas ridges and uplands are composed of more resistant rocks, particularly sandstone and siltstone. The North Branch of the Susquehanna River crosses these ridges as it flows generally from north to south. Its numerous tributaries form a trellis drainage network pattern as they flow through the valleys of less resistant rocks.

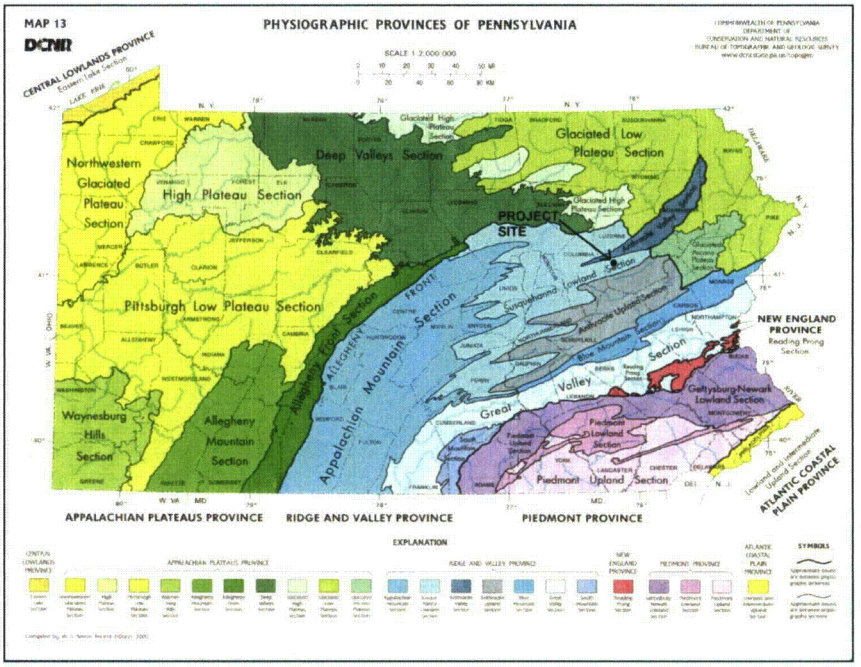


Figure 2 - Physiographic Provinces Map of Pennsylvania

2.2 Geology

The underlying bedrock consists of layered sedimentary rocks that are Devonian in age (~416 to 359 million years old). The vast majority of the BBNPP project boundary is underlain by dark-gray silty claystone of the Mahantango Formation (Dmh). Some of the northern-most portions of the BBNPP project boundary are underlain by dark-gray to grayish-black clay shale of the Harrel Formation (Dh) and dark-gray sandstone, siltstone, and shale of the Trimmers Rock Formation (Dtr). Source materials within Walker Run may include any of these formations as well as gray and bluish-gray sandstone, greenish-gray and grayish-red

siltstone, grayish-red claystone, and greenish-gray shale from the Irish Valley Member (Dci) of the Catskill Formation.

During the past 2 million years (approximate), the landscape has been modified by cyclical erosion and deposition associated with advancing and retreating ice sheets, up to several kilometers thick in places, that flowed southward from the northern polar regions. The most recent ice advance, known as the Wisconsinan, occurred about 45,000 to 15,000 years ago. The most recent part of this advance is referred to in this region as the Woodfordian, which is responsible for creating the most prominent glacial features in the BBNPP study area and the surrounding region. These features include a northwest-southeast trending Woodfordian terminal moraine complex that consists of boulder, poorly sorted sediment, and Woodfordian glaciofluvial (including kame) terraces along the Susquehanna River that consist of stratified sands and gravels. The terminal (end) and ground moraines deposited at the front of and beneath the ice sheet, respectively, are much coarser than the outwash sediments, and also are marked by kettles. Kettles are depressions on the ground surface that resulted from melting of ice blocks within the glacial deposits during deglaciation. After deglaciation, which ended approximately 10,000 yrs ago, the landscape of the BBNPP project boundary was mantled with fresh glacial and near-glacial deposits, which consisted of kame terrace sediments that were deposited along the sides of river valleys adjacent to ice margins, and of various types of till and outwash that formed at the leading edge of the Woodfordian ice sheet. Drainage was poor as a result of the near-glacial and glacial deposits, which typically consist of sediment that ranges from clay- to boulder-size, and resulted in widespread swampy conditions as streams adjusted to deglacial conditions.

2.3 Hydrology

Wetlands within the BBNPP project boundary are associated with two watersheds: Walker Run and the North Branch of the Susquehanna River (NBSR). Confers Lane currently serves as the divide between the two watersheds within the site. Despite being separated by Confers Lane, wetland 12.1 on the west side of the road and wetland 16 on the east side of the road retain similar characteristics and are thought to have been hydrologically connected in the past before they were dissected by the roadway. The numbering system of wetlands corresponds to the system used in the US Army Corps of Engineers Preliminary Jurisdictional Determination Application Document (Normandeau, February 2010), modified slightly by the Wetlands Functions and Values Assessment Report (LandStudies, October 2010).

Wetland 12.1 is located along the Eastern Tributary of Walker Run. Walker Run is classified as a wild trout stream; therefore wetland 12.1 is considered an exceptional value wetland (EV), per 25 Pa. Code Chapter 105.17. Since wetlands 12.1 and 16 were historically hydrologically connected, wetland 16 is also considered to be an exceptional value wetland.

Wetland 12.1 surrounds the north/south reach of the Eastern Tributary. The stream serves as an outlet for the wetland. The wetland has flat topography and the source of hydrology appears to be overland flow and spring upwellings when the groundwater table is high. Two channels created by surface water runoff from the "West Building" parking lot and from

Confers Lane join within the wetland and then flow to the Eastern Tributary as it begins to flow in an east-west direction. The Eastern Tributary has been artificially channelized (ditched) throughout the north-south section, especially behind the "West Building" where berms have been built on either side of the stream. The berms appear to be side-cast from digging out the channel.

Wetland 16 has no outlet and as a result tends to stay wetter during dry periods than Wetland 12.1. The long "tail" part of Wetland 16 that makes a 90-degree bend to the east is an extremely flat manmade channel formed between the elevated switchyard and a natural bedrock formation.

3 Visual Assessment of Project Area

Confers Lane is a two lane paved roadway that creates an unnatural berm through the middle of a once-hydrologically connected wetland (currently Wetlands 12.1 and 16). See Figure 3.

Figure 3. Confers Lane dividing Wetlands 12.1 and 16, facing south.

Both Wetland 12.1 and 16 are primarily Palustrine Forested (PFO) wetland, with some Palustrine Scrub-Shrub (PSS) and Palustrine Emergent (PEM) areas. Wildlife habitat serves as the principal function of these wetlands. Even with the artificial break between the two, there is adequate adjacent upland and wetland area to provide wildlife corridors for movement. Vegetation observed in Wetlands 12.1 and 16 include multiflora rose, sedge sp.,

skunk cabbage, highbush blueberry, spicebush, cattails, elderberry, swamp white oak, red maple, black gum, pin oak, yellow poplar, sensitive fern, silky dogwood, and arrowwood (LandStudies, October 2010).

4 Mitigation Design

The wetland mitigation design for Confers Lane involves removing the roadbed and grading the berm to the level of the existing wetlands to reconnect Wetlands 12.1 and 16. To connect the wetlands properly, a small amount of grading within the existing wetland will need to be performed. Upon completion of grading, however, the affected area will be re-planted and enhanced.

In the area of the existing roadbed, the existing surface shall be scarified to a depth of at least eight (8) inches. Clean, native topsoil shall be amended with 25% compost and placed on wetland to proposed final grade elevations (1' minimum) to provide a good growing medium for the native species to be planted. Several native shrub and tree species, including hickory, swamp white oak, red maple and silver maple, will be planted within the created wetland area and the entire disturbed area will be planted with a wetland seed mix (see Figures 4-6).

Trees

Key	Botanical Name	Common Name	Size	Qty.	Spacing	I.S.	Notes
	Acer rubrum	Red Maple	1"-1.5"	10	20'-30'	FAC	
	Acer saccharinum	Silver Maple	1"-1.5"	8	20'-30'	FACW	
CO	*Carya ovata*	Shagbark Hickory	1"-1.5"	8	20'-30'	FACU	Upland areas only
	Quercus bicolor	Swamp White Oak	1"-1.5"	11	20'-30	FACW	
				37			

Figure 4. Tree planting schedule.

Shrubs

Key	Botanical Name	Common Name	Size	Qty	Spacing	I.S.	Notes
	Ilex verticillata	Winterberry	#5	18	4'-6'	FACW	1 male for every 8 female
	Lindera benzoin	Spicebush	#5	18	4'-6'	FACW	
	Vaccinium corymbosum	Highbush Blueberry	#5	16	4'-6'	FACW -	
	Viburnum trilobum	Cranberry Bush	#5	10	4'-6'	FACW	
				62			

Figure 5. Shrub planting schedule.

Floodplain Seed Mix

%	Botanical Name	Common Name	I.S.
10	*Elymus virginicus, PA*	Virginia Wild Rye, PA Ecotype	FACW
10	*Panicum ridigulum, PA*	Redtop Panic Grass, PA Ecotype	FACW+
8	*Elymus canadensis, PA*	Canada Wild Rye, PA Ecotype	FACU
5	*Carex vulpinoidea, PA Ecotype*	Fox Sedge, PA Ecotype	OBL
5	*Panicum clandestinum*	Deer Tongue 'Tioga', PA Ecotype	FAC+
5	*Elymus riparius, PA*	Riverbank Wild Rye, PA Ecotype	FACW
5	*Agrostis perennans, APB*	Autumn Bentgrass, APB	FACU
5	*Agrostis scabra, PA*	Ticklegrass, PA Ecotype (rough bentgrass)	FAC
5	*Carex scoparia*	Blunt Broom Sedge	FACW
5	*Festuca rubra*	Creeping Red Fescue	FACU
4	*Carex comosa*	Bristly Sedge	OBL
4	*Chasmanthium latifolium, PA*	River Oats, PA Ecotype	FACU
3	*Carex stipata*	Awl Sedge	OBL
3	*Elymus hystrix, PA*	Bottlebrush Grass, PA Ecotype	NI
3	*Juncus effusus, PA*	Soft Rush, PA Ecotype	FACW+
2	*Asclepias incarnata*	Swamp Milkweed	OBL
2	*Bidens aristosa*	Bur Marigold, 'Suther' NC Ecotype	FACW-
2	*Carex lurida*	Lurid Sedge	OBL
2	*Juncus tenuis*	Path Rush	FAC-
2	*Poa palustris*	Fowl Bluegrass	FACW
1	*Aster prenanthoides*	Zigzag Aster	FAC
1	*Aster laevis*	Smooth Blue Aster	NI
1	*Aster novae-angliae*	New England Aster	FACW-
1	*Carex crinta*	Fringed Sedge	OBL
1	*Iris versicolor*	Blue Flag Iris	OBL
1	*Lobelia cardinalis*	Cardinal Flower	FACW+
1	*Lobelia siphilitica*	Great Blue Lobelia	FACW+
1	*Scirpus validus*	Soft-stem Bulrush	OBL
1	*Solidago riddellii*	Riddell's Goldenrod	OBL
1	*Solidago rugosa*	Wrinkle Leaf Goldenrod	FAC
100		***Application Rate: 15-20 lbs/acre***	

Figure 6. Wetland Seed Mix.

The total created wetland acreage for the Confers Lane wetland is 0.36 acres and the total wetland enhancement acreage at Confers Lane is 0.04 acres.

5 References

Bell Bend Nuclear Power Plant COLA Revision 1. 2008. Unistar Nuclear Services LLC.

Bush, R. Dennis. 1973. Soil Survey of Luzerne County, Pennsylvania.

Soil Survey of Luzerne County. 1981. United States Department of Agriculture.

United States Army Corps of Engineers Preliminary Jurisdictional Determination Application Document. February 2010. Normandeau Associates, Inc.

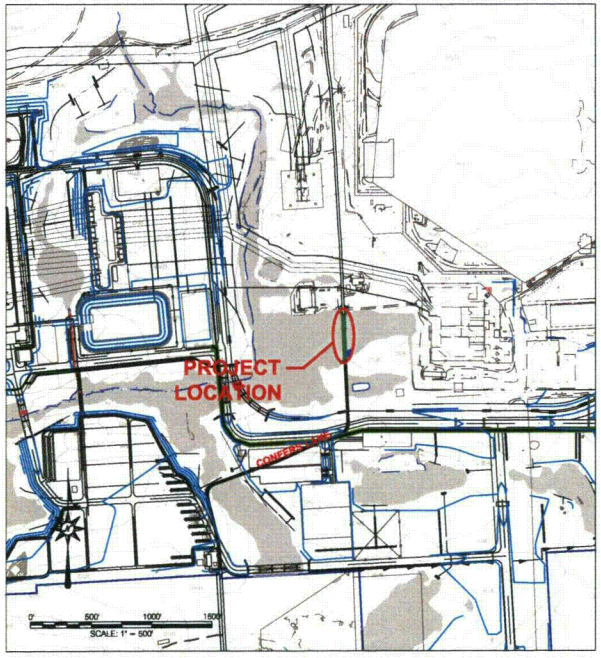
Wetland Delineation and Exceptional Value Wetlands Analysis Report for the Proposed Bell Bend Nuclear Power Plant Site, Luzerne County, PA. July 2010. Normandeau Associates, Inc.

Wetlands Functions and Values Assessment. October 2010. LandStudies, Inc.

BELL BEND NUCLEAR POWER PLANT
WETLAND MITIGATION PLAN
CONFERS LANE SITE

SALEM TOWNSHIP, LUZERNE COUNTY, PENNSYLVANIA

PLAN DATE: OCTOBER 29, 2010
REVISION 1: AUGUST 12, 2011



SITE MAP
1" = 500'

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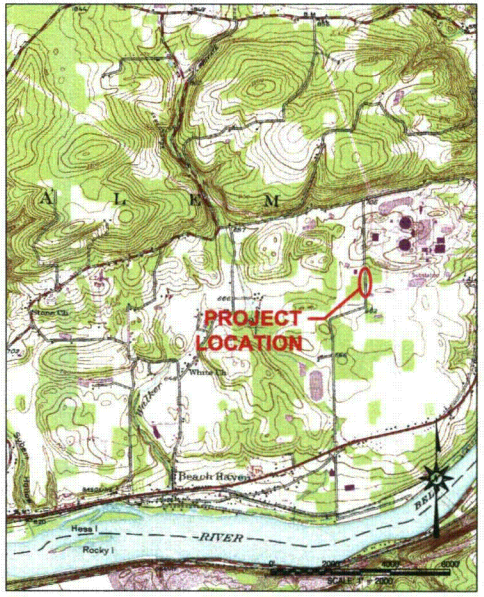
CLIENT ADDRESS:
PPL BELL BEND, LLC.
38 BOMBOY LANE, SUITE 2
BERWICK, PENNSYLVANIA 18603
PHONE: (570) 802-5636
FAX: (570) 802-5639

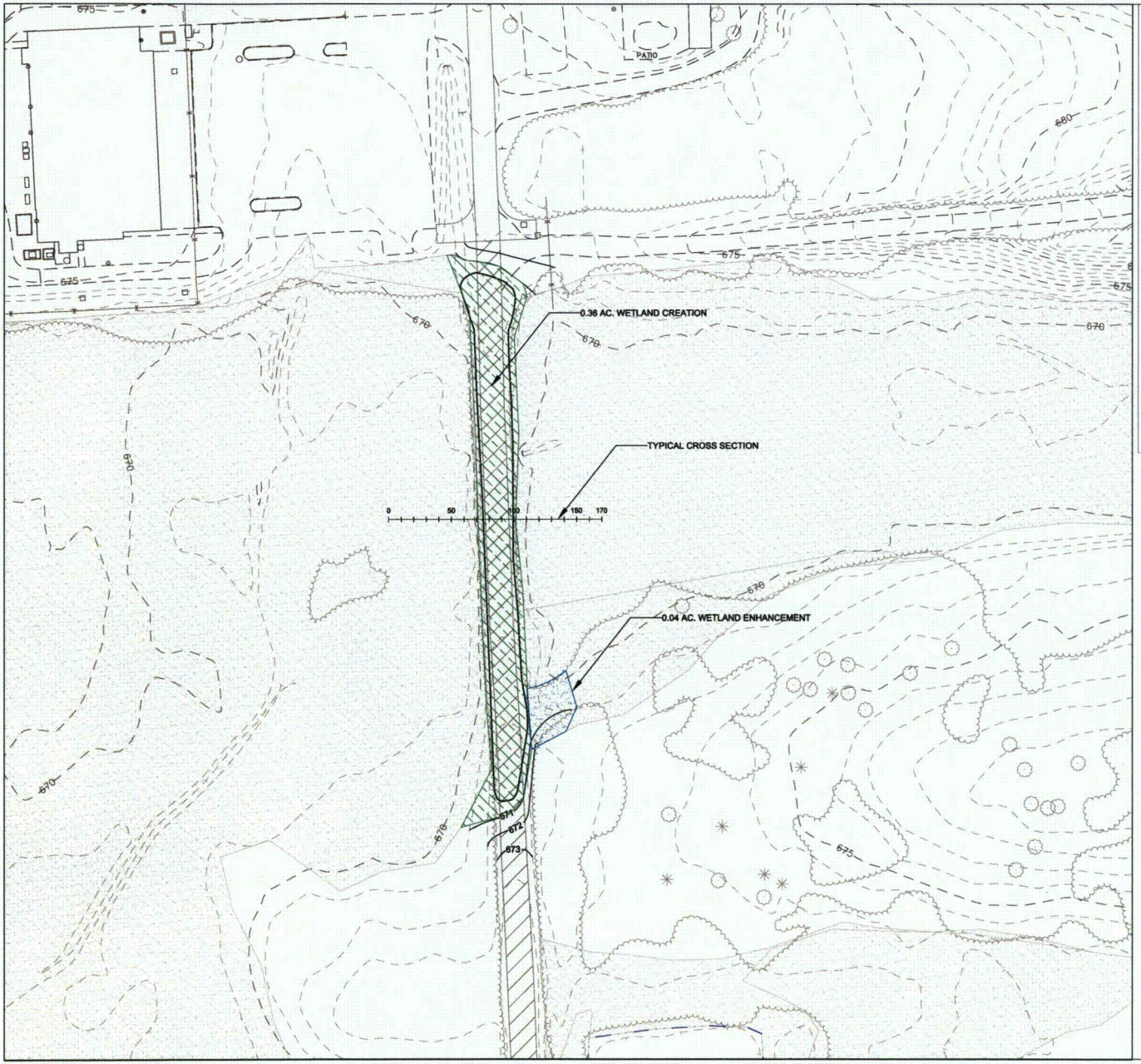


LOCATION MAP
1" = 2,000'

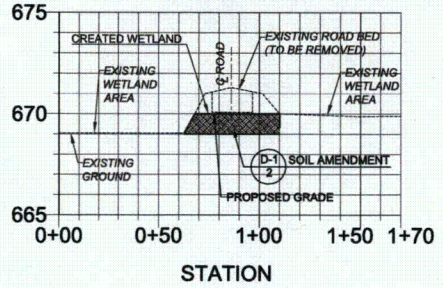
NOTES:
1. BACKGROUND TOPOGRAPHIC MAPPING WAS PRODUCED BY PETERS CONSULTANTS, INC. IN NOV. 2007, JAN. 2008 AND APRIL 2010. THE HORIZONTAL COORDINATE SYSTEM SHOWN ON THIS DRAWING IS PENNSYLVANIA'S STATE PLAN COORDINATE SYSTEM, NORTH AMERICAN DATUM OF 1983 (NAD 83). THE VERTICAL CONTOURS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
2. THE BBNPP PLOT PLAN IS FROM SARGENT & LUNDY, LLC., DRAWING SK-12198-400-001, REV. 4, REV. DATE 9-09-10.
3. THE WETLAND BOUNDARIES ARE FROM NORMANDEAU ASSOCIATES, INC. BELL BEND WETLANDS DELINEATION REPORT, REV. 3, JULY 2010.

Land Studies
717-627-4440
fax: 717-627-4660
landstudies.com
land@landstudies.com
315 North Street | Lititz, PA 17543
PA 042324

PROJECT:	WETLAND MITIGATION PLAN: CONFERS LANE SITE
PROJECT #: E-724-LS	DRAWING #: MIT-CL-001
COUNTY:	LUZERNE COUNTY
DATE:	OCTOBER 29, 2010
REVISION: 1	DATE: 8/12/2011



TYPICAL CROSS SECTION CONFERS LANE



SCALE:
H: 1" = 30'
V: 1" = 3'

NOTES:
1. SUBSOIL MUST BE DRY WHEN SCARIFYING IS PERFORMED.
2. SOIL, COMPOST MIX SHALL BE 75% CLEAN, NATIVE SOIL, 25% COMPOST

D-1 2 SOIL AMENDMENT
NTS

LEGEND

- EXISTING CONTOUR (MINOR)
- EXISTING CONTOURS (MAJOR)
- PROPOSED CONTOUR (MINOR)
- PROPOSED CONTOURS (MAJOR)
- EXISTING WETLANDS
- CREATED WETLANDS
- ENHANCED WETLANDS
- EXISTING PAVEMENT (TO BE REMOVED)

0 40' 80' 120'
SCALE: 1" = 40'

PA 042324
717-627-4440
fax: 717-627-4660
landstudies.com
land@landstudies.com
315 North Street | Lititz, PA 17543
Land Studies

PROJECT:
BELL BEND NUCLEAR POWER PLANT
PPL BELL BEND, LLC.
38 BOWMAN LANE, SUITE 2
BERWICK, PENNSYLVANIA 18603

SHEET TITLE:
GRADING PLAN
WETLAND MITIGATION PLAN - CONFERS LANE SITE
SALEM TOWNSHIP
LUZERNE COUNTY, PENNSYLVANIA

REVISIONS		
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CHECKED BY: BJE
DATE: OCTOBER 29, 2010
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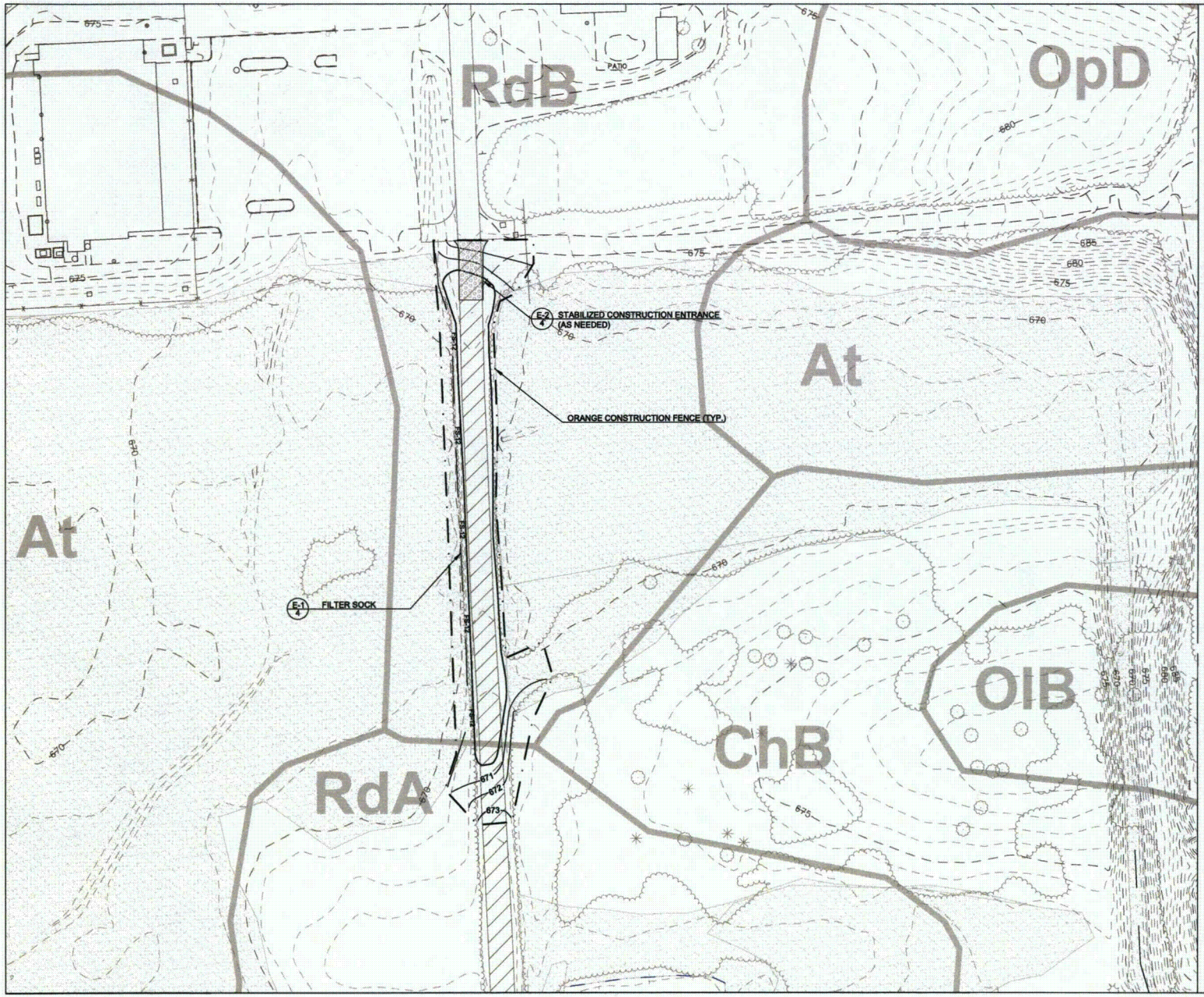
DRAWING NUMBER: MIT-CL-002
SHEET NUMBER:
2
OF 5



LEGEND

- EXISTING CONTOUR (MINOR)
- EXISTING CONTOURS (MAJOR)
- PROPOSED CONTOUR (MINOR)
- PROPOSED CONTOURS (MAJOR)
- FS-12 FILTER SOCK
- LIMIT OF DISTURBANCE
- EXISTING WETLANDS
- EXISTING PAVEMENT (TO BE REMOVED)
- SOIL BOUNDARY
- At SOIL MAPPING UNIT

0 40' 80' 120'
SCALE: 1" = 40'

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PROJECT:
BELL BEND NUCLEAR POWER PLANT
PPL BELL BEND, LLC.
38 BOMBOY LANE, SUITE 2
BERWICK, PENNSYLVANIA 18603

SHEET TITLE:
EROSION & SEDIMENT POLLUTION CONTROL PLAN
WETLAND MITIGATION PLAN - CONIFERS LANE SITE
SALEM TOWNSHIP
LUZERNE COUNTY, PENNSYLVANIA

REVISIONS		
NO.	DATE	DESCRIPTION
1	8/12/11	ADD DRAWING NUMBER

PROJECT NUMBER:	E-728-L8
DRAWN BY:	EPJ
CHECKED BY:	BJE
DATE:	OCTOBER 29, 2010
SCALE:	1" = 40'
DRAWING NUMBER:	MIT-CL-003
SHEET NUMBER:	3 OF 5

EROSION AND SEDIMENTATION CONTROL NOTES

A. GENERAL EROSION AND SEDIMENTATION CONTROL GUIDELINES

CONTRACTORS RESPONSIBILITIES

1. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONTACT THE LUZERNE COUNTY CONSERVATION DISTRICT (LCCD) 72 HOURS PRIOR TO CONSTRUCTION AND 72 HOURS PRIOR TO LEAVING THE SITE. ALSO, AT LEAST 3 DAYS BEFORE STARTING ANY EARTH DISTURBANCE ACTIVITIES, ALL CONTRACTORS INVOLVED IN THOSE ACTIVITIES SHALL NOTIFY THE PENNSYLVANIA ONE CALL SYSTEM INCORPORATED AT 1-800-242-1776 FOR BURIED UTILITIES LOCATIONS.
   LUZERNE COUNTY CONSERVATION DISTRICT
   485 SMITHS POND ROAD
   SHAVERTOWN, PA 18708
   (570) 674-7991
2. A COPY OF THIS E&SC PLAN SHALL BE KEPT AVAILABLE FOR INSPECTION ON THE CONSTRUCTION SITE AT ALL TIMES DURING EARTH MOVING ACTIVITY AND UNTIL THE SITE IS STABILIZED.
3. THE CONTRACTOR SHALL MINIMIZE MUD OR SEDIMENT-LADEN WATER EXITING THE CONSTRUCTION SITE TO THE GREATEST EXTENT POSSIBLE. THE CONTRACTOR IS RESPONSIBLE FOR ANY AND ALL DAMAGES TO DOWNSTREAM PROPERTIES AS A RESULT OF HIS/HER FAILURE TO PREVENT SUCH DAMAGES.
4. THE INTENT OF THIS PLAN/NARRATIVE IS TO INDICATE GENERAL MEANS OF COMPLIANCE WITH THE REQUIREMENTS OF THE RULES AND REGULATIONS OF CHAPTER 102 OF THE PENNSYLVANIA CLEAN STREAMS LAW. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO IMPLEMENT THESE METHODS PLUS ADDITIONAL METHODS AS MAY BE NECESSARY BECAUSE OF THE CONDITIONS, AND/OR CONSTRUCTION PROCEDURES IN ORDER TO ASSURE COMPLIANCE WITH APPLICABLE LAW. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO MAINTAIN ALL SEDIMENT AND EROSION CONTROL FACILITIES SO THAT THEY PERFORM AS REQUIRED BY LAW.
5. THE CONTRACTOR IS ADVISED TO BECOME THOROUGHLY FAMILIAR WITH THE PROVISIONS OF THE APPENDIX 84, EROSION CONTROL RULES AND REGULATIONS, TITLE 25, PART 1, DEPARTMENT OF ENVIRONMENTAL PROTECTION, SUBPART C, PROTECTION OF NATURAL RESOURCES, ARTICLE III, WATER RESOURCES, CHAPTER 102, EROSION CONTROL.
6. BEFORE INITIATING ANY REVISIONS TO THE APPROVED EROSION AND SEDIMENT CONTROL PLAN OR REVISIONS TO OTHER PLANS WHICH MAY AFFECT THE EFFECTIVENESS OF THE APPROVED E&S CONTROL PLAN, THE OPERATOR MUST RECEIVE APPROVAL OF THE REVISIONS FROM THE LUZERNE COUNTY CONSERVATION DISTRICT.
7. THE CONTRACTOR WILL BE RESPONSIBLE FOR PROVIDING A PREPAREDNESS, PREVENTION, AND CONTIGENCY (PPC) PLAN DESCRIBING ANY POTENTIAL HAZARDOUS MATERIALS THAT MAY BE STORED OR USED ON SITE AND EMERGENCY CLEAN-UP OR SPILL REMEDIATION PROCEDURES. THE PPC PLAN SHALL BE KEPT ON THE CONSTRUCTION SITE AT ALL TIMES.

B. GENERAL SEDIMENT AND EROSION CONTROL METHODS/PROCEDURES

1. ALL RELATED SEDIMENT AND EROSION CONTROL FACILITIES SHALL BE IN PLACE AND CAPABLE OF FUNCTIONING AS INTENDED PRIOR TO EARTH MOVING ACTIVITY WITHIN THEIR CONTRIBUTING WATERSHED AREAS. ALL SEDIMENT AND EROSION CONTROL FACILITIES SHALL REMAIN SO UNTIL UNIFORM OF THE UPLAND DRAINAGE AREA IS STABILIZED WITH PERMANENT GROUND COVER.
2. REDUCE BY THE GREATEST EXTENT PRACTICABLE THE AREA AND DURATION OF EXPOSURE OF READILY ERODIBLE SOILS.
3. EXCAVATED MATERIAL (SPOIL) SHALL BE HAULED AWAY FROM THE MITIGATION SITE AND DISPOSED OF WITHIN THE BELL BEND NUCLEAR POWER PLANT PROJECT AREA.
4. EXISTING WETLAND VEGETATION WILL BE PROTECTED TO THE GREATEST EXTENT POSSIBLE.
5. UPON COMPLETION OF EARTH MOVING, DISTURBED AREAS SHALL BE IMMEDIATELY SEEDED, MULCHED, OR OTHERWISE PROTECTED FROM ACCELERATED EROSION AND SEDIMENTATION.
6. THE CONTRACTOR SHALL PROVIDE PROTECTION AGAINST DISCHARGE OF POLLUTANTS SUCH AS CHEMICALS, FUEL, LUBRICANTS, SEWAGE, ETC. INTO STREAMS OR STORM WATER FACILITIES.
7. CONSTRUCTION ACCESS INTO UNPAVED AREAS FROM PAVED AREAS OR STREETS (PUBLIC OR PRIVATE) SHALL BE VIA A STABILIZED CONSTRUCTION ENTRANCE.
8. SEDIMENT SPILLED, DROPPED OR TRACKED ONTO PAVED SURFACES SHALL BE REMOVED IMMEDIATELY.
9. STOCKPILE HEIGHTS MUST NOT EXCEED 35 FEET. STOCKPILE SLOPES MUST BE 2:1 OR FLATTER.
10. IMMEDIATELY AFTER EARTH DISTURBANCE ACTIVITIES CEASE, THE OPERATOR SHALL STABILIZE ANY AREAS DISTURBED BY THE ACTIVITIES. DURING NON-GERMINATING PERIODS, MULCH MUST BE APPLIED AT THE SPECIFIED RATES. DISTURBED AREAS WHICH ARE NOT AT FINISHED GRADE AND WHICH WILL BE REDISTURBED WITHIN 1 YEAR MUST BE STABILIZED IN ACCORDANCE WITH THE TEMPORARY VEGETATIVE STABILIZATION SPECIFICATIONS. DISTURBED AREAS WHICH ARE AT FINISHED GRADE OR WHICH WILL NOT BE REDISTURBED WITHIN 1 YEAR MUST BE STABILIZED IN ACCORDANCE WITH THE PERMANENT VEGETATIVE STABILIZATION SPECIFICATIONS.
11. AN AREA SHALL BE CONSIDERED TO HAVE ACHIEVED FINAL STABILIZATION WHEN IT HAS A MINIMUM 70% UNIFORM PERENNIAL VEGETATIVE COVER WITH A DENSITY SUFFICIENT TO RESIST ACCELERATED SURFACE EROSION AND SUBSURFACE CHARACTERISTICS SUFFICIENT TO RESIST SLIDING AND OTHER MOVEMENTS.
12. AFTER FINAL SITE STABILIZATION HAS BEEN ACHIEVED, TEMPORARY EROSION AND SEDIMENT BMPS CONTROLS MUST BE REMOVED. AREAS DISTURBED DURING REMOVAL OF THE BMPS MUST BE STABILIZED IMMEDIATELY.

C. MAINTENANCE OF SEDIMENT AND EROSION CONTROL FACILITIES

1. UNTIL THE SITE ACHIEVES FINAL STABILIZATION, THE OPERATOR SHALL ASSURE THAT THE BEST MANAGEMENT PRACTICES ARE IMPLEMENTED, OPERATED, AND MAINTAINED PROPERLY AND COMPLETELY. MAINTENANCE SHALL INCLUDE INSPECTIONS OF ALL BEST MANAGEMENT PRACTICE FACILITIES. THE OPERATOR WILL MAINTAIN AND MAKE AVAILABLE TO LUZERNE COUNTY CONSERVATION DISTRICT COMPLETE, WRITTEN INSPECTION LOGS OF ALL THOSE INSPECTIONS. ALL MAINTENANCE WORK, INCLUDING CLEANING, REPAIR, REPLACEMENT, REGRADING AND RESTABILIZATION SHALL BE PERFORMED IMMEDIATELY.
2. UNTIL THE SITE IS STABILIZED, ALL EROSION AND SEDIMENT BMPS MUST BE MAINTAINED PROPERLY. MAINTENANCE MUST INCLUDE INSPECTIONS OF ALL EROSION AND SEDIMENT CONTROL BMPS AFTER EACH RUNOFF EVENT AND ON A WEEKLY BASIS. ALL PREVENTATIVE AND REMEDIAL MAINTENANCE WORK, INCLUDING CLEAN OUT, REPAIR, REPLACEMENT, RE-GRADING, RE-SEEDING, RE-MULCHING, AND RE-NETTING, MUST BE PERFORMED IMMEDIATELY. IF EROSION AND SEDIMENT CONTROL BMPS FAIL TO PERFORM AS EXPECTED, REPLACEMENT BMPS, OR MODIFICATIONS OF THOSE INSTALLED WILL BE REQUIRED.
3. ALL SEDIMENT AND EROSION CONTROL FACILITIES MUST BE MAINTAINED IN OPERATING CONDITION UNTIL UPSTREAM AREAS ARE OF UNIFORM 70% STABILIZED WITH UNIFORM PERENNIAL VEGETATIVE COVER.
4. SEDIMENT REMOVED FROM BMPS SHALL BE DISPOSED OF IN LANDSCAPED AREAS OUTSIDE OF STEEP SLOPES, WETLANDS, FLOODPLAINS OR DRAINAGE SWALES AND IMMEDIATELY STABILIZED, OR PLACED IN TOPSOIL STOCKPILES.
5. ALL NON-USABLE MATERIAL AND DEBRIS SHALL BE REMOVED FROM THE SITE AND DISPOSED OF IN A LEGAL MANNER IN ACCORDANCE WITH STATE AND LOCAL REQUIREMENTS.
6. IMMEDIATELY UPON DISCOVERING UNFORESEEN CIRCUMSTANCES POSING THE POTENTIAL FOR ACCELERATED EROSION AND/OR SEDIMENT POLLUTION, THE OPERATOR SHALL IMPLEMENT APPROPRIATE BEST MANAGEMENT PRACTICES TO ELIMINATE POTENTIAL FOR ACCELERATED EROSION AND/OR SEDIMENT POLLUTION.

D. RECYCLING AND DISPOSAL OF WASTE MATERIALS

1. THE OPERATOR SHALL REMOVE FROM THE SITE, RECYCLE, OR DISPOSE OF ALL BUILDING MATERIALS AND WASTES IN ACCORDANCE WITH THE DEPARTMENT'S SOLID WASTE MANAGEMENT REGULATIONS AT 25 PA. CODE 260.1 ET SEQ., 271.1 ET SEQ., AND 287.1 ET SEQ. THE CONTRACTOR SHALL NOT ILLEGALLY BURY, DUMP, OR DISCHARGE ANY BUILDING MATERIAL OR WASTES AT THE SITE.
2. THE OPERATOR SHALL ASSURE THAT AN EROSION AND SEDIMENT CONTROL PLAN HAS BEEN PREPARED, APPROVED BY THE LUZERNE COUNTY CONSERVATION DISTRICT, AND IS BEING IMPLEMENTED AND MAINTAINED FOR ALL SOIL AND/OR ROCK SPOIL AND BORROW AREAS, REGARDLESS OF THEIR LOCATIONS.
3. RE-USE OR RECYCLE SANDBAGS, CULVERTS, AND FLEXIBLE PIPE.
4. PROPERLY DISPOSE OF SEDIMENT FILTER BAGS, SILT FENCE, STAKES, AND FILTER SOCK MATERIAL.
5. DISPERSE COMPOST MATERIAL FROM FILTER SOCKS ON SITE, AS DIRECTED.

E. RESTORATION OF PLANTING AREAS

1. FINAL RESTORATION SHALL BE PERFORMED NO LATER THAN THE START OF THE NEXT PLANTING SEASON FOLLOWING CONSTRUCTION. THE PLANTING SEASON SHALL BE AS ESTABLISHED BY THE U.S. AGRICULTURAL SERVICE FOR THE AREA OF CONSTRUCTION.
2. TOPSOIL SHALL BE FREE FROM SUBSOIL, BRUSH, WEEDS, OR OTHER LITTER, CLAY LUMPS AND STONES, BUT MAY CONTAIN DECAYING VEGETABLE MATTER AS IS PRESENT IN GOOD TOPSOIL.
3. TOPSOIL SHALL BE IMPORTED FROM OFF-SITE IF NECESSARY AS DETERMINED BY PROJECT DESIGNER.
4. PRECAUTIONS SHALL BE EXERCISED AS NECESSARY TO CONFORM WITH LAWS RELATING TO EROSION AND SEDIMENT CONTROL.
5. SEED SHALL NOT HAVE LESS THAN 90% GERMINATION. GERMINATION TESTS OF SEEDS SHALL BE MADE NOT MORE THAN SIX (6) MONTHS PRIOR TO SEEDING. SEED WHICH HAS BECOME WET, MOLDY, OR OTHERWISE DAMAGED SHALL NOT BE USED.
6. THE CONTRACTOR SHALL BE RESPONSIBLE TO PRODUCE A STAND OF GRASS OR WETLAND VEGETATION IN ALL SEEDED OR SODDED AREAS. EROSION, DROUGHT, OR ANY OTHER CONDITION ENCOUNTERED SHALL NOT RELIEVE THE CONTRACTOR OF THIS REQUIREMENT.

F. SITE STABILIZATION

1. ALL DISTURBED WETLAND AREAS WITHIN THE PROPOSED WETLANDS WILL BE SEEDED WITH THE PROPOSED SEED MIX AS SPECIFIED IN THE SEEDING RESTORATION TABLE WITHIN 48 HOURS OF COMPLETING EARTH MOVING ACTIVITIES OR BY THE END OF A WORK DAY IF A PRECIPITATION EVENT IS FORECASTED.
2. ALL DISTURBED AREAS OUTSIDE OF THE PROPOSED WETLANDS WILL BE SEEDED WITH THE PROPOSED STABILIZATION SEED MIX AND MULCHED UPON THE COMPLETION OF EARTH MOVING ACTIVITIES.
3. MULCH AND STRAW WILL BE SPREAD AT 3 TONS/ACRE. STRAW MULCH SHALL BE APPLIED IN LONG STRANDS, NOT CHOPPED OR FINELY BROKEN.
4. MULCH WITH MULCH CONTROL NETTING OR EROSION CONTROL BLANKETS MUST BE INSTALLED ON ALL SLOPES 3:1 AND STEEPER.

SOIL DESCRIPTIONS

SYMBOL	NAME	DESCRIPTION	HYDRIC?
At	ATHERTON, SILT LOAM	SOILS ARE POORLY OR VERY POORLY DRAINED WITH LOW RUNOFF POTENTIAL AND PONDING WATER. THEY HAVE A SEASONALLY HIGH WATER TABLE NEAR OR AT THE SOIL SURFACE. THESE NEARLY LEVEL SOILS ARE FOUND PRIMARILY IN DEPRESSION IN GLACIAL OUTWASH TERRACES, OLDER STREAM TERRACES, AND KAME-KETTLE LAND FORMATIONS.	YES
RdB	REXFORD LOAM, 3-8% SLOPES	DEEP, SOMEWHAT POORLY DRAINED AND POORLY DRAINED SOILS LOCATED IN SMOOTH LOW-LYING CONCAVE DEPRESSIONS ON GLACIAL OUTWASH TERRACES DESCRIBES REXFORD LOAM SOILS. THIS SOIL COMMONLY HAS A FRAGIPAN AT 15 TO 24 INCHES WHICH SLOWS THE DOWNWARD MOVEMENT OF WATER. THE SEASONAL HIGH WATER TABLE IS SIX INCHES TO ONE FOOT.	YES

PA1 SYSTEM, INC. CALL BEFORE YOU DIG! PENNSYLVANIA LAW REQUIRES (1) WORKING DAYS NOTICE PER CONSTRUCTION ACTIVITY BEFORE YOU EXCAVATE, DRILL OR BLAST WITHIN 25 FEET OF UNDERGROUND UTILITY - STOP! CALL
SERIAL NUMBER: #20103051570

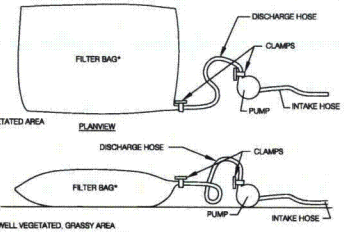
CONSTRUCTION SEQUENCE:

CONSTRUCTION NOTES:

- AT LEAST 7 DAYS BEFORE STARTING ANY EARTH DISTURBANCE ACTIVITIES THE OPERATOR SHALL INVITE ALL CONTRACTORS INVOLVED IN THOSE ACTIVITIES INCLUDING BUT NOT LIMITED TO: THE LANDOWNER, ALL APPROPRIATE MUNICIPAL OFFICIALS, THE EROSION AND SEDIMENT CONTROL PLAN PREPARER, AND A REPRESENTATIVE FROM THE LUZERNE COUNTY CONSERVATION DISTRICT FOR AN ON-SITE PRE-CONSTRUCTION MEETING. ALSO, AT LEAST 3 DAYS BEFORE STARTING ANY EARTH DISTURBANCE ACTIVITIES, ALL CONTRACTORS INVOLVED IN THOSE ACTIVITIES SHALL NOTIFY THE PENNSYLVANIA ONE CALL SYSTEM INCORPORATED AT 1-800-242-1776 FOR BURIED UTILITIES LOCATIONS.
- IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONTACT THE LUZERNE COUNTY CONSERVATION DISTRICT 72 HOURS PRIOR TO CONSTRUCTION AND 72 HOURS PRIOR TO LEAVING THE SITE.
- CLEAN EXCAVATED MATERIAL SHALL BE HAULED FROM THE SITE AND DISPOSED OF WITHIN THE PROJECT AREA.
- IF WATER NEEDS TO BE PUMPED FROM THE EXCAVATED AREA, IT SHALL BE PUMPED THROUGH A PUMPED WATER FILTER BAG DISCHARGING OVER NON-DISTURBED AREAS.
- THE OPERATOR SHALL REMOVE FROM THE SITE, RECYCLE, OR DISPOSE OF ALL BUILDING MATERIALS AND WASTES IN ACCORDANCE WITH THE DEPARTMENT'S SOLID WASTE MANAGEMENT REGULATIONS AT 25 PA. CODE 260.1 ET SEQ., 271.1 ET SEQ., AND 287.1 ET SEQ. THE CONTRACTOR SHALL NOT ILLEGALLY BURY, DUMP, OR DISCHARGE ANY BUILDING MATERIAL OR WASTES AT THE SITE.
- GRADED AREAS WITHIN THE PROPOSED WETLAND SHALL BE STABILIZED WITH THE PROPOSED CONSERVATION SEED MIX PRIOR TO PLANTINGS.
- AN AREA SHALL BE CONSIDERED TO HAVE ACHIEVED FINAL STABILIZATION WHEN IT HAS A MINIMUM UNIFORM 70% PERENNIAL VEGETATIVE COVER OR OTHER PERMANENT NON-VEGETATIVE COVER WITH A DENSITY SUFFICIENT TO RESIST ACCELERATED SURFACE EROSION AND SUBSURFACE CHARACTERISTICS SUFFICIENT TO RESIST SLIDING AND OTHER MOVEMENT.
- ALL EARTH DISTURBANCE ACTIVITIES SHALL PROCEED IN ACCORDANCE WITH THE FOLLOWING SEQUENCE. EACH STAGE SHALL BE COMPLETED BEFORE ANY FOLLOWING STAGE IS INITIATED. CLEARING AND GRUBBING SHALL BE LIMITED ONLY TO THOSE AREAS DESCRIBED IN EACH STAGE.

CONSTRUCTION STAGES:

1. STAKE OUT LIMIT OF DISTURBANCE IN THE FIELD.
2. INSTALL ORANGE CONSTRUCTION FENCE WHERE LOD IS ADJACENT TO EXISTING WETLANDS TO PREVENT ADDITIONAL DISTURBANCE TO THESE WETLANDS.
3. INSTALL FILTER SOCK AS SHOWN ON THE PLAN
4. PERFORM NECESSARY CLEARING AND GRUBBING WITHIN PROPOSED LIMIT OF DISTURBANCE.
5. REMOVE EXISTING PAVEMENT AND STONE BASE.
6. EXCAVATE PROPOSED WETLAND AREA TO PROPOSED SUB-GRADE ELEVATIONS. SCARIFY SUBSOIL TO A DEPTH OF AT LEAST EIGHT (8) INCHES.
7. ADD COMPOST AND TOPSOIL MIXTURE WITH A RATIO OF 75% CLEAN, NATIVE SOIL AND 25% COMPOST. SOIL/COMPOST SHALL BE THOROUGHLY MIXED.
8. PLACE SOIL/COMPOST MIXTURE ON WETLAND TO PROPOSED FINAL GRADE ELEVATIONS (1' MIN.).
9. SEED DISTURBED AREA WITH FLOODPLAIN SEED MIX, PER THE LANDSCAPE PLAN ON SHEET 5 OF 5. MULCH SEEDED AREA WITH STRAW AT 3 TONS PER ACRE.
10. INSTALL PROPOSED VEGETATION WITHIN GRADED WETLAND PER THE LANDSCAPE PLAN AND DETAILS ON SHEETS 5 &6 OF THIS PLAN SET.
11. REMOVE FILTER SOCK AFTER DISTURBED AREAS HAVE ACHIEVED A MINIMUM OF 70% VEGETATIVE COVER. STABILIZE ANY AREAS DISTURBED WHILE REMOVING THIS BMP WITH THE PROPOSED STABILIZATION SEED MIX AND MULCH.



E-3 / 4 PUMPED WATER FILTER BAG
NTS

Filter bags shall be made from non-woven geotextile material sewn with high strength, double stitched "J" type seams. They shall be capable of trapping particles larger than 150 micros.

A suitable means of accessing the bag with machinery required for disposal purposes must be provided. Filter bags shall be replaced when they become ½ full. Spare bags shall be kept available for replacement of those that have failed or are filled.

Bags shall be located in well-vegetated (grassy) area, and discharge onto stable, erosion resistant areas. Where this is not possible, a geotextile flow path shall be provided. Bags shall not be placed on slopes greater than 5%.

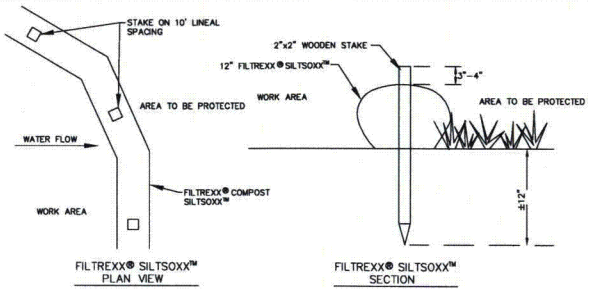
The pump discharge hose shall be inserted into the bags in a manner specified by the manufacturer and securely clamped.

The pumping rate shall be no greater than 750 gpm or ½ the maximum specified by the manufacturer, whichever is less. Pump intakes should be floating and screened.

Filter bags may be used to filter water pumped from disturbed areas prior to discharging to water of the Commonwealth. They may also be used to filter water pumped from the sediment storage areas of sediment basins.

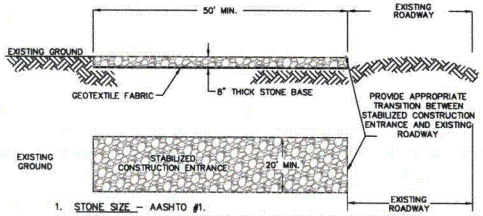
The pumping rate should be specified on the plan drawings next to the typical detail. Pumping rates will vary depending on the size of the filter bag, and the type and amount of sediment discharged to the bag.

Filter bags should be installed according to the details shown in Standard Construction Detail #26.



NOTES:
1. ALL MATERIAL TO MEET FILTREXX® SPECIFICATIONS.
2. SILTSOXX™ COMPOST/JSOIL/ROCK/SEED FILL TO MEET APPLICATION REQUIREMENTS.
3. SILTSOXX™ DEPICTED IS FOR MINIMUM SLOPES. GREATER SLOPES MAY REQUIRE LARGER SOCKS PER THE ENGINEER.
4. COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMINED BY ENGINEER.
5. LOCAL FILTREXX CONTACT: KEYL GROFF AT GARDENIQUE (610-972-9018).

E-1 / 4 FILTER SOCK (FILTREXX)
NTS



1. STONE SIZE – AASHTO #1.
2. LENGTH – AS REQUIRED TO BE EFFECTIVE, BUT NOT LESS THAN 50'.
3. THICKNESS – NOT LESS THAN 8".
4. WIDTH – FULL WIDTH OF ALL POINTS OF INGRESS OR EGRESS, BUT NOT LESS THAN 20'.
5. WASHING – WHEELS SHALL BE CLEAN PRIOR TO ENTRANCE ONTO EXISTING ROADWAY. WHEN WASHING IS REQUIRED IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE WHICH DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN. ALL SEDIMENT SHALL BE PREVENTED FROM ENTERING ANY STORM DRAIN, DITCH, OR WATERCOURSE THROUGH USE OF SAND BAGS, GRAVEL, BOARDS, OR OTHER APPROVED METHODS.
6. MAINTENANCE – THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO EXISTING ROADWAY, THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEAN OUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO EXISTING ROADWAYS MUST BE REMOVED IMMEDIATELY. CONSTRUCTION ENTRANCE MUST BE INSPECTED DAILY.

E-2 / 4 STABILIZED CONSTRUCTION ENTRANCE
NTS

PA 042324

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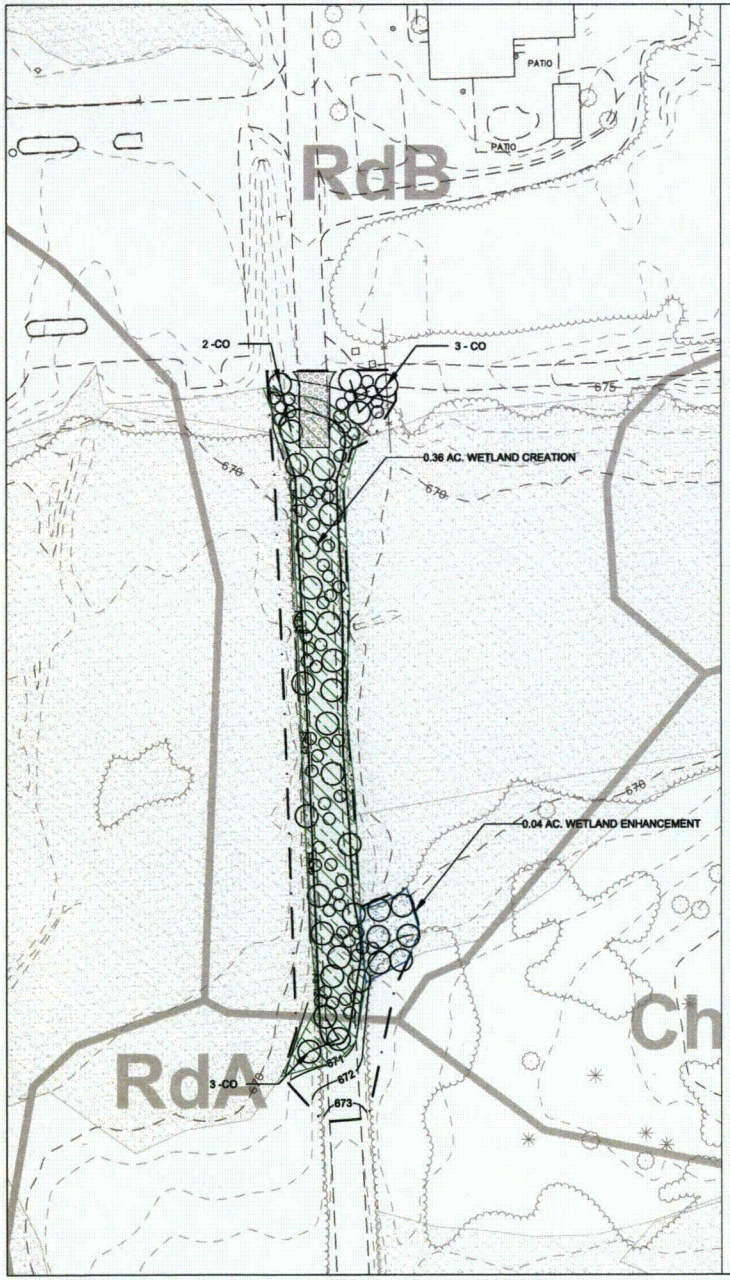
PROJECT: BELL BEND NUCLEAR POWER PLANT
PPL BELL BEND, LLC.
38 BOMBOY LANE, SUITE 2
BERWICK, PENNSYLVANIA 18603

SHEET TITLE: EROSION & SEDIMENT POLLUTION CONTROL NARRATIVE AND DETAILS
WETLAND MITIGATION PLAN - CONIFERS LANE
SALEM TOWNSHIP
LUZERNE COUNTY, PENNSYLVANIA

REVISIONS		
NO.	DATE	DESCRIPTION
1	8/12/11	ADD DRAWING NUMBER

PROJECT NUMBER: E-728-L8
DRAWN BY: EPJ
CHECKED BY: BJE
DATE: OCTOBER 29, 2010
SCALE: AS NOTED
DRAWING NUMBER: MIT-CL-004
SHEET NUMBER: 4 OF 5



SEEDING RESTORATION TABLE

LOCATION	TOPSOIL	STARTER FERTILIZER	LIME	SEED MIX
WETLAND	YES	N/A	N/A	FLOODPLAIN SEED MIX APPLICATION RATE: 15-20 LBS/ACRE
OTHER DISTURBED AREAS	NO	N/A	N/A	TEMPORARY STABILIZATION SEED MIX SEE SEED MIX FOR SEEDING

DUE TO SOIL LIMITATIONS NEITHER FERTILIZER NOR LIME WILL BE APPLIED TO THE GRADED WETLAND. IT IS ANTICIPATED THAT THE SPREADING OF TOPSOIL AND THE CLOSE PROXIMITY TO EXISTING WATER TABLE WILL PROMOTE RAPID GERMINATION OF PROPOSED SEED.

Temporary Stabilization Seed Mix

%	Botanical Name	Common Name	Seeding Window	Application Rate
100	*Secale cereale*	Cereal Rye	Sep. 1 - Oct. 16	30 lbs/acre
100	*Avena sativa*	Oats	May. 1 - Sept. 15	30 lbs/acre

%	Botanical Name	Common Name	I.S.
10	*Elymus virginicus, PA*	Virginia Wild Rye, PA Ecotype	FACW
10	*Panicum rigiulum, PA*	Redtop Panic Grass, PA Ecotype	FACW+
8	*Elymus canadensis, PA*	Canada Wild Rye, PA Ecotype	FACU
5	*Carex vulpinoidea, PA Ecotype*	Fox Sedge, PA Ecotype	OBL
5	*Panicum clandestinum*	Deer Tongue 'Tioga', PA Ecotype	FAC+
5	*Elymus riparius, PA*	Riverbank Wild Rye, PA Ecotype	FACW
5	*Agrostis perennans, APB*	Autumn Bentgrass, APB	FACU
5	*Agrostis scabra, PA*	Ticklegrass, PA Ecotype (rough bentgrass	FAC
5	*Carex scoparia*	Blunt Broom Sedge	FACW
5	*Festuca rubra*	Creeping Red Fescue	FACU
4	*Carex comosa*	Bristly Sedge	OBL
4	*Chasmanthium latifolium, PA*	River Oats, PA Ecotype	FACU
3	*Carex stipata*	Awl Sedge	OBL
3	*Elymus hystrix, PA*	Bottlebrush Grass, PA Ecotype	NI
3	*Juncus effusus, PA*	Soft Rush, PA Ecotype	FACW+
2	*Asclepias incarnata*	Swamp Milkweed	OBL
2	*Bidens aristosa*	Bur Marigold, 'Suther' NC Ecotype	FACW-
2	*Carex lurida*	Lurid Sedge	OBL
2	*Juncus tenuis*	Path Rush	FAC-
2	*Poa palustris*	Fowl Bluegrass	FACW
1	*Aster prenanthoides*	Zigzag Aster	FAC
1	*Aster laevis*	Smooth Blue Aster	NI
1	*Aster novae-angliae*	New England Aster	FACW-
1	*Carex crinita*	Fringed Sedge	OBL
1	*Iris versicolor*	Blue Flag Iris	OBL
1	*Lobelia cardinalis*	Cardinal Flower	FACW+
1	*Lobelia siphilitica*	Great Blue Lobelia	FACW+
1	*Scirpus validus*	Soft-stem Bulrush	OBL
1	*Solidago riddellii*	Riddell's Goldenrod	OBL
1	*Solidago rugosa*	Wrinkle Leaf Goldenrod	FAC
100		*Application Rate: 15-20 lbs/acre*	

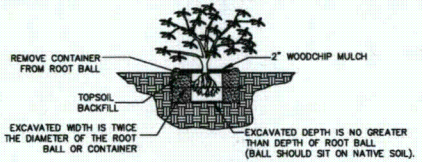
PLANT SCHEDULE

Trees

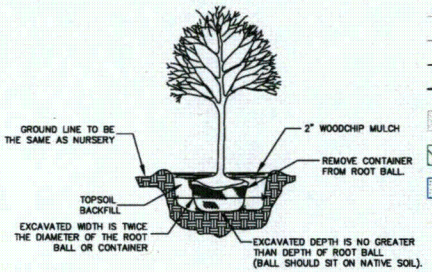
Key	Botanical Name	Common Name	Size	Qty.	Spacing	I.S.	Notes
	Acer rubrum	Red Maple	1"-1.5"	10	20'-30'	FAC	
	Acer saccharinum	Silver Maple	1"-1.5"	8	20'-30'	FACW	
CO	*Carya ovata*	Shagbark Hickory	1"-1.5"	8	20'-30'	FACU	Upland areas only
	Quercus bicolor	Swamp White Oak	1"-1.5"	11	20'-30	FACW	
				37			

Shrubs

Key	Botanical Name	Common Name	Size	Qty.	Spacing	I.S.	Notes
	Ilex verticillata	Winterberry	#5	18	4'-6'	FACW	1 male for every 8 female
	Lindera benzoin	Spicebush	#5	18	4'-6'	FACW	
	Vaccinium corymbosum	Highbush Blueberry	#5	16	4'-6'	FACW-	
	Viburnum trilobum	Cranberry Bush	#5	10	4'-6'	FACW	
				62			



L-1 / 5 TYPICAL SHRUB PLANTING - CONTAINER
NTS



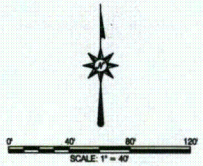
L-2 / 5 TREE PLANTING DETAIL
NTS

PLANT SPECIFICATIONS :

1. THE TREES AND SHRUBS SHALL BE NURSERY GROWN IN A CLIMATE SIMILAR TO THAT OF THE LOCALITY OF THE PROJECT.
2. SET PLANTS AT SAME FINISHED GRADE AS GROWN IN THE NURSERY.
3. ALL TREES AND SHRUBS SHALL HAVE A NORMAL HABIT OF GROWTH AND SHALL BE SOUND, HEALTHY AND VIGOROUS, THEY SHALL BE FREE FROM DISEASE, INSECTS, INSECT EGGS, AND LARVAE.
4. ALL PLANTING SHALL BE PERFORMED IN CONFORMANCE WITH GOOD NURSERY AND LANDSCAPE PRACTICE.

LEGEND

- EXISTING CONTOUR (MINOR)
- EXISTING CONTOURS (MAJOR)
- PROPOSED CONTOUR (MINOR)
- PROPOSED CONTOURS (MAJOR)
- EXISTING WETLANDS
- CREATED WETLANDS
- ENHANCED WETLANDS
- PROPOSED TREE
- PROPOSED SHRUB



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PROJECT:
BELL BEND NUCLEAR POWER PLANT
PPL BELL BEND, LLC.
38 ROMBOY LANE, SUITE 2
BERWICK, PENNSYLVANIA 18603

SHEET TITLE:
LANDSCAPING PLAN
WETLAND MITIGATION PLAN - CONIFERS LANE
SALEM TOWNSHIP
LUZERNE COUNTY, PENNSYLVANIA

REVISIONS		
NO.	DATE	DESCRIPTION
1	8/12/11	ADD DRAWING NUMBER

PROJECT NUMBER: E-726-L8
DRAWN BY: ---
CHECKED BY: ***
DATE: OCTOBER 29, 2010
SCALE: 1"=40'
DRAWING NUMBER: MIT-CL-205
SHEET NUMBER: 5 OF 5

Final

A Field Survey of Fish and Aquatic Macroinvertebrates at the Proposed Bell Bend Nuclear Power Plant Site, Luzerne County, Pennsylvania

Submitted to:
AREVA NP, Inc.
Marlborough, MA

Rev. 4
September 2011

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Record of Revisions

Revision	Date	Pages/Sections Changed	Brief Description
000	September 2008	All	Initial release
001	July 2010	Page 2	Added a paragraph describing the reason for the report revision.
001	July 2010	Pages 2 to 4, and 10 to 11	Added a description of 2010 sampling effort and the results.
001	July 2010	Figures	Inserted new figure 3 and changed old figure 3 to figure 4.
001	July 2010	Figures	Moved location of BBNPP as part of the Plot Plan Change Project and changed boundary from OCA to BBNPP/SSES Site Boundary and for Figure 1 added potential areas of disturbance boundary.
001	July 2010	Tables	Inserted tables 9 and 10, required number adjustment for all tables that follow.
002	August 2010	Record of Revisions	Table 4 was inserted in Rev.1 but not indicated in Record of Revisions.
002	August 2010	Page 2	Modified text in regard to 2010 survey.
002	August 2010	Pages 3 to 6	Text inserted in regard to sampling methods for fish and macroinvertebrates.
002	August 2010	References	Added reference for Murphy and Willis (1996).
003	November 2010	Figures	Revised boundary from SSES/BBNPP Site Boundary to BBNPP Project Boundary which included addition of the cemetery cut-out.
003	November 2010	Figure 4, Tables 1,2,11,12,13,14,15,16, and 28, Text	Revised stream names to conform with response to RAI AE 2.3-1.
004	September 2011	Figure 1	Revised BBNPP project boundary and potential area of disturbance per changes related to disposal of excess cut material.
004	September 2011	Figures 2-4	Revised BBNPP project boundary per changes related to disposal of excess cut material.

INTRODUCTION

Bell Bend Nuclear Power Plant (BBNPP) is proposed to be sited adjacent to the Susquehanna Steam Electric Station in Salem Township, Luzerne County, Pennsylvania (Figure 1). Normandeau Associates, Inc. was contracted by AREVA NP, Inc. to assess the aquatic communities of water bodies on and adjacent to the BBNPP Site. The biological sampling effort focused on water bodies that occurred in the potential areas of disturbance, although a selection of water bodies outside of this area were sampled in order to account for potential downstream impacts.

Sampling was performed to determine the community composition of benthic macroinvertebrates and fish inhabiting several ponds and small streams, as well as North Branch Canal and adjacent water bodies, potentially to be affected by construction of the plant. The aquatic biota sampling was performed under scientific collector's permits issued by the Pennsylvania Fish and Boat Commission (PFBC).

The initial aquatic biota surveys were performed as part of the overall environmental surveys of the BBNPP site in 2007 and 2008. Thereafter, the site was expanded to include several new parcels of property. Consequently, reconnaissance level field studies of the new parcels were performed in 2010 to supplement the ecological survey data previously obtained and reported in the 2008 report. The only new aquatic ecology survey information obtained during the additional field studies was for the North Branch Canal and adjacent water bodies. This revision includes the new data as well as previously reported information.

Personnel

This fishery and macroinvertebrate report for the BBNPP site is the product of efforts from many well-trained personnel. Field work was accomplished by field biologists

Jayme Schaeffer, Charles Dix, and Matthew Williams under the direction of aquatic scientist Bryan Lees, who also coordinated the laboratory processing of macroinvertebrate samples at Normandeau's Stowe laboratory. Identification of the macroinvertebrate samples was completed by Bryan Lees, Stacy Lathrop, and George Christian. Melonie Ettinger, Brenda Strouse, and Connie Booz provided secretarial and computer support for tables and text. Bryan Lees prepared the report, and Project Manager, Paul Harmon, coordinated the efforts.

METHODS

Fish Collections

The objectives of fisheries sampling were to determine the species composition of the fish community and the relative abundance of the species present. A variety of standard fish sampling methods, e.g. as described in Murphy and Willis (1996), was employed in this study. The sampling team deployed the specific sampling gear they judged as most appropriate for each water body sampled.

Six ponds were surveyed for fish within the BBNPP site (Figure 2). Johnson's Pond, Beaver Pond, Unnamed Pond 1, Farm Pond, and West Building Pond were surveyed for fish during November 2007 and July 2008. Unnamed Pond 2 was surveyed for fish during July 2008. The fish community was assessed using several gear types: a 4-ft x 8-ft flat seine, 12-ft jon boat outfitted with a single anode probe and an electrofishing pram with a single anode probe. At each location the appropriate gear type was selected based on access and pond depth. The small and shallow West Building Pond was sampled with the seine. The large and shallow Farm Pond was sampled with the seine in 2007 and with the towed electrofishing pram during 2008. The larger Beaver Pond and Johnson's Pond were sampled with the 12-ft jon boat. The shallow Unnamed Pond 1 was sampled with the electrofishing pram. Unnamed Pond 2 was too shallow to seine (only a few inches of water present) so visual inspections were made to determine if fish were present. Both electrofishing gears were powered by a Georator unit

producing 230-volt DC current with output ranging from 2 to 5 amperes. For all gear types an effort was made to sample the entire pond perimeter and cover all habitat types including several transects across Johnson's Pond.

An original attempt at sampling the North Branch Canal occurred during the summer of 2008. However, excessive duckweed on the water surface as well as thick beds of submerged aquatic vegetation made it impossible to effectively survey the fish community. During April 2010 the fish communities of the North Branch Canal and adjacent areas were surveyed using the12-ft jon boat outfitted with a single anode probe or the electrofishing pram with a single anode probe. The water surface was clear of vegetation and submerged vegetation was limited which allowed for effective sampling. Surveys were completed at two stations within the maintained section of the Canal (Stations 1 and 2), an unmaintained section of the Canal (Station 3), as well as the Canal outlet, and a Marshland area adjacent to the Canal (Figure 3). Canal Stations 1 and 2 are hydrologically connected by a large culvert under Riverlands Road. The Canal outlet is located at the downstream boundary of Canal Station 2 below the Canal dam and it carries overflow from the Canal over the Canal dam a short distance into the Susquehanna River. Canal Station 3 is hydrologically separated from Stations 1 and 2. At each station within the Canal (Stations 1-3), the entire perimeter of the Canal was surveyed along with several transects across the Canal. At Station 3 the entire perimeter of the main Canal was sampled and a portion of open water adjacent to the Canal. For the Canal outlet sampling was completed in the plunge pool formed by the overflow from the Canal and within the channel. The marshland area adjacent to the lower section of the unmaintained portion of the canal was also surveyed by sampling the perimeter and several open-water transects.

Six stations were surveyed for fish in the Walker Run watershed both within and downstream of the BBNPP site boundaries (Figure 4). Stations 1, 2, 4, 5, and 6 were located on the main stem of Walker Run and Station 3 was on Unnamed Tributary No. 1. Stations 1, 2, and 3 were surveyed during November 2007 and April and July 2008. Stations 4 and 5 were surveyed during April and July 2008. Station 6 was surveyed

during July 2008. Walker Run fish surveys were completed using the towed electrofishing pram outfitted with a single or double anode probe, depending on the width of the stream reach being surveyed. At each station a single electrofishing pass was completed. Station length varied from 100 feet at Station 6 to 280 feet for Station 4. All captured fish were identified to species and enumerated; a subsample of each species was measured for total length and then all fish were released.

In addition, three unnamed tributaries to the Susquehanna River were assessed during July 2008 (Figure 4). Unnamed Tributary No. 4 was dry and no fish were present. Unnamed Tributaries No. 5 and No. 3 were too small and overgrown with vegetation to effectively survey for fish. However, visual inspections were made of both streams and no fish were observed.

All surveys were performed in order to determine both the community composition and relative abundance of fishes in each of the water bodies. Sampling gear was selected to ensure that the most efficient gear type was being utilized for a given water body. All gear types utilized in these surveys are commonly employed in fisheries surveys. A scientific collector's permit was obtained from the Pennsylvania Fish and Boat Commission (PFBC) in order to collect and possess fishes and other aquatic organisms.

Stream Macroinvertebrates

All macroinvertebrate sampling was completed in order to determine both composition and abundance of benthic macroinvertebrates in each of the water bodies. The macroinvertebrate sampling methodology employed standard, commonly used approaches for sampling and processing benthic macroinvertebrates (Barbour et. al 1999). This standardized sampling approach aids in making comparisons among stations and between years.

Benthic macroinvertebrates were collected from Stations 1 and 2 in Walker Run during November 2007 and April and July 2008 and from Stations 4 and 5 during April and July

2008. Benthic macroinvertebrates were also collected from Station 6 in Walker Run during July 2008. Three unnamed tributaries (Unnamed Tributary No. 3, 4, and 5) to the Susquehanna River were also surveyed during July 2008. Unnamed Tributary No. 4 was completely dry thus a benthic sample was not collected. A 500-micron mesh D-frame kick net was utilized for the collections. A total of 1 minute of kicking at two or three locations was completed for each station. Samples were collected from riffle areas with cobble substrate, although limited cobble was present at Station 1. The contents of each kick were composited into one sample. Each sample was labeled, preserved in 70% isopropanol, and transported to Normandeau's laboratory for sorting and identification. Each sample was completely sorted and abundant taxa (>200 specimens) were subsampled. All insects, except Chironomidae, were identified to genus level. Non-insects were identified to genus or order level depending on the particular group.

Pond/ Canal Macroinvertebrates

Benthic macroinvertebrates were collected from North Branch Canal Station 1, Johnson's Pond, Beaver Pond, and Unnamed Pond 1 during July 2008. A 500-micron mesh D-frame kick net was utilized for the collections. A sample consisted of making several net sweeps along the shoreline of each water body. Each sweep was composited into a single sample at each location and preserved in 70% isopropanol, and transported to Normandeau's laboratory for sorting and identification. A qualitative sort of each sample was completed and most organisms were identified to order or family.

Stream Site Descriptions

Walker Run is a second order cool water stream that flows through a section of the proposed BBNPP site. The main stem of Walker Run flows south through the western portion of the site and a secondary branch (Unnamed Tributary No. 1) flows west until it's confluence with the main stem. Station 1 was the most downstream station within

the site, spatially located below the confluence with Unnamed Tributary No. 1, on the main stem of Walker Run. This section of the stream flowed through forested land with average stream width of 11 ft and maximum depth of 1 ft. Bottom substrate was a mix of silt and sand with some woody debris. Station 2 was located on the main stem of Walker Run, upstream of Station 1 and Unnamed Tributary No. 1. This section of the stream flowed through actively farmed fields and was overgrown with scrubby vegetation and small trees. Average water depth was less than 1 ft, although several deep pools were present, and stream width averaged 9 ft. Bottom substrate was composed mainly of sand and large cobble. Station 3 was located on Unnamed Tributary No. 1 to the main stem of Walker Run. At this location the stream flowed through forested land, averaged 5 ft in width, and had limited flow with water depths less than 1 ft. Stream substrate was comprised of a mixture of silt and clay. Station 4 was located downstream of Station 1, approximately 0.5 miles from the site boundary. This section of the stream flowed through an active dairy farm with animal access to the entire sample reach. Few trees were present along the stream bank with grasses being the dominant cover type within the riparian corridor. Stream width averaged 16 feet and depths varied from less than a foot to nearly 3 feet deep in one deep trough-like pool. Substrate was composed mainly of large cobble with fine sediments in the depositional areas. Station 5 was roughly 0.25 miles downstream of Station 4 and flowed through a narrow strip of forested land. The stream was widest here averaging 21 feet across and also had the steepest gradient. Bottom substrate was composed of large cobble and no pools were present within the reach. Station 6 was the most upstream station on the main stem of Walker Run and it flowed along a maintained grassy area. The stream bank was bordered by a narrow strip of shrubs and trees and stream width varied from 4 ft to 15 ft.

Unnamed Tributary No. 4 was located at the eastern corner of the site just downstream of the boundary. It is a small intermittent stream that flowed through a forested patch of land at the assessment location and was completely dry at the time of sampling. Stream channel width ranged to 5 ft. Unnamed Tributary No. 5 was a small stream that flowed in an easterly direction through the eastern portion of the site before it eventually

entered Lake Took-a-While. It flowed through a mix of shrubs and grasses with stream channel width ranging up to 4 ft. Unnamed Tributary No. 3 was located downstream of the site, approximately 1/3 of a mile from the site boundary. The stream had limited discharge during sampling and flowed through a narrow forested patch of land with stream width ranging to 5 ft. It was mostly fed by a small impoundment along Confers Lane and upstream of this point the stream channel was dry.

Habitat Assessments

Habitat assessments were performed using the EPA Rapid Bioassessment Protocols (RBP) for high gradient streams (Barbour et al. 1999). Assessments were completed on Walker Run and Unnamed Tributary No. 1 during April 2008 at Stations 1-5 and during July 2008 at Station 6. The RBP evaluates and scores a total of ten parameters on a 0 to 20 scale, with 200 being the highest total score possible. Each parameter is important in determining the quality of the in-stream and riparian habitat that influences the structure and function of the aquatic community in the stream. Degraded habitat conditions are considered one of the major stressors to aquatic communities and can lead to alterations in natural aquatic assemblages.

Total habitat scores were similar for Stations 1, 2, 3, 5, and 6 (Table 1), ranging from 144 to 166. For the most part each of these stations scored similarly for most of the habitat parameters. The total score for Station 4 was 123. This station scored significantly lower than the other stations for three parameters: bank stability, vegetative protection, and riparian vegetative zone width. The low scores for these parameters are a direct result of the use of the land area around the stream as pasture for dairy cows.

Water Quality

Temperature, pH, dissolved oxygen, and conductivity were measured during collections at each of the six Walker Run watershed stations, in several of the ponds, and in the Canal and adjacent areas. A Horiba U-10 multimeter was used to collect the in-situ

water quality data. Most water quality parameters were similar among each of the stream stations (Table 2). The only exception was conductivity in Unnamed Tributary No. 1 (Station 3), which was approximately twice as high as any of the other stations. Similarly, water quality among the ponds was comparable although conductivity was much lower for Johnson's Pond than the other four ponds (Table 3). Water quality in the Canal and adjacent areas was similar except for conductivity, which varied considerably among the stations (Table 4).

RESULTS AND DISCUSSION

Fish

Pond Surveys 2007

No fish were collected in the West Building Pond or Unnamed Pond 1. Fish were present within Johnson's, Beaver, and Farm ponds from which a total of 254 fish representing seven species and one hybrid was collected (Table 5). Beaver Pond yielded a total of 164 fish representing five species and one hybrid. Brown bullhead was the dominant species within Beaver Pond, comprising 61% of the catch. A total of 89 fish representing three species was collected from Johnson's Pond with bluegill being numerically dominant, comprising 96% of the catch. A single creek chub was collected from Farm Pond. Length ranges of fish collected in the ponds are given in Table 6.

Pond Surveys 2008

No fish were collected from West Building Pond, Unnamed Pond 1, or Unnamed Pond 2. For the other three ponds (Beaver, Johnson's, Farm) a total of 356 fish representing nine species and one hybrid was collected (Table 7). A total of 64 fish representing four species and one hybrid was collected from Beaver Pond. The predominate species in

Beaver Pond was brown bullhead, comprising 39.1% of the catch. Johnson's Pond yielded a total of 240 fish representing three species and one hybrid with bluegill being numerically dominant, comprising 85.8% of the catch. Fifty-two fish representing four species were collected from Farm Pond with creek chub the predominant species, comprising 82.7% of the catch. Length ranges of fish collected in the ponds are given in Table 8.

The fish assemblages observed within Beaver Pond and Johnson's Pond were characteristic of a typical warm-water pond in Pennsylvania (Cooper 1983). Most of the species including largemouth bass, bluegill, and brown bullhead are commonly recommended by extension agencies for stocking in small ponds in Pennsylvania (PSU 2000). In both ponds the predominant fish species were from the families Centrarchidae (sunfishes) and Ictaluridae (catfishes). Several species within these two families are common inhabitants of ponds throughout Pennsylvania. Beaver Pond had the most balanced and diverse fish assemblage with both brown bullhead and green sunfish being abundant. Three centrarchids were present in Johnson's Pond with bluegill being abundant. Community composition was similar within both ponds during Fall 2007 and Summer 2008. The Farm Pond fish assemblage was not representative of a typical fish community for ponds in Pennsylvania. A majority of the species collected in Farm Pond including creek chub, white sucker, and blacknose dace normally inhabit streams and rivers and are not found in ponds (Cooper 1983). It is probable that these fish were washed into Farm Pond during flood events that caused Walker Run to overflow it's banks.

No rare, threatened, endangered, or species of special concern were collected.

North Branch Canal and adjacent areas 2010

Seven species of fish totaling 59 individuals were collected from three stations on the North Branch Canal during the spring of 2010 (Table 9). Bluegill and green sunfish

were the two numerically dominant species within the Canal, comprising 58% and 15% of the total catch, respectively. Station 1 yielded four species and a total of 27 individuals with bluegill being the most abundant species. A total of five fish representing two species was collected from Station 2. For Station 3, 27 individuals and five species were collected with bluegill being numerically dominant. Length ranges of fish collected in the Canal are given in Table 10.

A total of 160 individual fish representing 12 species and one hybrid was collected from the Canal outlet during the spring of 2010 (Table 9). Golden shiner was the most abundant species comprising 27% of the total catch. Other abundant species included bluegill (21%), green sunfish (21%), and white sucker (16%). Length ranges of fish collected in the Canal outlet are given in Table 10.

Four pumpkinseed sunfish were collected from the Marshland during the spring of 2010 (Table 9). No other fish were observed during the survey effort. Length ranges of fish collected in the Marshland are given in Table 10.

The fish communities present within the Canal, Canal outlet, and Marshland were similar to what would be expected for warmwater lentic waterbodies in eastern Pennsylvania. The warmwater fish species composition of the Canal is similar to Lake Took-a-While, a lake to which the Canal is hydrologically connected (Ecology III 2000). The Canal outlet fish community was also comprised of warmwater species, although several species characteristic of lotic systems (white sucker, creek chub, bluntnose minnow) likely migrated upstream from the Susquehanna River. One unusual species occurrence in the Canal outlet was the collection of a single brook stickleback (*Culaea inconstans*). This species prefers cool, clear, heavily vegetated, spring fed creeks, rivers, lakes, and ponds (PNHP 2007). The Canal is a warmwater aquatic system that is unlikely to provide suitable habitat for maintenance of brook stickleback populations. It is probable that the single brook stickleback that was collected was either introduced through human action (i.e. bait bucket or aquarium fish) or the fish migrated upstream from the Susquehanna River into the Canal outlet. Brook stickleback are considered a

rare but locally abundant species found in the Ohio, Erie, and Susquehanna River watersheds of Pennsylvania (Cooper 1983). The species is currently considered a candidate species in Pennsylvania (PA Code 1991). No previous occurrences of the brook stickleback are known from the Susquehanna River or adjacent waterbodies in the vicinity of BBNPP (Ecology III 1995, 2000).

Walker Run Fall 2007

Seven species of fish and one hybrid totaling 299 individuals were collected from three stations on Walker Run during the fall of 2007 (Table 11). Station 1 yielded 151 individual fish of five species with blacknose dace and creek chub being the numerically dominant species. A total of 56 fish representing five species was collected from Station 2. Species composition and relative abundance was similar for Stations 1 and 2 with blacknose dace and creek chub being co-dominant. For Station 3, 92 fish representing five species and one hybrid were collected with creek chub being numerically dominant, comprising 70% of the catch. Length ranges of fish collected in Walker Run during the fall of 2007 are given in Table 12.

Walker Run Spring 2008

Ten species of fish totaling 857 individuals were collected from five stations on Walker Run during the spring of 2008 (Table 13). A total of 112 individuals representing six species was collected from Station 1; Station 2 yielded 101 individuals and four species of fish. Blacknose dace was numerically dominant at Stations 1 and 2 comprising 43.8% and 45.5% of the total, respectively. For station 3 a total of four species and 50 individual fish was collected with creek chub being dominant, comprising 32.0% of the total. Station 4 yielded 371 individuals and nine species and at Station 5 a total of six species and 223 individuals was collected. The dominant species at Station 4 was white sucker, comprising 40.7% of the total and for Station 5 blacknose dace was numerically dominant, comprising 83.4% of the collection. Length ranges of fish collected in Walker Run during the spring of 2008 are given in Table 14.

Walker Run Summer 2008

Ten species and one hybrid fish totaling 921individuals were collected from six stations in Walker Run during July 2008 (Table 15). Station 4 yielded the greatest number of individuals (430) and the most species (9). The fewest number of fish (51) and species (4) were collected from Station 3. Blacknose dace, creek chub, and white sucker were among the predominate species at most of the stations. Length ranges of fish collected in Walker Run during the summer of 2008 are given in Table 16.

The fish assemblage observed in Walker Run was characteristic of similar-sized coolwater streams throughout eastern Pennsylvania (Fairchild 1998, Horwitz 2008). A mixture of both coldwater and warmwater species was collected throughout the watershed. Walker Run is currently designated as a cold water fishery (PA 1980). This designation indicates that in Walker Run the maintenance or propagation, or both, of fish species including the family Salmonidae occurs. This designation was confirmed with the collection of brown trout which are in the family Salmonidae.

In Walker Run a general trend of increasing species diversity and abundance was observed at stations that were farther downstream, which is a common characteristic of smaller headwater streams. Similar species composition and abundance was observed during the fall, spring, and summer sampling events. Although brown trout was present during the spring and summer but not the fall sampling effort. Seasonal movement of brown trout within the stream most likely explains their presence during spring and summer and not during the fall. The brown trout appeared to be naturally reproduced, wild fish. Trout are not currently stocked in Walker Run by the PFBC.

Four species that were relatively abundant throughout the surveyed locations in Walker Run were blacknose dace, creek chub, white sucker, and tessellated darter. The

abundance of blacknose dace and creek chub in Walker Run offers an important forage base for brown trout and other predatory fish. Blacknose dace distribution is widespread in Pennsylvania and nearly every stream in Pennsylvania contains blacknose dace (Cooper 1983). Additionally, white sucker, creek chub, and tessellated darter are also widely distributed throughout Pennsylvania.

Qualitative collections of crayfish were completed while electrofishing in the lower reaches of Walker Run during summer 2008 (Stations 4 and 5) Crayfish were extremely abundant and only one species was collected, *Orconectes obscurus*. Another species, *Cambarus bartonii bartonii*, however, was collected in Walker Run benthic macroinvertebrate samples.

No rare, threatened, endangered, or species of special concern were collected nor would any be expected to occur in Walker Run.

Macroinvertebrates

Ponds/Canal 2008

The macroinvertebrate communities within the ponds and Canal were similar. In all four water bodies Chironomidae (midges) was the most abundant group. Other common taxa within the ponds and Canal include Odonata, Hemiptera, Oligochaeta, and Gastropoda. In two of the ponds, Johnson's and Beaver, the mayfly *Caenis* was present. This species commonly inhabits lentic habitats. No other Ephemeroptera, Trichoptera, or Plecoptera (EPT) were identified. In addition, no mussels were observed in any of the water bodies.

Walker Run Fall 2007

A combined total of 2,510 macroinvertebrates representing 66 taxa was collected from Walker Run during the fall of 2007 (Tables 17 and 18). Diptera was the dominant group both numerically (48.1%) and by the number of taxa (n=15). The EPT group made up a large proportion of the total taxa and was represented by 30 genera.

A total of 1,349 macroinvertebrates representing 46 taxa was collected from Station 1 (Table 17). Diptera was the dominant group at Station 1 comprising 73.0% of the macroinvertebrates; most of the dipterans were in the family Chironomidae. Diptera was also the most diverse group with 13 taxa being collected. The EPT grouping comprised 12.3% of the macroinvertebrates with a total of 12 taxa present from this group. The caddisfly *Cheumatopsyche* was the most abundant EPT taxon representing 4.3% of the macroinvertebrates.

At Station 2 a total of 1,161 macroinvertebrates from 52 taxa was collected (Table 18). Of these, two groups were essentially co-dominant, Ephemeroptera and Coleoptera comprising 33.6% and 31.4% of the total, respectively. Diptera were also fairly numerous accounting for 19.2% of the macroinvertebrates. The combined contribution of the EPT group accounted for 45.9% of the macroinvertebrates and over half of the total taxa (n= 26 taxa). The mayfly *Stenonema* was the most abundant EPT taxon comprising 22.8% of the macroinvertebrates.

Walker Run Spring 2008

A total of 15,228 organisms and 69 taxa was collected from Walker Run during Spring 2008 (Tables 19-22). Similar to fall 2007, Diptera was the dominant group both numerically (81.1%) and by number of taxa (15). The EPT group comprised a large number of the total taxa with 27 genera identified.

For Station1 a total of 1,510 organisms and 44 taxa was collected (Table 19). Diptera was most abundant comprising 65.2% of organisms with most of the dipterans being in the family Chironomidae. The EPT group was also common, comprising 25.7% of

macroinvertebrates. The mayfly *Eurylophella* was the dominant EPT taxon, comprising 18.1% of the macroinvertebrates.

At Station 2 a total of 43 taxa and 3,765 organisms was collected. Diptera was the dominant group accounting for 60.0% of organisms (Table 20). The blackfly *Prosimulium* was the most numerous taxon comprising 53.8% of all organisms. The EPT group accounted for 22.4% of organisms and 21 taxa. Several mayflies were numerous with *Ephemerella* being the dominant EPT taxon, accounting for 6.2% of all organisms.

A total of 2,481 organisms and 35 taxa was collected from Station 4 (Table 21). Diptera was the predominate group comprising 72.7% of all organisms. Of these, Chironomidae was the dominant organism accounting for 49.5% of the total. The EPT group accounted for 22.3% of organisms and 13 taxa with the mayfly *Ephemerella* being most numerous at 11.0%.

At the most downstream location, Station 5, a total of 7,472 organisms and 24 taxa was collected (Table 22). The blackfly, *Prosimulium*, was the predominate organism accounting for 83.9% of the total. The EPT group comprised 4.9% of the total with nine taxa from the group being identified.

Walker Run Summer 2008

A total of 7,247 organisms and 59 taxa was collected from Walker Run during the summer of 2008 (Tables 23-27). Similar to both fall 2007 and spring 2008, Diptera was the most abundant group both numerically (30.9%) and by number of taxa (13). The EPT group comprised a large number of the total taxa with 22 being identified.

At Station 1 a total 1,233 organisms and 36 taxa was collected (Table 23). Diptera was the most abundant group comprising 44.3% of all organisms, with Chironomidae accounting for a large proportion of the group at 41.8%. The EPT group accounted for

28.5% of all organism and 12 taxa with the caddisfly *Cheumatopsyche* being most numerous at 13.4%.

For Station 2 a total of 689 organisms and 31 taxa was collected (Table 24). Diptera was the most abundant group comprising 41.9% of organisms with most of the dipterans being in the family Chironomidae. The EPT group was also common, comprising 33.1% of the macroinvertebrates and 13 taxa. The mayfly *Baetis* was the dominant EPT taxon comprising 12.5% of all organisms.

Station 4 yielded a total of 1,796 organisms and 36 taxa (Table 25). Trichoptera was the most abundant group, comprising 47.1% of all organisms. A majority of the trichopterans were *Cheumatopsyche* (29.7%) and *Hydropsyche* (11.1%). Overall, the EPT group comprised 54.0% of all organisms with the afformentioned *Cheumatopsyche* being the most abundant taxon within the group. A total of 12 EPT taxa was collected.

At Station 5 a total of 774 organisms and 33 taxa was collected (Table 26). Trichoptera was the most abundant group, comprising 44.1% of all organisms with *Chimarra* being the most numerous organism in the group (24.9%). A total of 14 EPT taxa was collected and this group comprised 63.8% of all organisms.

Station 6, the most upstream station, yielded 2,755 organisms and 34 taxa (Table 27). Ephemeroptera was the dominant group accounting for 33.7% of all organisms with *Baetis* being the most numerous organism in the group (23.8%). A total of 13 EPT taxa was collected which comprised 60.9% of all organisms.

The macroinvertebrate community present in Walker Run was diverse and representative of a small coolwater stream in eastern Pennsylvania. A total of 88 taxa was collected. Almost half (43) of these taxa were within the EPT group. Taxa within this group are generally considered intolerant to most types of water pollution and

habitat degradation. The benthic macroinvertebrates present in Walker Run were indicative of a healthy, clean-water stream community.

For the most part, species abundance and composition was similar among stations and between seasons. Most of the differences were related to the heterogeneous or "patchy" distribution of macroinvertebrates. However, some more specific differences were evident. Some of the seasonal differences were related to the life history characteristics of benthic macroinvertebrates. For example, as a part of the life history of many mayfly species there is an egg diapause. This results in many species being in egg stage during summer and not hatching until fall; therefore, these species would not be collected in benthos samples. Additionally, seasonal differences in abundance can be related to "blooms" of organisms. This phenomenon occurred at Stations 2, 4, and 5 during the spring when large numbers of the blackfly *Prosimulium* were collected. Most species within this genus mature in the spring and can be highly abundant if habitat conditions are especially favorable (Adler 1986). These habitat conditions include swift currents for feeding and stable, size-specific substrate for attachment. Both of these parameters were present at Stations 2, 4, and 5 and appear to explain the large abundance of blackfly in each of the areas.

No rare, threatened, endangered, or species of special concern were collected or are thought to occur within the Walker Run watershed.

Unnamed Tributaries

Unnamed Tributary No. 5

A total of 8,161 organisms and 16 taxa was collected from Unnamed Tributary No. 5 (Table 28). The macroinvertebrate community was dominated by the amphipod *Gammarus* which comprised 95.9% of all organisms. A single EPT taxon, the mayfly *Baetis*, was collected which comprised 0.3% of the collection.

Unnamed Tributary No. 3

A total of 444 organisms and 17 taxa was collected from Unnamed Tributary No. 3 (Table 29). Diptera was the dominant group comprising 73.4% of all organisms with Chironomidae accounting for 52.3% of the dipterans. The EPT group comprised 18.9% of all organisms and a total of 6 taxa was collected.

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Table 1. Habitat assessment[1] summary for six stations located on Walker Run and Unnamed Tributary No. 1.

Habitat Parameter		Station 1	2	3	4	5	6
Epifaunal Substrate/ Available Cover		15	17	14	17	18	15
Embeddedness		15	18	14	15	16	15
Velocity/Depth regime		12	15	9	15	13	15
Sediment Deposition		12	16	14	12	17	16
Channel Flow Status		19	19	19	19	19	16
Channel Alteration		19	16	19	17	19	15
Frequency of Riffles		16	16	14	16	18	16
Bank Stability							
	Left Bank	7	7	8	2	8	7
	Right Bank	7	6	8	2	9	6
Vegetative Protection							
	Left Bank	5	6	8	2	9	6
	Right Bank	5	6	8	2	9	6
Riparian Vegetative Zone Width							
	Left Bank	9	4	8	2	4	6
	Right Bank	9	4	8	2	7	5
Total Score		150	150	151	123	166	144

[1] U.S. EPA. 1999. Rapid Biooassessment Protocols For Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish. Second Edition. EPA 841-B-99-002. (http://www.epa.gov/OWOW/monitoring/techmon.html)

Table 2. Water quality data collected from Walker Run and Unnamed Tributary No. 1 during Fall 2007 and Spring and Summer 2008.

Season	Parameter	Station 1	2	3	4	5	6
Fall 2007							
	Temperature (°C)	5.2	6.2	6			
	pH	6.6	6.8	6.7			
	Dissolved Oxygen (mg/l)	11.5	11.2	11.1			
	Conductivity (µS/cm)	127	95	334			
Spring 2008							
	Temperature (°C)	8.8	9.3	11.2	8.3	10.6	
	pH	6.5	7.5	7.8	7.6	7.6	
	Dissolved Oxygen (mg/l)	11.8	11.7	11.2	12	12.7	
	Conductivity (µS/cm)	80	63	158	81	81	
Summer 2008							
	Temperature (°C)	20.5	21.3	22.4	22.7	24.7	24.1
	pH	6.3	6.4	7.1	7.5	7.3	7.3
	Dissolved Oxygen (mg/l)	7			8.2	7	8.4
	Conductivity (µS/cm)	86	80	195	85	81	70

Table 3. Water quality data collected from the ponds during Fall 2007 and Summer 2008.

Season	Parameter	Pond				
		West Building	Beaver	Johnson's	Farm	Unnamed 1
Fall 2007						
	Temperature (°C)	5.2	7.1	8.5	9.0	5.4
	pH	7.2	7.5	7.2	6.2	6.1
	Dissolved Oxygen (mg/l)	10.6	14.2	11.1	10.5	10.9
	Conductivity (µS/cm)	261	426	35	110	93
Spring 2008						
	Temperature (°C)		25.0	25.7	26.0	23.9
	pH		7.1	6.0	6.0	6.3
	Dissolved Oxygen (mg/l)		6.8	7.2	-	7.1
	Conductivity (µS/cm)		245	35	83	109

Table 4. Water quality data collected from the Canal and adjacent areas during Spring 2010.

Season	Parameter	Canal				Marshland
		Station 1	Station 2	Station 3	Outlet	
Spring 2010						
	Temperature (°C)	17.9	13.6	8.6	13.3	9.4
	pH	7.9	7.2	6.2	7.1	6.1
	Dissolved Oxygen (mg/l)	9.0	9.1	4.9	9.3	6.9
	Conductivity (µS/cm)	728	672	309	644	191

Table 5. Number and percent composition of fish collected from three ponds located within the proposed BBNPP site, November 8, 2007.

Common name	Scientific name	Beaver Pond		Johnson's Pond		Farm Pond	
		Number	Percent	Number	Percent	Number	Percent
Bluegill	*Lepomis macrochirus*	5	3	85	96		
Brown bullhead	*Ameiurus nebulosus*	100	61				
Creek chub	*Semotilus atromaculatus*	1	1			1	100
Golden shiner	*Notemigonus crysoleucas*	1	1				
Green sunfish	*Lepomis cyanellus*	48	29				
Largemouth bass	*Micropterus salmoides*			3	3		
Sunfish hybrid	*Lepomis sp.*	9	5				
White crappie	*Pomoxis annularis*			1	1		
Total number of organisms		164		89		1	
Total number of species[1]		5		3		1	

Note that no fish were collected from either the West Building Pond or Unnamed Pond

[1]excludes sunfish hybrid

Table 6. Length range of fish collected from ponds within the BBNPP site during November 2007.

Taxon	Total Length (mm)					
	Beaver Pond		Johnson's Pond		Farm Pond	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
White crappie			89			
Bluegill	78	98	42	116		
Golden shiner	101					
Creek chub					55	
Green sunfish	36	120				
Largemouth bass			89	341		
Brown bullhead	64	250				
Sunfish hybrid	75	91				

Table 7. Number and percent composition of fish collected from three ponds located within the proposed BBNPP site, July 2008.

Common name	Scientific name	Beaver Pond		Johnson's Pond		Farm Pond	
		Number	Percent	Number	Percent	Number	Percent
Blacknose dace	*Rhinichthys atratulus*					4	7.7
Bluegill	*Lepomis macrochirus*	1	1.6	206	85.8		
Brown bullhead	*Ameiurus nebulosus*	25	39.1				
Creek chub	*Semotilus atromaculatus*					43	82.7
Golden shiner	*Notemigonus crysoleucas*	17	26.6			3	5.8
Green sunfish	*Lepomis cyanellus*	20	31.3				
Largemouth bass	*Micropterus salmoides*			23	9.6		
Sunfish hybrid	*Lepomis sp.*	1	1.6	4	1.7		
White crappie	*Pomoxis annularis*			7	2.9		
White sucker	*Catostomus commersoni*					2	3.8
Total number of organisms		64		240		52	
Total number of species[1]		4		3		4	

Note that no fish were collected from either the West Building Pond, Unnamed Pond, or Unnamed Pond 2

[1]excludes sunfish hybrid

Table 8. Length range of fish collected from ponds within the BBNPP site during July 2008.

Taxon	Total Length (mm)					
	Beaver Pond		Johnson's Pond		Farm Pond	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
White crappie			120	190		
Bluegill	75		30	160		
Golden shiner	32	125			27	
Creek chub					21	112
Blacknose dace					22	40
Green sunfish	54	145				
Largemouth bass			40	355		
Brown bullhead	80	225				
Sunfish hybrid	95		140	230		
White sucker					87	134

Table 9. Number and percent composition of fish collected within the proposed BBNPP site including three stations in the North Branch Canal, the Canal outlet, and in a Marshland adjacent to the Canal, April 2010.

Common Name	Scientific Name	Canal station 1		Canal station 2		Canal station 3		Canal outlet		Marshland		Total
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	
black crappie	*Pomoxis nigromaculatus*					1	4					1
bluegill	*Lepomis macrochirus*	14	52	4	80	16	59	34	21			53
bluntnose minnow	*Pimephales notatus*							8	5			8
brook stickleback	*Culaea inconstans*							1	1			1
brown bullhead	*Ameiurus nebulosus*							2	1			2
chain pickerel	*Esox niger*					1	4					1
common carp	*Cyprinus carpio*							1	1			1
creek chub	*Semotilus atromaculatus*							2	1			2
fathead minnow	*Pimephales promelas*							2	1			2
golden shiner	*Notemigonus crysoleucas*							43	27			8
green sunfish	*Lepomis cyanellus*	9	33					34	21			29
largemouth bass	*Micropterus salmoides*	2	7			2	7					4
pumpkinseed	*Lepomis gibbosus*					7	26	6	4	4	100	17
spotfin shiner	*Cyprinella spiloptera*							1	1			1
sunfish hybrid	*Lepomis sp.*							1	1			1
white sucker	*Catostomus commersoni*							25	16			14
yellow bullhead	*Ameiurus natalis*	2	7	1	20							3
Total number of organisms		27		5		27		160		4		148
Total number of species[1]		4		2		5		12		1		16

[1]Hybrid excluded from species total

Table 10. Length range of fish collected from the North Branch Canal, Canal outlet, and Marshland adjacent to Canal, April 2010.

	Total Length (mm)									
	Canal station 1		Canal station 2		Canal station 3		Canal outlet		Marshland	
Taxon	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
brown bullhead							58	71		
bluntnose minnow							57	77		
white sucker							51	95		
common carp							160			
chain pickerel					157					
fathead minnow							52	72		
pumpkinseed					97	157	44	77	83	112
green sunfish	57	124					41	118		
sunfish hybrid							71			
bluegill	94	173	123	147	58	175	37	187		
largemouth bass	296	321			93	302				
golden shiner							72	117		
black crappie					125					
creek chub							48	58		
spotfin shiner							79			
brook stickleback							45			
yellow bullhead	73	244	83							

Table 11. Number and percent composition of fish collected from three stations on Walker Run and Unnamed Tributary No. 1 located within the proposed BBNPP site, November 8, 2007.

Common name	Scientific name	Station 1		Station 2		Station 3	
		Number	Percent	Number	Percent	Number	Percent
Blacknose dace	*Rhinichthys atratulus*	59	39	17	30	3	3
Bluegill	*Lepomis macrochirus*					7	8
Creek chub	*Semotilus atromaculatus*	46	30	18	32	64	70
Fallfish	*Semotilus corporalis*	22	15	1	2		
Green sunfish	*Lepomis cyanellus*			2	4	10	11
Sunfish hybrid	*Lepomis sp.*					4	4
Tessellated darter	*Etheostoma olmstedi*	4	3				
White sucker	*Catostomus commersoni*	20	13	18	32	4	4
Total number of organisms		151		56		92	
Total number of species[1]		5		5		6	

[1]excludes sunfish hybrid

Table 12. Length range of fish collected in Walker Run and Unnamed Tributary No. 1 during November 2007.

Taxon	Total Length (mm)	
	Minimum	Maximum
Blacknose dace	38	81
Bluegill	62	79
Creek chub	36	143
Fallfish	47	133
Green sunfish	39	83
Tessellated darter	61	71
White sucker	36	151

Table 13. Number and percent composition of fish collected from five stations on Walker Run and Unnamed Tributary No. 1 located within and downstream of the proposed BBNPP site, April 7 and 8, 2008.

Common name	Scientific name	Station 1		Station 2		Station 3		Station 4		Station 5	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Blacknose dace	*Rhinichthys atratulus*	49	43.8	46	45.5	11	22.0	39	10.5	186	83.4
Bluegill	*Lepomis macrochirus*							1	0.3		
Brown trout	*Salmo trutta*	1	0.9	3	3.0			4	1.1	2	0.9
Creek chub	*Semotilus atromaculatus*	43	38.4	32	31.7	16	32.0	99	26.7	16	7.2
Fallfish	*Semotilus corporalis*							23	6.2		
Green sunfish	*Lepomis cyanellus*	1	0.9			9	18.0	1	0.3		
Longnose dace	*Rhinichthys cataractae*									15	6.7
Pumpkinseed	*Lepomis gibbosus*							1	0.3		
Tessellated darter	*Etheostoma olmstedi*	5	4.5					52	14.0	2	0.9
White sucker	*Catostomus commersoni*	13	11.6	20	19.8	14	28.0	151	40.7	2	0.9
Total number of organisms		112		101		50		371		223	
Total number of species		6		4		4		9		6	

Table 14. Length range of fish collected in Walker Run and Unnamed Tributary No. 1 during April 2008.

Taxon	Length (mm)	
	Minimum	Maximum
Blacknose dace	30	80
Bluegill	66	
Brown trout	102	295
Creek chub	37	136
Fallfish	52	168
Green sunfish	46	47
Longnose dace	46	105
Pumpkinseed	52	
Tessellated darter	31	65
White sucker	43	271

Table 15. Number and percent composition of fish collected from five stations on Walker Run and Unnamed Tributary No. 1 located within and downstream of the proposed BBNPP site, July 2008.

Common name	Scientific name	Station 1		[1]Station 2		Station 3		Station 4		Station 5		Station 6	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Blacknose dace	*Rhinichthys atratulus*	52	41.6	8	10.0	30	58.8	27	6.3	112	68.3	34	47.9
Bluegill	*Lepomis macrochirus*	1	0.8					1	0.2	1	0.6		
Brown trout	*Salmo trutta*			1	1.3			3	0.7	1	0.6	9	12.7
Creek chub	*Semotilus atromaculatus*	62	49.6	21	26.3	17	33.3	81	18.8	22	13.4	7	9.9
Fallfish	*Semotilus corporalis*	1	0.8	3	3.8			13	3.0			2	2.8
Green sunfish	*Lepomis cyanellus*	1	0.8	3	3.8	1	2.0	36	8.4	4	2.4		
Largemouth bass	*Micropterus salmoides*							1	0.2				
Sunfish hybrid	*Lepomis sp.*									1	0.6		
Longnose dace	*Rhinichthys cataractae*									15	9.1		
Tessellated darter	*Etheostoma olmstedi*	4	3.2					87	20.2				
White sucker	*Catostomus commersoni*	4	3.2	44	55.0	3	5.9	181	42.1	8	4.9	19	26.8
Total number of organisms		125		80		51		430		164		71	
Total number of species		7		6		4		9		7		5	

[1]sample location downstream of original sample boundary

Table 16. Length range of fish collected in Walker Run and Unnamed Tributary No. 1 during July 2008.

Taxon	Total Length (mm)	
	Minimum	Maximum
Blacknose dace	25	66
Bluegill	54	67
Brown trout	60	297
Creek chub	45	176
Fallfish	65	225
Green sunfish	53	85
Largemouth bass	50	
Longnose dace	54	106
Tessellated darter	45	64
White sucker	33	270

Table 17. Number and percent composition of benthic macroinvertebrates collected with a kick net at Station 1 in Walker Run on November 8, 2007.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
OLIGOCHAETA		5	5	0.4	0.4
CRUSTACEA		2		0.1	
	Amphipoda		1		0.1
	Cambarus		1		0.1
PLECOPTERA		5		0.4	
	Allocapnia		4		0.3
	Taeniopteryx		1		0.1
EPHEMEROPTERA		86		6.4	
	Acerpenna		12		0.9
	Eurylophella		14		1.0
	Paraleptophlebia		6		0.4
	Stenonema		54		4.0
TRICHOPTERA		74		5.5	
	Cheumatopsyche		58		4.3
	Chimarra		1		0.1
	Hydatophylax		8		0.6
	Hydropsyche		4		0.3
	Neophylax		2		0.1
	Nyctiophylax		1		0.1
COLEOPTERA		136		10.1	
	Anchytarsus		1		0.1
	Dubiraphia		111		8.2
	Ectopria		1		0.1
	Helichus		1		0.1
	Optioservus		6		0.4
	Oulimnius		5		0.4
	Promoresia		5		0.4
	Stenelmis		6		0.4
DIPTERA		985		73.0	
	Alluaudomyia		7		0.5
	Antocha		7		0.5
	Bezzia		7		0.5
	Chelifera		2		0.1
	Chironomidae		847		62.8

Table 17. Continued.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
DIPTERA (continued)					
	Chrysops		11		0.8
	Culicoides		7		0.5
	Dicranota		2		0.1
	Hemerodromia		2		0.1
	Hexatoma		5		0.4
	Probezzia		8		0.6
	Prosimulium		7		0.5
	Sphaeromias		73		5.4
MOLLUSCA		21		1.6	
	Ferrissia		7		0.5
	Physa		1		0.1
	Musculium		13		1.0
OTHER		35		2.6	
	Acariformes		16		1.2
	Nematoda		2		0.1
	Aeshnidae		2		0.1
	Calopterygidae		2		0.1
	Gomphidae		7		0.5
	Nigronia		4		0.3
	Sialis		2		0.1
TOTAL		1,349	1,349	100	100

Table 18. Number and percent composition of benthic macroinvertebrates collected with a kick net at Station 2 in Walker Run on November 8, 2007.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
CRUSTACEA					
	Cambarus	4	4	0.3	0.3
PLECOPTERA		30		2.6	
	Acroneuria		6		0.5
	Agnetina		1		0.1
	Leuctra		1		0.1
	Paracapnia		1		0.1
	Pteronarcys		1		0.1
	Sweltsa		12		1.0
	Taeniopteryx		8		0.7
EPHEMEROPTERA		390		33.6	
	Acentrella		1		0.1
	Baetis		1		0.1
	Acerpenna		6		0.5
	Ephemera		1		0.1
	Ephemerella		14		1.2
	Eurylophella		46		4.0
	Leptophlebia		1		0.1
	Paraleptophlebia		49		4.2
	Serratella		5		0.4
	Stenacron		1		0.1
	Stenonema		265		22.8
TRICHOPTERA		113		9.7	
	Cheumatopsyche		68		5.9
	Chimarra		25		2.2
	Dolophilodes		1		0.1
	Hydropsyche		2		0.2
	Lype		2		0.2
	Micrasema		4		0.3
	Neophylax		8		0.7
	Polycentropus		3		0.3
COLEOPTERA		364		31.4	
	Anchytarsus		16		1.4
	Dubiraphia		2		0.2
	Optioservus		67		5.8
	Oulimnius		239		20.6

Table 18. Continued.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
COLEOPTERA (continued)					
	Promoresia		34		2.9
	Stenelmis		6		0.5
DIPTERA		223		19.2	
	Antocha		8		0.7
	Chironomidae		172		14.8
	Dicranota		15		1.3
	Hemerodromia		2		0.2
	Palpomyia group		8		0.7
	Pericoma		1		0.1
	Pilaria		1		0.1
	Probezzia		1		0.1
	Prosimulium		14		1.2
	Tipula		1		0.1
MOLLUSCA		16		1.4	
	Ferrissia		2		0.2
	Physa		4		0.3
	Pisidium		10		0.9
OTHER					
	Prostoma	21	1	1.8	0.1
	Tricladida		1		0.1
	Aeshnidae		1		0.1
	Gomphidae		12		1.0
	Nigronia		5		0.4
	Sialis		1		0.1
TOTAL		1,161	1,161	100	100

Table 19. Number and percent composition of benthic macroinvertebrates collected with a kick net at Station 1 in Walker Run on April 7, 2008.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
OLIGOCHAETA		38	38	2.5	2.5
CRUSTACEA		2		0.1	
	Cambarus		2		0.1
PLECOPTERA		6		0.4	
	Amphinemura		2		0.1
	Isoperla		1		0.1
	Leuctra		2		0.1
	Prostoia		1		0.1
EPHEMEROPTERA		329		21.8	
	Cingymula		8		0.5
	Epeorus		16		1.1
	Eurylophella		273		18.1
	Stenonema		32		2.1
TRICHOPTERA		53		3.5	
	Brachycentrus		1		0.1
	Cheumatopsyche		30		2.0
	Chimarra		1		0.1
	Hydropsyche		3		0.2
	Lepidostoma		1		0.1
	Neophylax		8		0.5
	Oecetis		1		0.1
	Pycnopsyche		7		0.5
	Rhyacophila		1		0.1
COLEOPTERA		44		2.9	
	Dubiraphia		28		1.9
	Helichus		1		0.1
	Optioservus		9		0.6
	Oulimnius		5		0.3
	Promoresia		1		0.1
DIPTERA		984		65.2	
	Antocha		2		0.1
	Bezzia		1		0.1
	Chironomidae		752		49.8
	Chrysops		1		0.1
	Dicranota		3		0.2

Table 19. Continued.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
DIPTERA (continued)					
	Pilaria		1		0.1
	Probezzia		4		0.3
	Prosimulium		162		10.7
	Sphaeromias		7		0.5
	Stegopterna		48		3.2
	Tipula		3		0.2
MOLLUSCA		31		2.1	
	Ferrissia		1		0.1
	Physa		3		0.2
	Musculium		15		1.0
	Pisidium		12		0.8
OTHER		23		1.5	
	Acariformes		5		0.3
	Nematoda		8		0.5
	Aeshnidae		1		0.1
	Gomphidae		6		0.4
	Nigronia		3		0.2
TOTAL		1,510	1,510	100	100

Table 20. Number and percent composition of benthic macroinvertebrates collected with a kick net at Station 2 in Walker Run on April 7, 2008.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
OLIGOCHAETA		15	15	0.4	0.4
CRUSTACEA		2		0.1	
	Amphipoda		1		<0.1
	Cambarus		1		<0.1
PLECOPTERA		38		1.0	
	Acroneuria		11		0.3
	Amphinemura		8		0.2
	Leuctra		8		0.2
	Isoperla		10		0.3
	Pteronarcys		1		<0.1
EPHEMEROPTERA		766		20.3	
	Baetis		117		3.1
	Cinygmula		136		3.6
	Ephemerella		234		6.2
	Epeorus		198		5.3
	Isonychia		9		0.2
	Stenonema		27		0.7
	Serratella		45		1.2
TRICHOPTERA		42		1.1	
	Cheumatopsyche		6		0.2
	Chimarra		15		0.4
	Diplectrona		2		0.1
	Hydropsyche		7		0.2
	Leucotrichia		1		<0.1
	Lype		1		<0.1
	Neophylax		4		0.1
	Polycentropus		1		<0.1
	Rhyacophila		5		0.1
COLEOPTERA		594		15.8	
	Anchytarsus		3		0.1
	Curculionidae		1		<0.1
	Optioservus		84		2.2
	Oulimnius		434		11.5
	Promoresia		72		1.9

Table 20. Continued.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
DIPTERA		2,259		60.0	
	Antocha		1		<0.1
	Chironomidae		228		6.1
	Clinocera		2		0.1
	Dicranota		2		0.1
	Pilaria		1		<0.1
	Prosimulium		2,024		53.8
	Tipula		1		<0.1
MOLLUSCA		12		0.3	
	Pisidium		8		0.2
	Sphaerium		4		0.1
OTHER		37		1.0	
	Acariformes		1		<0.1
	Nematoda		1		<0.1
	Cordulegastridae		8		0.2
	Gomphidae		24		0.6
	Nigronia		3		0.1
TOTAL		3,765	3,765	100	100.0

Table 21. Number and percent composition of benthic macroinvertebrates collected with a kick net at Station 4 in Walker Run on April 8, 2008.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
OLIGOCHAETA		71	71	2.9	2.9
CRUSTACEA		23		0.9	
	Amphipoda		23		0.9
PLECOPTERA		8		0.3	
	Amphinemura		8		0.3
EPHEMEROPTERA		368		14.8	
	Cinygmula		8		0.3
	Ephemerella		272		11.0
	Epeorus		24		1.0
	Eurylophella		8		0.3
	Stenonema		56		2.3
TRICHOPTERA		132		5.3	
	Cheumatopsyche		88		3.5
	Chimarra		8		0.3
	Diplectrona		1		<0.1
	Hydropsyche		23		0.9
	Micrasema		2		0.1
	Neophylax		1		<0.1
	Psychomyia		9		0.4
COLEOPTERA		55		2.2	
	Anchytarsus		5		0.2
	Hydrobius		1		<0.1
	Optioservus		3		0.1
	Oulimnius		15		0.6
	Promoresia		8		0.3
	Stenelmis		23		0.9
DIPTERA		1,804		72.7	
	Antocha		20		0.8
	Chelifera		6		0.2
	Chironomidae		1,228		49.5
	Clinocera		7		0.3
	Dasyhelea		2		0.1
	Prosimulium		530		21.4
	Sphaeromias		3		0.1
	Stegopterna		8		0.3
MOLLUSCA		5		0.2	
	Pisidium		5		0.2

Table 21. Continued.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
OTHER		15		0.6	
	Acariformes		4		0.2
	Nematoda		4		0.2
	Aeshnidae		1		<0.1
	Gomphidae		3		0.1
	Sialis		3		0.1
TOTAL		2,481	2,481	100	100

Table 22. Number and percent composition of benthic macroinvertebrates collected with a kick net at Station 5 in Walker Run on April 8, 2008.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
CRUSTACEA		1		<0.1	
	Cambarus		1		<0.1
PLECOPTERA		2		<0.1	
	Amphinemura		2		<0.1
EPHEMEROPTERA		288		3.9	
	Ephemerella		288		3.9
TRICHOPTERA		76		1.0	
	Cheumatopsyche		14		0.2
	Chimarra		23		0.3
	Hydropsyche		14		0.2
	Micrasema		3		<0.1
	Neophylax		19		0.3
	Polycentropus		1		<0.1
	Rhyacophila		2		<0.1
COLEOPTERA		17		0.2	
	Ectopria		1		
	Optioservus		6		0.1
	Oulimnius		5		0.1
	Promoresia		3		<0.1
	Stenelmis		2		<0.1
DIPTERA		6,634		88.8	
	Antocha		2		<0.1
	Chironomidae		356		4.8
	Clinocera		2		<0.1
	Dicranota		1		<0.1
	Hemerodromia		1		<0.1
	Prosimulium		6,272		83.9
MOLLUSCA		4		0.1	
	Pisidium		4		0.1
OTHER		450		6.0	
	Nematoda		449		6.0
	Nigronia		1		<0.1
TOTAL		7,472	7,472	100	100

Table 23. Number and percent composition of benthic macroinvertebrates collected with a kick net at Station 1 in Walker Run on July 14, 2008.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
OLIGOCHAETA		4	4	0.3	0.3
CRUSTACEA		2		0.2	
	Cambarus		1		0.1
	Stygobromis		1		0.1
PLECOPTERA		38		3.1	
	Acroneuria		5		0.4
	Leuctra		30		2.4
	Sweltsa		3		0.2
EPHEMEROPTERA		30		2.4	
	Leptophlebiidae		1		0.1
	Eurylophella		6		0.5
	Serratella		1		0.1
	Stenonema		22		1.8
TRICHOPTERA		284		23.0	
	Brachycentrus		12		1.0
	Cheumatopsyche		165		13.4
	Chimarra		13		1.1
	Hydropsyche		56		4.5
	Hydroptila		38		3.1
COLEOPTERA		210		17.0	
	Anchytarsus		1		0.1
	Ectopria		4		0.3
	Optioservus		66		5.4
	Oulimnius		9		0.7
	Promoresia		71		5.8
	Stenelmis		59		4.8
DIPTERA		546		44.3	
	Antocha		4		0.3
	Bezzia		1		0.1
	Chironomidae		516		41.8
	Dicranota		21		1.7
	Tipula		4		0.3
MOLLUSCA		8		0.6	
	Ferrissia		4		0.3
	Pisidium		4		0.3

Table 23. Continued.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
OTHER		111		9.0	
	Acariformes		27		2.2
	Argia		26		2.1
	Boyeria		1		0.1
	Nigronia		18		1.5
	Prostoma		4		0.3
	Sialis		2		0.2
	Stylogomphus		4		0.3
	Veliidae		29		2.4
TOTAL		1,233	1,233	100	100

Table 24. Number and percent composition of benthic macroinvertebrates collected with a kick net at Station 2 in Walker Run on July 15, 2008.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
OLIGOCHAETA		19	19	2.8	2.8
CRUSTACEA		3		0.4	
	Cambarus		3		0.4
PLECOPTERA		50		7.3	
	Acroneuria		5		0.7
	Leuctra		42		6.1
	Nemouridae		1		0.1
	Sweltsa		2		0.3
EPHEMEROPTERA		137		19.9	
	Baetis		86		12.5
	Leptophlebiidae		4		0.6
	Eurylophella		15		2.2
	Serratella		3		0.4
	Stenacron		1		0.1
	Stenonema		28		4.1
TRICHOPTERA		41		6.0	
	Cheumatopsyche		27		3.9
	Chimarra		4		0.6
	Hydropsyche		10		1.5
COLEOPTERA		93		13.5	
	Optioservus		57		8.3
	Oulimnius		24		3.5
	Promoresia		6		0.9
	Stenelmis		6		0.9
DIPTERA		289		41.9	
	Antocha		1		0.1
	Chironomidae		272		39.5
	Dicranota		4		0.6
	Hemerodromia		4		0.6
	Probezzia		1		0.1
	Simulium		7		1.0
MOLLUSCA		23		3.3	
	Ferrissia		2		0.3
	Pisidium		21		3.0

Table 24 Continued.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
OTHER		34		4.9	
	Acariformes		9		1.3
	Nematoda		4		0.6
	Nigronia		4		0.6
	Stylogomphus		17		2.5
TOTAL		689	689	100	100

Table 25. Number and percent composition of benthic macroinvertebrates collected with a kick net at Station 4 in Walker Run on July 14, 2008.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
OLIGOCHAETA		36	36	2.0	2.0
CRUSTACEA		57		3.2	
	Cambarus		1		0.1
	Gammarus		56		3.1
PLECOPTERA		6		0.3	
	Acroneuria		1		0.1
	Leuctra		5		0.3
EPHEMEROPTERA		118		6.6	
	Leptophlebiidae		1		0.1
	Baetis		55		3.1
	Eurylophella		1		0.1
	Stenacron		3		0.2
	Stenonema		58		3.2
TRICHOPTERA		846		47.1	
	Cheumatopsyche		533		29.7
	Chimarra		81		4.5
	Hydropsyche		200		11.1
	Hydroptila		16		0.9
	Psychomyia		16		0.9
COLEOPTERA		292		16.3	
	Ectopria		19		1.1
	Macronychus		4		0.2
	Optioservus		71		4.0
	Oulimnius		9		0.5
	Promoresia		46		2.6
	Stenelmis		143		8.0
DIPTERA		408		22.7	
	Antocha		15		0.8
	Chironomidae		348		19.4
	Dicranota		10		0.6
	Hemerodromia		2		0.1
	Hexatoma		1		0.1
	Limonia		3		0.2
	Simulium		26		1.4
	Tipula		3		0.2

Table 25. Continued.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
MOLLUSCA		10		0.6	
	Ferrissia		5		0.3
	Pisidium		5		0.3
OTHER		23		1.3	
	Acariformes		8		0.4
	Nigronia		2		0.1
	Nematoda		1		0.1
	Sialis		1		0.1
	Veliidae		11		0.6
TOTAL		1,796	1,796	100	100

Table 26. Number and percent composition of benthic macroinvertebrates collected with a kick net at Station 5 in Walker Run on July 14, 2008.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
OLIGOCHAETA		2	2	0.3	0.3
CRUSTACEA		3		0.4	
	Cambarus		2		0.3
	Gammarus		1		0.1
PLECOPTERA		22		2.8	
	Acroneuria		18		2.3
	Leuctra		4		0.5
EPHEMEROPTERA		131		16.9	
	Baetis		32		4.1
	Isonychia		30		3.9
	Leptophlebiidae		1		0.1
	Leucrocuta		1		0.1
	Stenonema		49		6.3
	Stenacron		18		2.3
TRICHOPTERA		341		44.1	
	Cheumatopsyche		118		15.2
	Chimarra		193		24.9
	Dolophilodes		8		1.0
	Hydropsyche		13		1.7
	Psychomyia		8		1.0
	Rhyacophila		1		0.1
COLEOPTERA		74		9.6	
	Ectopria		8		1.0
	Macronychus		1		0.1
	Optioservus		18		2.3
	Promoresia		2		
	Psephenus		21		2.7
	Stenelmis		24		3.1
DIPTERA		191		24.7	
	Antocha		8		1.0
	Atrichopogon		1		0.1
	Chironomidae		178		23.0
	Dicranota		1		0.1

Table 26. Continued.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
DIPTERA (continued)					
	Molophilus		1		0.1
	Tipula		2		0.3
MOLLUSCA		3		0.4	
	Ferrissia		3		0.4
OTHER		7		0.9	
	Argia		1		0.1
	Sialis		1		0.1
	Veliidae		5		0.6
TOTAL		774	774	100	100

Table 27. Number and percent composition of benthic macroinvertebrates collected with a kick net at Station 6 in Walker Run on July 15, 2008.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
OLIGOCHAETA		10	10	0.4	0.4
CRUSTACEA		15		0.5	
	Cambarus				0.0
	Gammarus		15		0.5
PLECOPTERA		192		7.0	
	Acroneuria		24		0.9
	Leuctra		144		5.2
	Sweltsa		24		0.9
EPHEMEROPTERA		928		33.7	
	Leptophlebiidae		16		0.6
	Acentrella		32		1.2
	Baetis		656		23.8
	Eurylophella		16		0.6
	Serratella		112		4.1
	Stenonema		96		3.5
TRICHOPTERA		556		20.2	
	Cheumatopsyche		280		10.2
	Dolophilodes		11		0.4
	Hydropsyche		264		9.6
	Neophylax		1		0.0
COLEOPTERA		232		8.4	
	Helichus		24		0.9
	Optioservus		114		4.1
	Oulimnius		63		2.3
	Psephenus		6		0.2
	Promoresia		3		0.1
	Stenelmis		22		0.8
DIPTERA		808		29.3	
	Antocha		17		0.6
	Chironomidae		656		23.8
	Chelifera		8		0.3
	Dicranota		82		3.0
	Hemerodromia		17		0.6
	Hexatoma		13		0.5
	Probezzia		8		0.3

Table 27. Continued.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
DIPTERA (continued)					
	Simulium		5		0.2
	Tipula		2		0.1
OTHER		14		0.5	
	Acariformes		2		0.1
	Boyeria		1		0.0
	Nigronia		2		0.1
	Stylogomphus		9		0.3
TOTAL		2,755	2,755	100	100

Table 28. Number and percent composition of benthic macroinvertebrates collected with a kick net in Unnamed Tributary No. 5 on July 16, 2008.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
OLIGOCHAETA		19	19	0.2	0.2
CRUSTACEA		7,824		95.9	
	Cambarus		4		0.0
	Gammarus		7,820		95.8
EPHEMEROPTERA		27		0.3	
	Baetis		27		0.3
COLEOPTERA		83		1.0	
	Optioservus		47		0.6
	Oulimnius		34		0.4
	Tropisternus		2		0.0
DIPTERA		206		2.5	
	Chironomidae		170		2.1
	Chrysops		1		0.0
	Dicranota		2		0.0
	Dixa		10		0.1
	Ephydridae		5		0.1
	Limonia		9		0.1
	Simulium		9		0.1
OTHER		2		0.0	
	Dugesia		1		0.0
	Nematoda		1		0.0
TOTAL		8,161	8,161	100	100

Table 29. Number and percent composition of benthic macroinvertebrates collected with a kick net in Unnamed Tributary No. 3 on July 16, 2008.

Group	Taxon	Total Number		Percent of Total	
		Group	Taxon	Group	Taxon
OLIGOCHAETA		5	5	1.1	1.1
CRUSTACEA		7		1.6	
	Crangonyx		7		1.6
PLECOPTERA		1		0.2	
	Leuctra		1		0.2
EPHEMEROPTERA		20		4.5	
	Baetis		2		0.5
	Leptophlebiidae		13		2.9
	Stenonema		5		1.1
TRICHOPTERA		63		14.2	
	Cheumatopsyche		1		0.2
	Diplectrona		62		14.0
DIPTERA		326		73.4	
	Chironomidae		232		52.3
	Dicranota		88		19.8
	Pseudolimnophila		1		0.2
	Tipula		5		1.1
MOLLUSCA		15		3.4	
	Corbicula		1		0.2
	Pisidium		8		1.8
	Physella		6		1.4
OTHER		7		1.6	
	Gerridae		4		0.9
	Sialis		3		0.7
TOTAL		444	444	100	100

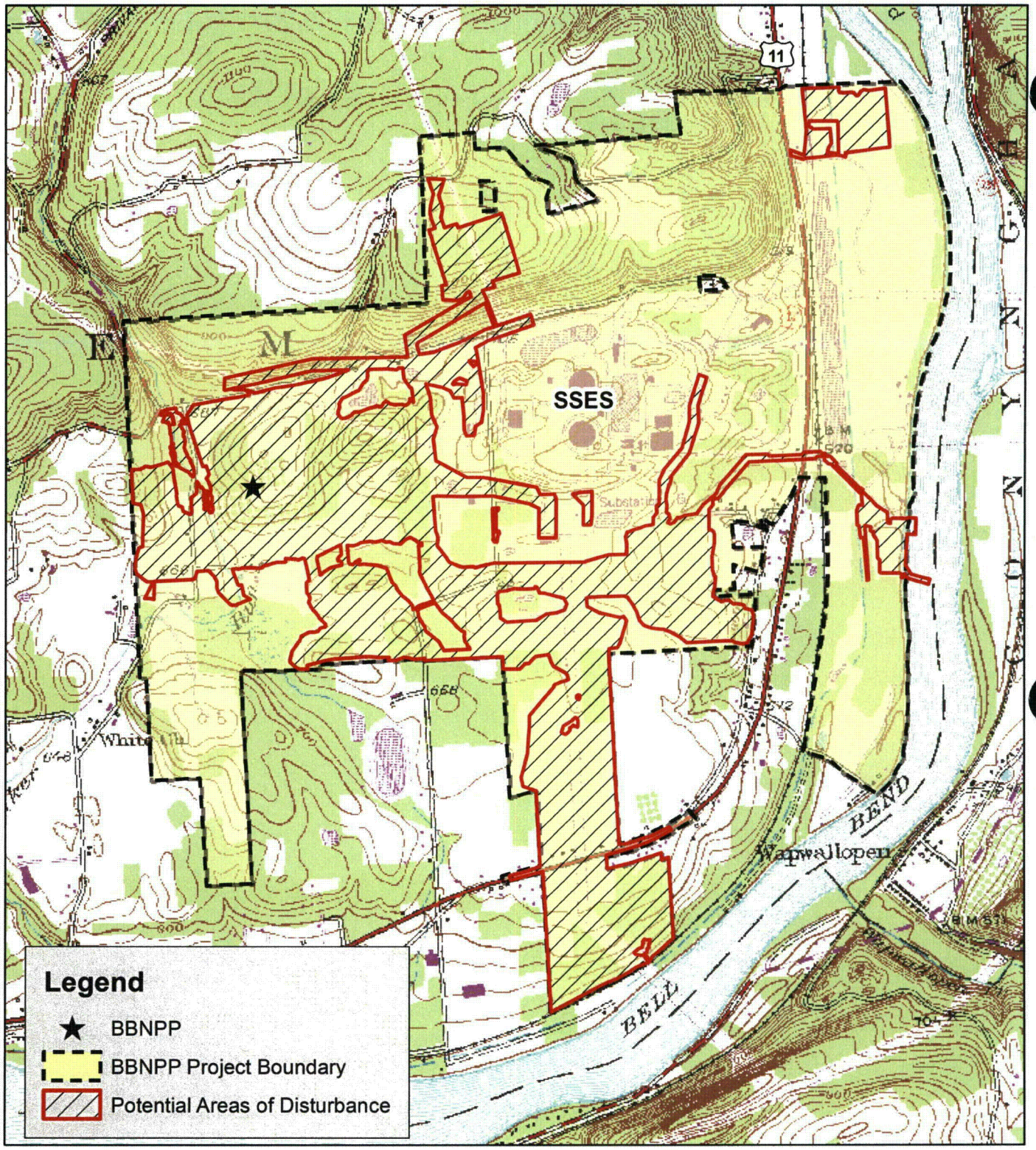

Figure 1.
Location of Proposed BBNPP

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date: 07/20/10
prepared by: s.sherman
project: 22474.000

rev. date: 11/11/10, 09/01/11
prepared for: b.lees
file name: Figure1.BBNPP_Site_USGS

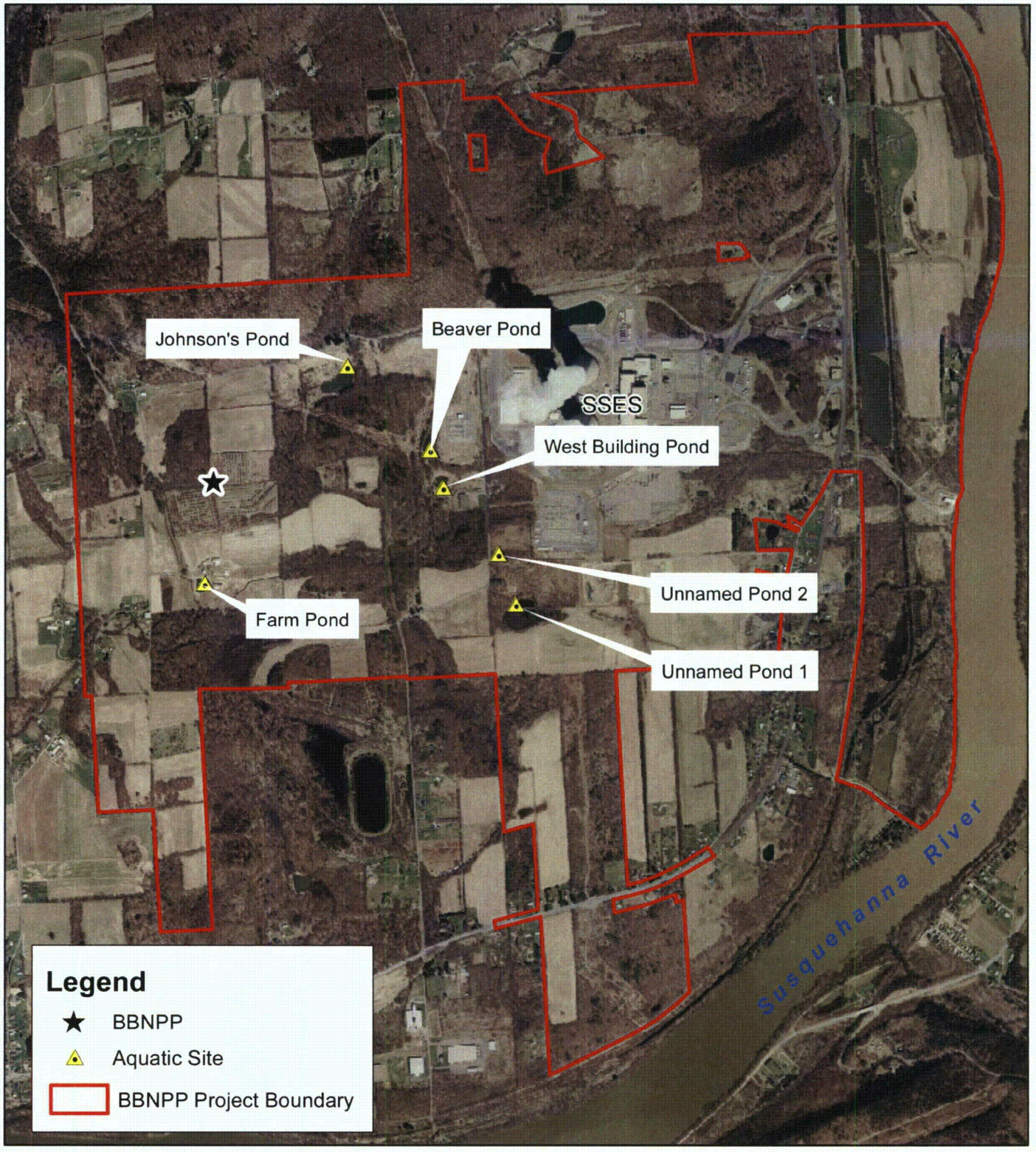

Figure 2.
Location of the pond biota collection stations.

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rev. date: 11/17/10, 09/01/11
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file name: Figure2.BBNPP Ponds

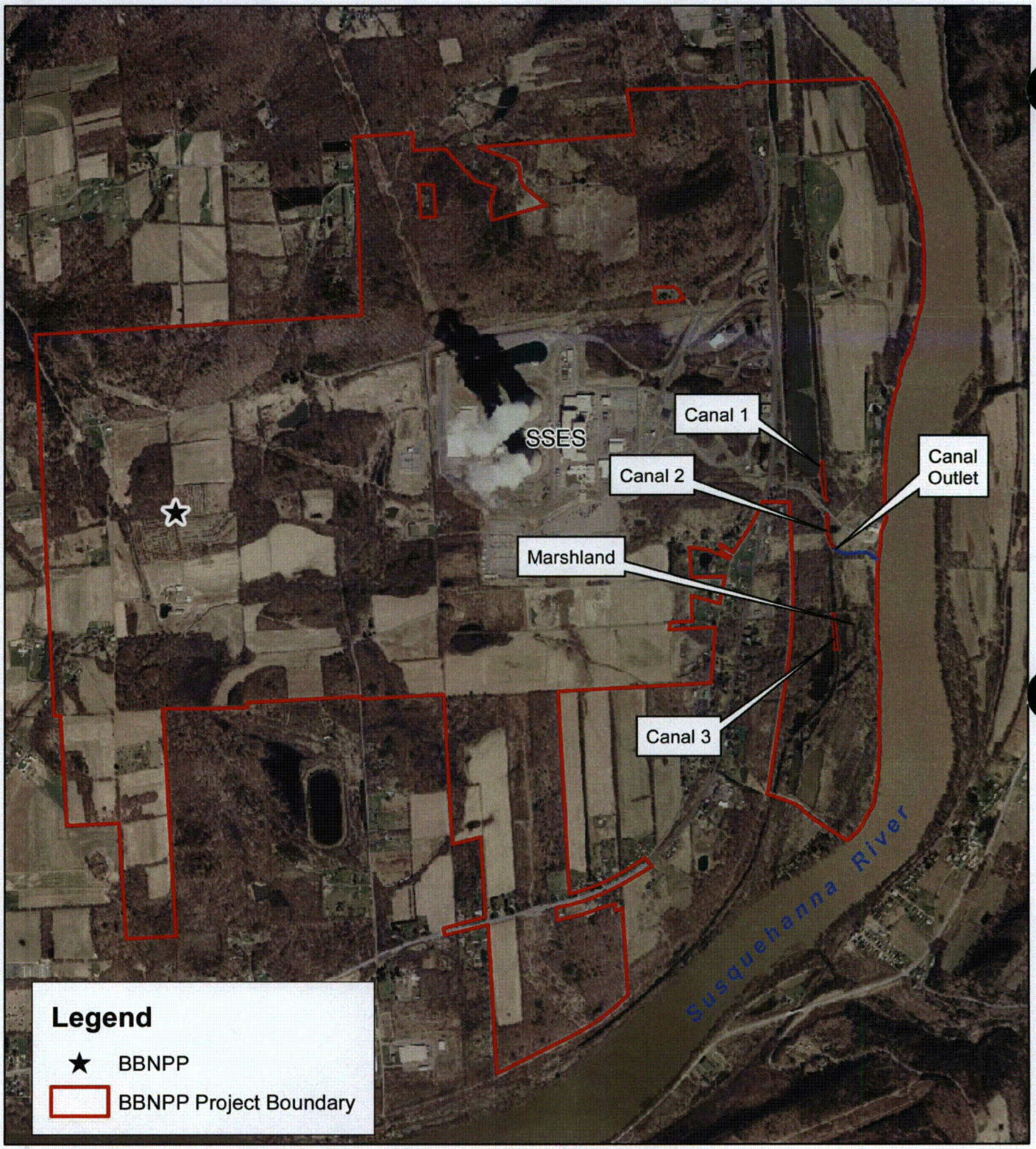

Figure 3.
Location of the North Branch Canal, Canal Outlet and Marshland biota collection stations.

N

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prepared for: b.lees
file name: Figure3.North_Branch_Canal

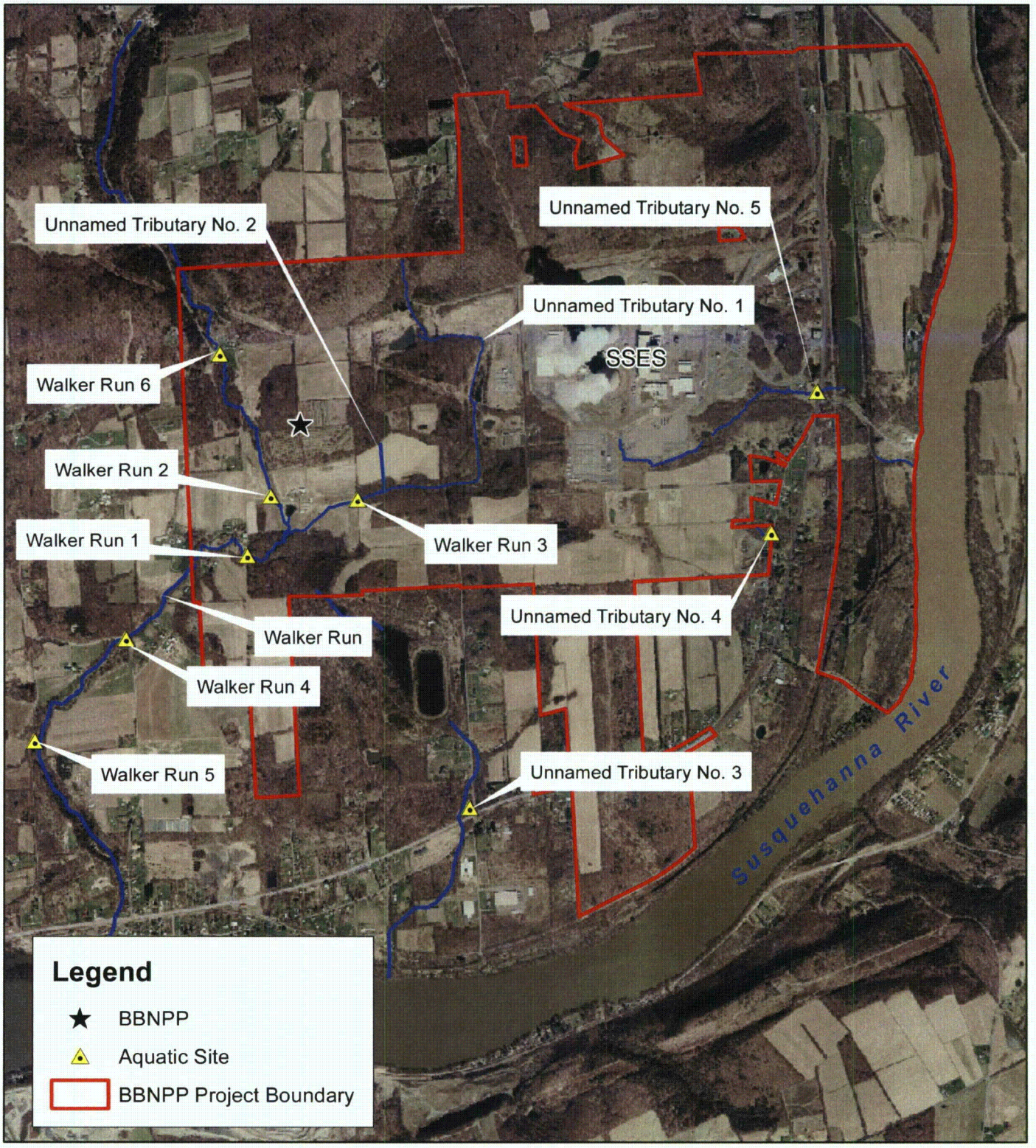

Figure 4.
Location of biota sample stations on Walker Run and unnamed tributaries.

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project: 22474.000

rev. date: 11/17/10, 09/01/11
prepared for: b.lees
file name: Figure4.BBNPP StreamSamples

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Table 10. Mean, minimum, and maximum total length of fish collected in impingement samples from the SSES CWIS traveling screens, April 22, 2008 to April 20, 2009.

RECORD OF REVISIONS

Revision	Date	Pages/Sections Changed	Brief Description
000	May 2009	All	Initial release
001	June 2010	Figure 1	Removed OCA boundary
001	June 2010	All	Added document title to header and revision number to footer