

# Appendix E

## *Susquehanna Steam Electric Station* Units 1 and 2



**Applicant's  
Environmental Report -  
Operating License  
Renewal Stage**



**Appendix E**  
**Applicant's Environmental Report –**  
**Operating License Renewal Stage**  
**Susquehanna Steam Electric Station**

**PPL Susquehanna, LLC**

**Unit 1**

**Docket No. 50-387**

**License No. NPF-014**

**Unit 2**

**Docket No. 50-388**

**License No. NPF-022**

**September 2006**

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## ACRONYMS AND ABBREVIATIONS

AADT	Annual Average Daily Traffic
AEC	Atomic Energy Commission
AEPS	Alternative Energy Portfolios Standards Act
BASD	Berwick Area School District
BTU	British Thermal Unit
BWR	Boiling Water Reactor
°C	Degrees Celsius
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CWA	Clean Water Act
DEP	[Pennsylvania] Department of Environmental Protection
DSM	Demand-Side Management
EPA	[U.S.] Environmental Protection Agency
EPP	Environmental Protection Plan
EPU	Extended Power Uprate
ESA	Endangered Species Act
°F	degrees Fahrenheit
FES	Final Environmental Statement
fps	feet per second
FSAR	Final Safety Analysis Report
FWS	[U.S.] Fish and Wildlife Service
GE	General Electric
GEIS	Generic Environmental Impact Statement for License Renewal of Nuclear Plants
gpd	gallons per day
gpm	gallons per minute
GW	groundwater
HPS	Hunlock Power Station
IPA	Integrated Plant Assessment
kWh	kilowatt hours
KOZ	Keystone Opportunity Zone
MGD	million gallons per day
MM	million
MSA	Metropolitan Statistical Area
MW	Megawatt
MWe	Megawatts-electric
MWt	Megawatts-thermal
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act

NESC	National Electrical Safety Code
NMFS	National Marine Fisheries Services
NO <sub>x</sub>	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRC	[U.S.] Nuclear Regulatory Commission
PNHP	Pennsylvania Natural Heritage Program
PJM	Pennsylvania, New Jersey, Maryland [power pool]
PM <sub>10</sub>	particulates with diameters less than 10 microns
PM <sub>2.5</sub>	particulates with diameters less than 2.5 microns
ppt	parts per thousand
PPUC	Pennsylvania Public Utilities Commission
PSDC	Pennsylvania State Data Center
PURTA	Pennsylvania Utility Realty Tax Act
PWS	Public Water Supply
SAMA	Severe Accident Mitigation Alternatives
SCR	Selective catalytic reduction
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SMITTR	Surveillance, Monitoring, Inspections, Testing, Trending, and Recordkeeping
SO <sub>2</sub>	sulfur dioxide
SO <sub>x</sub>	sulfur oxides
SRBC	Susquehanna River Basin Commission
SSES	Susquehanna Steam Electric Station
SW	surface water
TSP	total suspended particulates
USCB	U.S. Census Bureau

## **1.0 INTRODUCTION**

### **1.1 PURPOSE OF AND NEED FOR ACTION**

The U.S. Nuclear Regulatory Commission (NRC) licenses the operation of domestic nuclear power plants in accordance with the Atomic Energy Act of 1954, as amended, and NRC implementing regulations. PPL Susquehanna, LLC (PPL Susquehanna) operates the Susquehanna Steam Electric Station (SSES) Units 1 & 2, pursuant to NRC Operating Licenses NPF-014 and NPF-022, respectively. The license for Unit 1 will expire July 17, 2022 and the license for Unit 2 will expire March 23, 2024. PPL Susquehanna has prepared this environmental report in conjunction with its application to NRC to renew the SSES operating licenses, as provided by the following NRC regulations:

Title 10, Energy, Code of Federal Regulations (CFR), Part 54, Requirements for Renewal of Operating Licenses for Nuclear Power Plants, Section 54.23, Contents of Application-Environmental Information (10 CFR 54.23) and

Title 10, Energy, CFR, Part 51, Environmental Protection Requirements for Domestic Licensing and Related Regulatory Functions, Section 51.53, Postconstruction Environmental Reports, Subsection 51.53(c), Operating License Renewal Stage [10 CFR 51.53(c)].

NRC has defined the purpose and need for the proposed action, the renewal of the operating license for nuclear power plants such as SSES, as follows:

“...The purpose and need for the proposed action (renewal of an operating license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, and, where authorized, Federal (other than NRC) decision makers.” (NRC 1996a)

The renewed operating licenses would allow an additional 20 years of plant operation beyond the current SSES licensed operating period of approximately 40 years.

## 1.2 ENVIRONMENTAL REPORT SCOPE AND METHODOLOGY

NRC regulations for domestic licensing of nuclear power plants require environmental review of applications to renew operating licenses. The NRC regulation 10 CFR 51.53(c) requires that an applicant for license renewal submit with its application a separate document entitled Applicant's Environmental Report - Operating License Renewal Stage. In determining what information to include in the SSES Environmental Report, PPL Susquehanna has relied on NRC regulations and the following supporting documents that provide additional insight into the regulatory requirements:

- NRC supplemental information in the Federal Register (NRC 1996a, 1996b, 1996c, and 1999a)
- Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS) (NRC 1996d and 1999b)
- Regulatory Analysis for Amendments to Regulations for the Environmental Review for Renewal of Nuclear Power Plant Operating Licenses (NRC 1996e)
- Public Comments on the Proposed 10 CFR Part 51 Rule for Renewal of Nuclear Power Plant Operating Licenses and Supporting Documents: Review of Concerns and NRC Staff Response (NRC 1996f)
- Supplement 1 to Regulatory Guide 4.2, Preparation of Supplemental Environmental Report for Applications to Renew Nuclear Power Plant Operating Licenses (NRC 2000)

PPL Susquehanna has prepared [Table 1.2-1](#) to verify conformance with regulatory requirements. [Table 1.2-1](#) indicates where the environmental report responds to each requirement of 10 CFR 51.53(c). In addition, each responsive section is prefaced by a boxed quote of the regulatory language and applicable supporting document language.

**Table 1.2-1. Environmental Report Responses to License Renewal  
Environmental Regulatory Requirements**

<b>Regulatory Requirement</b>	<b>Responsive Environmental Report Section(s)</b>
10 CFR 51.53(c)(1)	Entire Document
10 CFR 51.53(c)(2), Sentences 1 and 2	3.0 Proposed Action
10 CFR 51.53(c)(2), Sentence 3	7.2.2 Environmental Impacts of Alternatives
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(1)	4.0 Environmental Consequences of the Proposed Action and Mitigating Actions
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(2)	6.3 Unavoidable Adverse Impacts
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(3)	7.0 Alternatives to the Proposed Action
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(3)	8.0 Comparison of Environmental Impacts of License Renewal with the Alternatives
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(4)	6.5 Short-Term Use Versus Long-Term Productivity of the Environment
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(5)	6.4 Irreversible and Irrecoverable Resource Commitments
10 CFR 51.53(c)(2) and 10 CFR 51.45(c)	4.0 Environmental Consequences of the Proposed Action and Mitigating Actions
10 CFR 51.53(c)(2) and 10 CFR 51.45(c)	6.2 Mitigation
	7.2.2 Environmental Impacts of Alternatives
	8.0 Comparison of Environmental Impacts of License Renewal with the Alternatives
10 CFR 51.53(c)(2) and 10 CFR 51.45(d)	9.0 Status of Compliance

**Table 1.2-1. Environmental Report Responses to License Renewal Environmental Regulatory Requirements (continued)**

Regulatory Requirement	Responsive Environmental Report Section(s)
10 CFR 51.53(c)(2) and 10 CFR 51.45(e)	4.0 Environmental Consequences of the Proposed Action and Mitigating Actions
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(2)	6.3 Unavoidable Adverse Impacts
10 CFR 51.53(c)(3)(ii)(A)	4.1 Water Use Conflicts (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a Small River with Low Flow)
10 CFR 51.53(c)(3)(ii)(A)	4.6 Groundwater Use Conflicts (Plants Using Cooling Water Towers or Cooling Ponds and Withdrawing Makeup Water from a Small River)
10 CFR 51.53(c)(3)(ii)(B)	4.2 Entrainment of Fish and Shellfish in Early Life Stages
10 CFR 51.53(c)(3)(ii)(B)	4.3 Impingement of Fish and Shellfish
10 CFR 51.53(c)(3)(ii)(B)	4.4 Heat Shock
10 CFR 51.53(c)(3)(ii)(C)	4.5 Groundwater Use Conflicts (Plants Using >100 gpm of Groundwater)
10 CFR 51.53(c)(3)(ii)(C)	4.7 Groundwater Use Conflicts (Plants Using Ranney Wells)
10 CFR 51.53(c)(3)(ii)(D)	4.8 Degradation of Groundwater Quality
10 CFR 51.53(c)(3)(ii)(E)	4.9 Impacts of Refurbishment on Terrestrial Resources
	4.10 Threatened or Endangered Species
10 CFR 51.53(c)(3)(ii)(F)	4.11 Air Quality During Refurbishment (Non-Attainment Areas)
10 CFR 51.53(c)(3)(ii)(G)	4.12 Microbiological Organisms

**Table 1.2-1. Environmental Report Responses to License Renewal  
Environmental Regulatory Requirements (continued)**

<b>Regulatory Requirement</b>	<b>Responsive Environmental Report Section(s)</b>
10 CFR 51.53(c)(3)(ii)(H)	4.13 Electric Shock from Transmission-Line-Induced Currents
10 CFR 51.53(c)(3)(ii)(I)	4.14 Housing Impacts
10 CFR 51.53(c)(3)(ii)(I)	4.15 Public Utilities: Public Water Supply Availability
10 CFR 51.53(c)(3)(ii)(I)	4.16 Education Impacts from Refurbishment
10 CFR 51.53(c)(3)(ii)(I)	4.17 Offsite Land Use
10 CFR 51.53(c)(3)(ii)(J)	4.18 Transportation
10 CFR 51.53(c)(3)(ii)(K)	4.19 Historic and Archaeological Resources
10 CFR 51.53(c)(3)(ii)(L)	4.20 Severe Accident Mitigation Alternatives
10 CFR 51.53(c)(3)(iii)	4.0 Environmental Consequences of the Proposed Action and Mitigating Actions
10 CFR 51.53(c)(3)(iii)	6.2 Mitigation
10 CFR 51.53(c)(3)(iv)	5.0 Assessment of New and Significant Information
10 CFR 51, Appendix B, Table B-1, Footnote 6	2.6.2 Minority and Low-Income Populations

### **1.3 SUSQUEHANNA STEAM ELECTRIC STATION LICENSEE AND OWNERSHIP**

Ownership of the station is shared by PPL Susquehanna, LLC, Berwick, PA (90 percent) and Allegheny Electric Cooperative Inc., Harrisburg, PA (10 percent). PPL Susquehanna, LLC, is a subsidiary of PPL Generation, LLC, which is a subsidiary of PPL Energy Supply, LLC, which is a subsidiary of PPL Corporation based in Allentown, PA. PPL Corporation generates electricity at power plants in the northeastern and western United States; markets energy throughout the United States and Canada; provides energy services for businesses in the mid-Atlantic and northeastern U.S.; and delivers energy to customers in Pennsylvania, the United Kingdom and Latin America. PPL Susquehanna is the licensed operator of SSES (PPL 2004).



## 1.4 REFERENCES

Note to reader: Some web pages cited in this document are no longer available, or are no longer available through the original URL addresses. Hard copies of cited web pages are available in PPL Susquehanna files. Some sites, for example the census data, cannot be accessed through their given URLs. The only way to access these pages is to follow queries on previous web pages. The complete URLs used by PPL Susquehanna have been given for these pages, even though they may not be directly accessible. Also, all references are specific to respective chapter.

NRC (U.S. Nuclear Regulatory Commission). 1996a. "Environmental Review for Renewal of Nuclear Power Plant Operating Licenses." Federal Register. Vol. 61, No. 109. June 5.

NRC (U.S. Nuclear Regulatory Commission). 1996b. "Environmental Review for Renewal of Nuclear Power Plant Operating Licenses; Correction." Federal Register. Vol. 61, No. 147. July 30.

NRC (U.S. Nuclear Regulatory Commission). 1996c. "Environmental Review for Renewal of Nuclear Power Plant Operating Licenses." Federal Register. Vol. 61, No. 244. December 18.

NRC (U.S. Nuclear Regulatory Commission). 1996d. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants. Volumes 1 and 2.* NUREG-1437. Washington, DC. May.

NRC (U.S. Nuclear Regulatory Commission). 1996e. *Regulatory Analysis for Amendments to Regulations for the Environmental Review for Renewal of Nuclear Power Plant Operating Licenses.* NUREG-1440. Washington, DC. May.

NRC (U.S. Nuclear Regulatory Commission). 1996f. *Public Comments on the Proposed 10 CFR Part 51 Rule for Renewal of Nuclear Power Plant Operating Licenses and Supporting Documents: Review of Concerns and NRC Staff Response. Volumes 1 and 2.* NUREG-1529. Washington, DC. May.

NRC (U.S. Nuclear Regulatory Commission). 1999a. "Changes to Requirements for Environmental Review for Renewal of Nuclear Power Plant Operating Licenses; Final Rule." Federal Register. Vol. 64, No. 171. September 3.

NRC (U.S. Nuclear Regulatory Commission). 1999b. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS). Section 6.3, "Transportation" and Table 9-1, "Summary of findings on NEPA issues for license renewal of nuclear power plants."* NUREG-1437. Volume 1, Addendum 1. Washington, DC. August.

NRC (U.S. Nuclear Regulatory Commission). 2000. Preparation of Supplemental Environmental Reports for Applications to Renew Nuclear Power Plant Operating Licenses; Supplement 1 to Regulatory Guide 4.2. Washington, DC. September.

PPL. 2004. Susquehanna Energy Information Center. Available at:  
<http://www.pplweb.com/community/seic/index.htm>. Accessed June 2, 2004.

## 2.0 SITE AND ENVIRONMENTAL INTERFACES

### 2.1 LOCATION AND FEATURES

Susquehanna Steam Electric Station (SSES) is located in Salem Township, Luzerne County, Pennsylvania, along the Susquehanna River in an area of open deciduous woodlands, interspersed with grasslands and orchards (PPL 2005). The largest community within 10 miles of the site is the borough of Berwick, Pennsylvania, approximately five miles southwest of SSES. The nearest major metropolitan areas are Wilkes-Barre, Pennsylvania, approximately 20 miles to the northeast; Allentown, Pennsylvania, approximately 50 miles to the southeast; and Harrisburg, Pennsylvania, approximately 70 miles southwest of the SSES site (NRC 1981). [Figures 2.1-1](#) and [2.1-2](#) are the 50-mile and 10-mile vicinity maps, respectively.

PPL Susquehanna owns 2,355 acres on both sides of the Susquehanna River (Fields 2005). SSES is on the west side of the Susquehanna River on 1,574 acres, that includes the SSES property (1,173 acres) and the Riverlands Recreation Area (401 acres), a strip of land between the power generating facilities and the Susquehanna River (PPL 2004; [Figure 2.1-3](#)). Land on the west side of the river is jointly owned with Allegheny Electric Cooperative (10%). The Riverlands Recreation Area includes natural and recreational areas (PPL 2004):

- Riverlands Nature Center. The Nature Center is located in the Susquehanna Energy Information Center at the entrance to the Recreation Area ([Figure 2.1-3](#)).
- Riverlands Recreation Area. This recreation area on the west side of the river is a popular spot for picnicking, group outings, hiking, sports, and playing.
- Lake Took-A-While. A 30-acre fishing lake and a restored section of the North Branch Canal provide fishing opportunities and are open to the public. Boating is allowed, but no gasoline engines are permitted.
- Wetlands Nature Area. This 94-acre tract of riverine forest, marsh, swamp, and vernal pools has been set aside as an area for nature study and education. A portion of the long-abandoned North Branch Canal runs north-south across the property.

US Route 11 separates the SSES property from the Riverlands Recreation Area. The developed portion of the SSES property is approximately 487 acres, 233 acres of which are within the Protected Area (see [Figure 2.1-3](#)). The Protected Area is surrounded by security fencing; access to this part of the site is through the main entrance off US Route 11 (Fields 2005).

Figure 2.1-1.50 Mile-Vicinity Map.

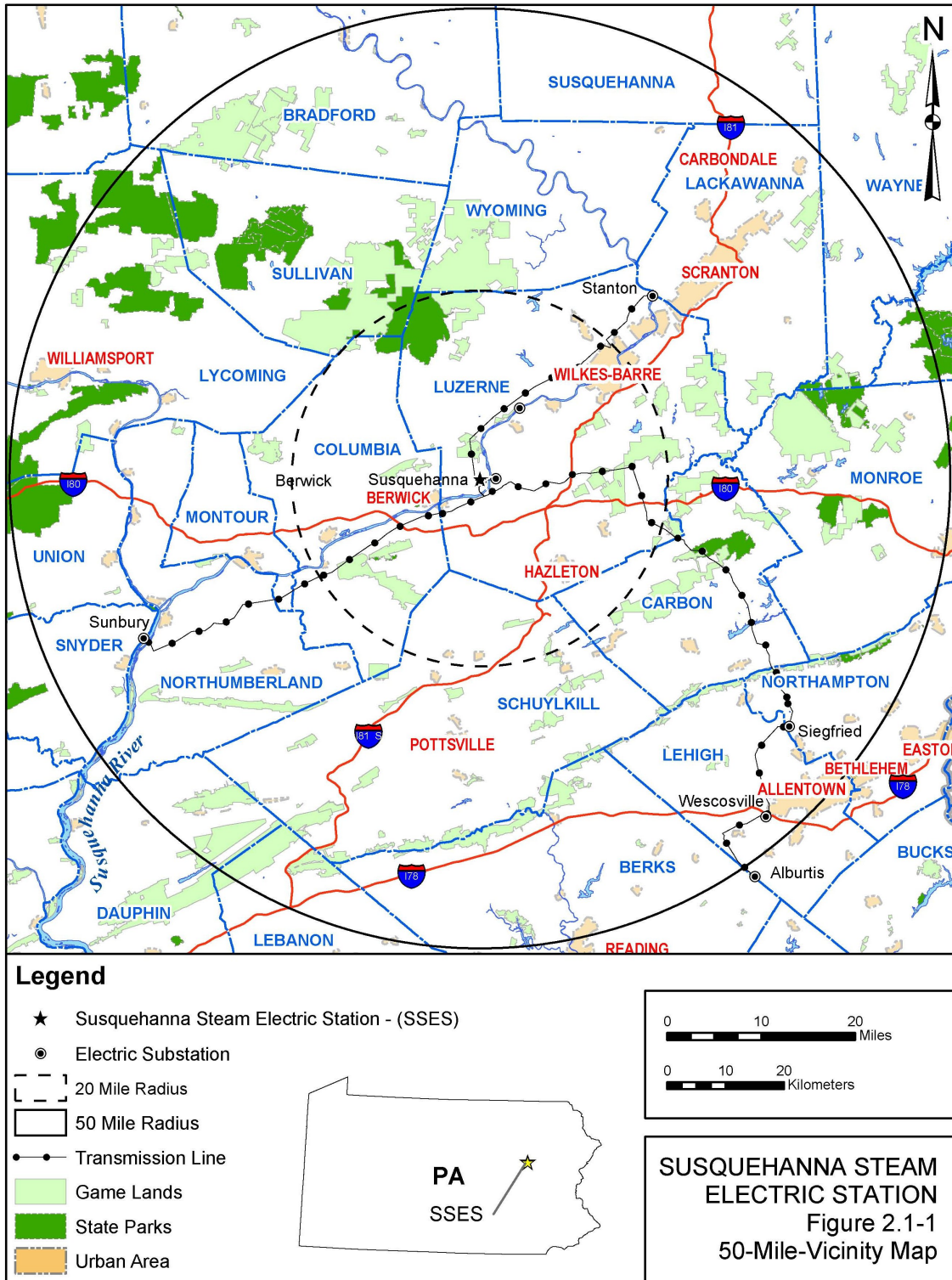


Figure 2.1-2. 10-Mile Vicinity Map

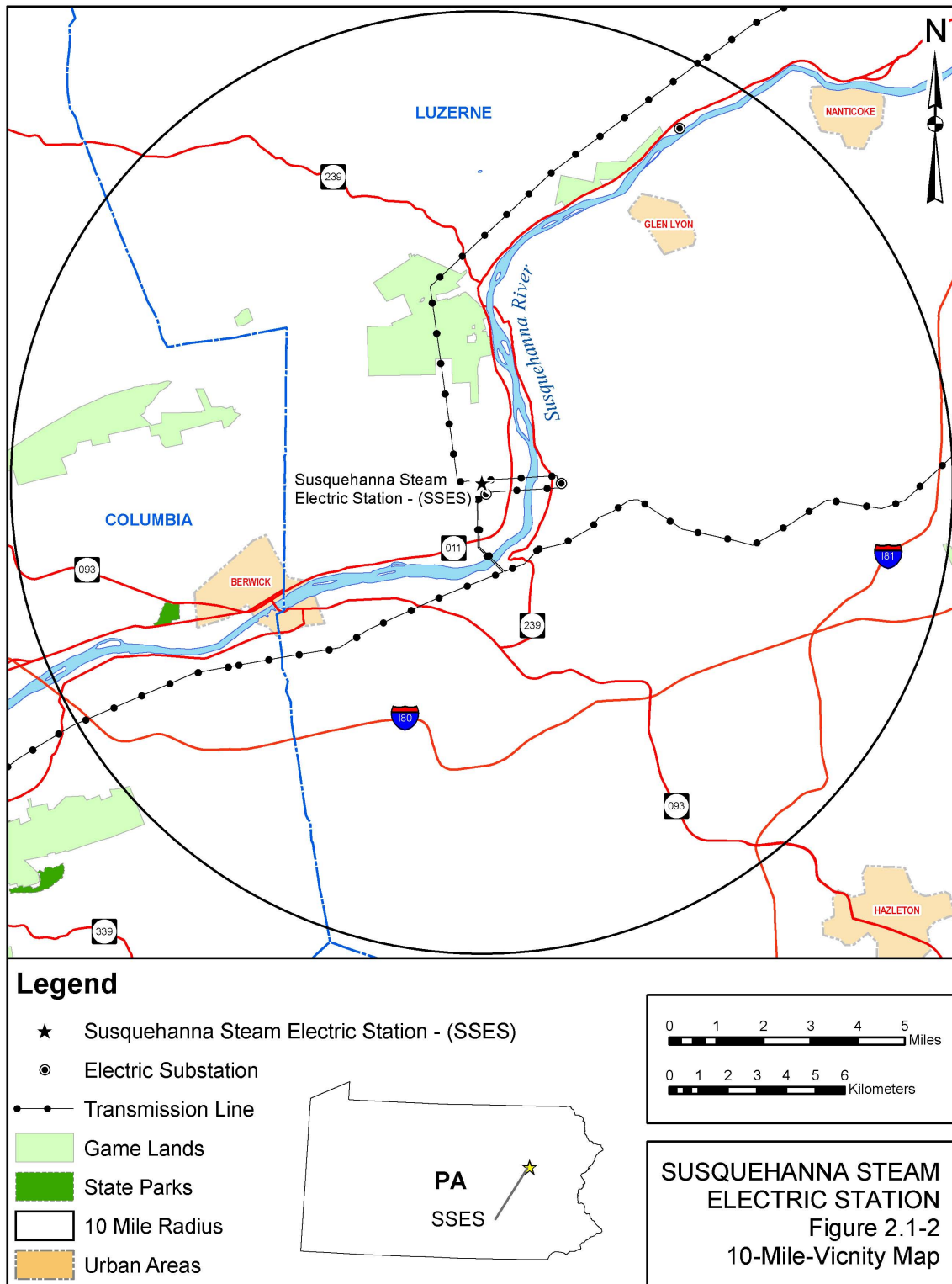
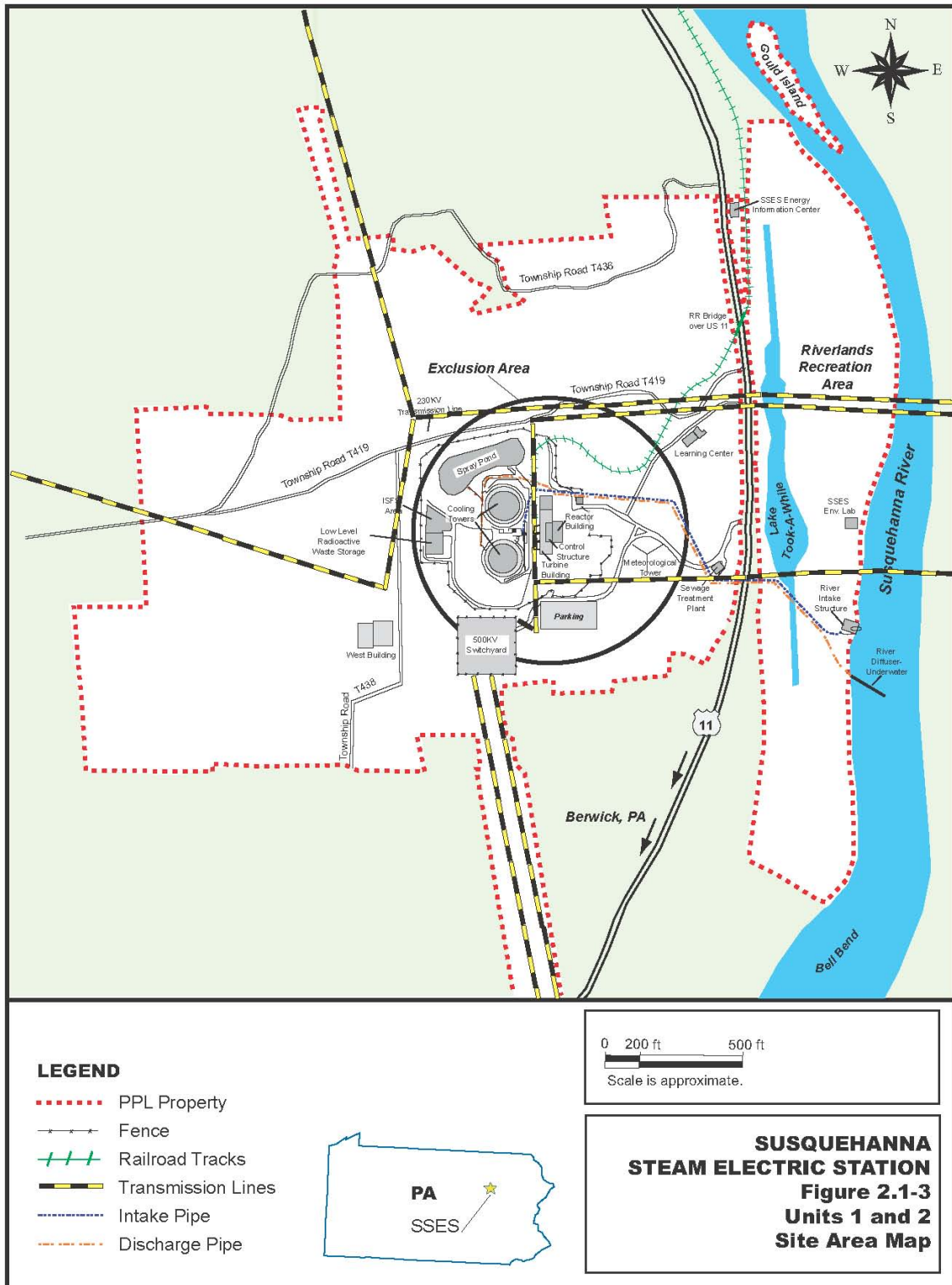




Figure 2.1-3. Site Area Map



The property also includes a 401 acre nature preserve known as the Susquehanna Riverlands. PPL Susquehanna owns 717 of these mostly undeveloped acres on the east side of the Susquehanna River (Fields 2005). This includes approximately 275 acres of natural, recreational, and wildlife lands. Council Cup Scenic Overlook (88 acres), a 700-foot-high bluff that affords a spectacular view of the Susquehanna River Valley, is the dominant natural topographic feature of the Susquehanna Riverlands (PPL 2004). This scenic overlook was used in the past as a lookout and meeting place for Native Americans. Gould Island, a 65-acre island that lies just upstream of the Riverlands Area, is owned by PPL Susquehanna (PPL 2004).

The SSES reactors are on a rolling plateau above the river at an approximate elevation of 675 feet above mean sea level (NRC 1981). SSES consists of two boiling water reactors, Unit 1 and Unit 2, with electrical capability of 1,300 MWe each (PPL 2005; Detamore 2004). The net capacity will be approximately 2,510 MWe for both units after the extended power uprate is approved by the NRC. The units share a common control room, refueling floor, turbine operating deck, radwaste system, and other auxiliary systems (PPL 2005).

Section 3.1 describes key features of SSES, including reactor and containment systems, cooling water system, and transmission system.

## **2.2 AQUATIC ECOLOGY**

PPL Susquehanna has conducted studies of water quality and aquatic organisms in the Susquehanna River up- and downstream of SSES since 1971. This long-term monitoring program has made it possible for PPL Susquehanna to monitor the overall health of the Susquehanna River and its aquatic communities in the vicinity of SSES and to identify any chronic or recurring water quality problems or obvious impacts to aquatic communities that might be traced to operation of SSES. The comprehensive monitoring program that assessed water quality, algae (periphyton and phytoplankton), benthic macroinvertebrates, and fish from 1971 to 1994 was reduced in scope in 1995 to focus on water quality and fish populations as key indicators of possible SSES-related impacts.

### **2.2.1 Hydrology**

The Susquehanna River flows south more than 440 miles from its source, Lake Otsego in south-central New York, to Havre de Grace, Maryland, where it empties into the Chesapeake Bay. It drains an area of about 27,500 square miles and supplies approximately 19 million gallons of fresh water per minute to the Chesapeake Bay, about half of the Bay's total freshwater inflow (Alliance for the Chesapeake Bay undated; Smithsonian Environmental Research Center 2003).

PPL Susquehanna monitors Susquehanna River levels at SSES and uses these measurements to estimate flows at the station, based on established river level – flow relationships. In 2004, Susquehanna River flow was above average every month except February, April and June. It was a year with above average precipitation primarily caused by the remnants of four hurricanes passing through the Susquehanna drainage. Daily mean flow ranged from 2,970 cubic feet per second (cfs) (July 8) to 204,000 cfs (September 19). Average monthly (daily mean) flows ranged from 6,970 cfs (February) to 38,200 cfs (September) (Ecology III 2005).

The Susquehanna River at SSES shows a predictable annual pattern of temperatures, with lowest temperatures in winter and highest temperatures in late summer. River temperature was monitored from February 18 to December 31, 2004. A new recorder was installed on February 18 to replace the old one which was destroyed by a lightning strike. In 2004, daily mean river temperatures ranged from 0.1° C (32.2° F, December 21) to 26.2° C (79.2° F, July 5), while average monthly mean temperatures ranged from 1.6° C (34.9° F) in February to 24.1° C (75.4° F) in July (Ecology III 2005).



## **2.2.2 Water Quality**

Water quality in the Susquehanna River in the area of SSES has improved steadily since PPL Susquehanna began monitoring in 1971. This improvement has been attributed to a reduction in mine drainage pollutants from upstream sources and a reduction in point source pollutants from upstream municipal water treatment plants and industrial facilities following the enactment of the Clean Water Act in 1972. From 1973 through 2004, there was a decreasing trend in levels of turbidity, sulfate, total iron, total solids, and total suspended solids and an increasing trend in pH, total alkalinity, and dissolved oxygen concentrations (Ecology III 2005). The most noticeable change in 32 years of water quality monitoring at SSES has been the reduction in total iron levels in this reach of the Susquehanna River. Most, if not all, of these water quality improvements were associated with the demise of anthracite coal mining in the Wyoming Valley region upriver of SSES in the 1970s (Ecology III 2005).

## **2.2.3 Aquatic Communities**

Prior to 1995, PPL Susquehanna monitored algae (periphyton and phytoplankton) and benthic macroinvertebrates at an upriver control station (SSES) and two downriver indicator stations (Bell Bend and Bell Bend I). In 1994, the last year in which collections were made, totals of 42, 39, and 40 genera of periphyton were found at SSES, Bell Bend, and Bell Bend I locations, respectively (Ecology III 1995). Diatoms comprised 83, 75, and 76 percent, respectively, of all attached algal cells at the three sites. Densities of periphyton at both the control and indicator sites decreased in operational years compared to pre-operational years. Also, the composition of the periphyton shifted from mainly green algae and diatoms during the pre-operational years to mainly diatoms in the operational years. These changes occurred at both control and indicator sites, and were therefore not related to SSES operations (Ecology III 1995).

Benthic macroinvertebrates were monitored at control and indicator locations from 1980 through 1994. Trichopterans (caddisflies) and ephemeropterans (mayflies) dominated collections at the control site in both pre-operational (1980-1982) and operational (1983-1994) years, but ephemeropterans became relatively more abundant in the 1990s (Ecology III 1995). Ephemeropterans made up the bulk of macroinvertebrates (by weight) at indicator sites in most years. Overall, the ephemeropterans made up a “major portion” of the biomass in each year after 1983, when SSES began operating (Ecology III 1995). Ephemeropterans, which dominated collections at both control and indicator sites, are widely regarded as a pollution-sensitive group that is an indicator of good water quality (Michigan State University 1997, Pennsylvania Sea Grant 2003, EPA 2003a).

PPL Susquehanna monitors Susquehanna River fish populations at a control station (two sites, one along the east bank and one along the west bank) upriver of the SSES river intake structure and at an indicator station (east and west bank sites) at Bell Bend downriver of the discharge diffuser. Fish are collected by electrofishing and seining in spring, summer, and fall at study sites established in 1976 and sampled in the same manner since that time.

In 2004, 993 fish of 21 species were collected at control and indicator locations (Ecology III 2005). Quillback was the most abundant species at both control and indicator locations, making up 22 percent and 23 percent of all fish collected, respectively (Ecology III 2005). Smallmouth bass and walleye ranked second and third in abundance at both control and indicator locations. Species richness was higher at the indicator location (20 species) than the control location (17 species) (Ecology III 2005). This was due primarily to a greater diversity of Lepomids (sunfish) at the indicator sites downriver of the SSES discharge diffuser.

Statistical analysis of electrofishing collections (number of fish per sample) indicated that seven species experienced significant post-operational declines at Bell Bend (indicator) sites relative to SSES (control) sites: quillback, white sucker, northern hogsucker, shorthead redhorse, muskellunge, rock bass, and smallmouth bass. Some of these apparent declines were attributed to “greater increases” at control sites, meaning that local populations appeared to expand more rapidly at upriver control sites than downriver indicator sites; others were attributed to “greater decreases” at indicator sites, meaning that local populations appeared to decline more rapidly at downriver indicator sites than upriver control sites.

Seining at control and indicator locations in 2004 collected 897 fish of 12 species (Ecology III 2005). Samples were numerically dominated by bluntnose minnow and two shiner species, the spotfin shiner and the spottail shiner, which together made up 83 percent and 94 percent, of all fish collected by seine at control and indicator locations respectively, (Ecology III 2005). Bluntnose minnow was the most commonly captured species at control sites (37 percent of fish collected), as was spottail shiner at indicator sites (45 percent of fish collected).

Eleven species (of the 12 species collected) were collected at both the control and indicator sites, and at both locations minnows and sunfish dominated samples. The number of fish collected at the SSES control location was approximately one-fourth (24 percent) the number collected at the Bell Bend indicator location, a trend observed for the last several years.

Based on fish studies conducted annually since 1976, the Susquehanna River in the vicinity of SSES supports a diverse assemblage of coolwater and warmwater fishes including Notropids (minnows), Catastomids (suckers), Ictalurids (catfish), Centrarchids (sunfish), and Percids (darters and perch). There is no indication that pollution-tolerant species or groups are predominant or that sensitive or pollution-intolerant species are rare or absent. Water quality improvement in the 1970s and 1980s brought fishermen back to the river in increasing numbers (Ecology III 1987). Creel surveys conducted in 1986 in the vicinity of SSES revealed that muskellunge, smallmouth bass, and walleye were the species most often sought by anglers and walleye, channel catfish, and smallmouth bass were the species most often caught. Although no recent creel data are available, anecdotal information suggests that these same species continue to be sought and harvested by fishermen in the vicinity of SSES. Smallmouth bass fishing appears to be growing in popularity; however, as the quality of the smallmouth bass fishing improves.

## 2.3 GROUNDWATER RESOURCES

SSES is located in the Appalachian Mountain Section of the Valley and Ridge Physiographic Province. The site is on a relatively flat plateau south of a ridge and overlooking the Susquehanna River floodplain to the east. Both the plateau and the floodplain are underlain by a weathered overburden of glacial till and outwash. This material ranges from gravel-boulders (adjacent to bedrock) to sand and silt nearer the surface (AEC 1973). The depth of overburden varies across the site from 0 to 125 feet (PPL 2005). Beneath the overburden the bedrock consists of the Devonian Mahantango Formation which is a siltstone with a well-developed joint system. The Mahatango bedding is delineated by sandstone stringers and is composed of upper and lower members with the lower unit being more calcareous and resistant to erosion. Beneath the Mahantango Formation are older shale deposits of the Marcellus Formation (PPL 2005) and deeper still is the Onandaga Formation (AEC 1973). These three formations formed in the Devonian period of the Paleozoic era (around 390 million years ago). The Mahatango and Marcellus Formations vary to approximately 1,100 and 400 feet thick, respectively, in the area (PPL 2005). The predominantly siltstone strata of the Mahantango Formation constitutes a limited source of domestic water, but due to its relatively low yield is not considered a local aquifer (PPL 2005). The Onandaga Formation consists of a non-cherty limestone approximately 1,000 feet beneath the site (AEC 1973).

Two general types of aquifers occur in the region. The first consists of the sandstone and occasional limestone strata that occur within the predominant shales of the Paleozoic rock. The second exists in the unconsolidated overburden material that is for the most part Pleistocene stratified drift, till, or kames (laid down within the last 70 million years). Within two miles of SSES most groundwater wells are completed in the bedrock shales (PPL 2005).

SSES is not located in a recharge area for any aquifer; however, recharge to the unconsolidated sand and gravel does occur over the site. Groundwater movement on the site is generally in an easterly direction and ultimately discharges to the Susquehanna River (PPL 2005).

## **2.4 CRITICAL AND IMPORTANT TERRESTRIAL HABITATS**

PPL Susquehanna owns 2,355 acres on both sides of the Susquehanna River. Approximately 487 acres are used for generation facilities and associated maintenance facilities, laydown areas, parking lots, and roads, and approximately 130 acres is leased to local farmers (Fields 2005). The remainder of the site is primarily river floodplain forest, upland forest, and marshes (NRC 1981, Jaquith 1999). The river floodplain forest at SSES is dominated by silver maple, river birch, and Northern red oak. The upland forest is dominated by Virginia pine, sweet birch, flowering dogwood, white oak, Northern red oak, black oak, and yellow poplar. The marsh is dominated by a variety of emergent vegetation such as sedges, bulrush, cattail, and cutgrass (NRC 1981).

The PPL Susquehanna property includes the Susquehanna Riverlands a 401 acre nature preserve that is used for outdoor recreation, Wetlands Nature Area, and wildlife habitat on the west bank of the river. On the east side of the river is the Council Cup Scenic Overlook, a 700-foot-high bluff and natural area (PPL 2004). Also, there are approximately 275 acres of natural, recreational, and wildlife lands on the east side of the river.

Numerous wildlife species occur in the forests and marshes at SSES. Common mammals include Eastern cottontail, white-tailed deer, opossum, raccoon, and a variety of small rodents such as the Eastern gray squirrel, meadow vole, and deer mouse. Beavers and muskrats are common in the marshes and along the river shoreline (NRC 1981, Jaquith 1999).

A variety of reptiles and amphibians inhabit SSES. The most commonly observed snakes are the Eastern garter snake, black rat snake, and the Northern water snake. Common turtles in riparian and wetland areas include the Eastern painted turtle, snapping turtle, wood turtle, and spotted turtle. The Eastern box turtle is common in the upland forests. Common amphibians include American toads, spring peepers, Southern leopard frogs, green frogs, red-backed salamanders, slimy salamanders, and red-spotted newts (Jaquith 1999).

The National Audubon Society has designated the Susquehanna Riverlands as an Important Bird Area in Pennsylvania because of the extensive riparian forests and the numerous bird species that utilize the area. Birds characteristic of the river floodplain forests at SSES include the yellow-throated vireo, tufted titmouse, American redstart, and blue-grey gnatcatcher. Birds associated specifically with wetlands at SSES include the swamp sparrow, Virginia rail, and waterfowl such as the wood duck and mallard. Common upland birds species at SSES include the wood thrush, red-eyed vireo, scarlet tanager, eastern wood pewee, blue jay, and red-tailed hawk (Jaquith 1999).

Section 3.1.3 describes the transmission lines that were built to connect SSES to the transmission systems. The principal land-use categories crossed by the transmission corridors are agriculture and hardwood forest (PPL Electric Utilities Corp 2004). The SSES-associated transmission corridors are maintained by trimming or removal of undesirable vegetation from the floor and sides of the corridors, and by use of herbicides (PPL Electric Utilities Corp 2004). Transmission lines are patrolled annually by helicopter. Herbicide application includes stump treatment, basal application, and foliar application, and is done by certified applicators according to label specifications. Small and large shrubs, and small trees such as flowering dogwood, redbud, hawthorn, cedar, and dwarf willow within the transmission corridors are preserved to the greatest extent possible. In addition, taller trees are preserved when on gullies, ravines, or hillsides where topography is such that the trees will never reach the wire security zone (PPL Electric Utilities Corp 2004).

The SSES transmission lines do not cross any national parks or other federal lands, but several State Game Lands are crossed. State Game Lands are publicly owned lands managed by the Pennsylvania Game Commission that are set aside for the protection, propagation, and management of game and wildlife; these lands provide areas for public hunting and trapping. The Sunbury corridor crosses State Game Lands No. 58. The Stanton corridor crosses State Game Lands No. 260. The Alburtis corridor crosses State Game Lands Nos. 187, 149, 141, and 168, and Hickory Run State Park. No areas designated by the US Fish and Wildlife Service (FWS) as “critical habitat” for threatened or endangered species exist at SSES or along or adjacent to transmission lines.

## 2.5 THREATENED OR ENDANGERED SPECIES

Animal and plant species that are state- or federally-listed as endangered or threatened and recorded in counties within which SSES and its associated transmission lines are located are listed in [Table 2.5-1](#). Counties crossed by the transmission lines are Luzerne (the location of SSES), Carbon, Columbia, Lehigh, Northampton, Northumberland, Montour, and Snyder. The species included in [Table 2.5-1](#) are those that meet at least one of the following conditions:

- Records maintained by the U.S. Fish and Wildlife Service (FWS) indicate that the species is known to occur in Luzerne, Carbon, Columbia, Lehigh, Northampton, Northumberland, Montour, or Snyder counties, and the species is federally-listed as endangered, threatened, proposed for federal listing, or is a candidate for federal listing (FWS 2004).
- Records maintained by the Pennsylvania Natural Heritage Program (PNHP) indicate that the species has been verified since 1980 to occur in Luzerne, Carbon, Columbia, Lehigh, Northampton, Northumberland, Montour, or Snyder counties, and the species is state-listed as endangered or threatened (PDCNR 2004; 2005).
- The species has been observed in the vicinity of SSES by Ecology III biologists while conducting environmental studies at SSES (Ecology III 1995), and is state- or federally-listed.

The Susquehanna River and riparian wetlands near the river at SSES are utilized by several special-status bird species, especially during autumn and spring migrations. Ospreys (*Pandion haliaetus*) and bald eagles (*Haliaeetus leucocephalus*) have become relatively common along the river near SSES during migrations and bald eagles winter along the Susquehanna River in Luzerne and Columbia counties (Ecology III 1995). Peregrine falcons (*Falco peregrinus*), short-eared owls (*Asio flammeus*), American bitterns (*Botaurus lentiginosus*), least bitterns (*Ixobrychus exilis*), and great egrets (*Ardea alba*) are occasionally observed at SSES. The sedge wren (*Cistothorus platensis*), upland sandpiper (*Bartramia longicauda*), and black tern (*Chlidonias niger*) have each been recorded only once at SSES (Ecology III 1995). None of the bird species listed in [Table 2.5-1](#) is known to nest at SSES (Ecology III 1995). Osprey nests have been recorded in Luzerne, Carbon, and Northampton counties, and the upland sandpiper is known to nest in Northumberland County (PDCNR 2004).

Four species in [Table 2.5-1](#) are federally-listed as endangered or threatened. Indiana bats (*Myotis sodalis*), which are federally-listed as endangered; hibernate in Luzerne County with a known hibernaculum within five miles of the site (FWS 2004). Bog turtles (*Clemmys muhlenbergii*), federally-listed as threatened, occur in Lehigh and Northampton counties. Bald eagles, federally-listed as threatened, nest in

Northumberland County. Populations of the Northeastern bulrush (*Scirpus ancistrochaetus*), federally-listed as endangered, are known from Carbon and Lehigh counties (FWS 2004). Other than bald eagles, PPL Susquehanna has not identified any occurrences of these species at SSES.

In addition to the Indiana bat, state-listed mammals in counties crossed by the transmission lines are the Eastern woodrat (*Neotoma magister*), the small-footed myotis (*Myotis leibii*), and the Eastern fox squirrel (*Sciurus niger vulpinus*). The Eastern woodrat is known from Carbon and Snyder counties, and the small-footed myotis has been recorded in Luzerne and Northumberland counties (PDCNR 2004)

In addition to the Northeastern bulrush, state-listed plants recorded in counties crossed by the transmission lines are the variable sedge (*Carex polymorpha*), jeweled shooting star (*Dodecatheon radicum*), and spreading globeflower (*Trollius laxus laxus*). Variable sedge has been recorded in Luzerne and Carbon counties, jeweled shooting star is known to occur in Columbia, Montour, and Northumberland counties, spreading globeflower is known from Northampton County, wild bleeding-hearts (*Dicentra eximia*), matted spike-rush (*Eleocharis intermedia*), and crested dwarf iris (*Iris cristata*) is known from Carbon County, Torrey's rush (*Juncus torreyi*) occurs in Lehigh County, and Carey's smartweed (*Polygonum careyi*) is known from Carbon and Lehigh counties (PDCNR 2004; 2005). PPL has not identified any occurrences of these species at SSES.

Attachment B includes copies of PPL Susquehanna correspondence with FWS, the Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources, and the Pennsylvania Fish and Boat Commission. FWS and Pennsylvania state agencies have stated that no adverse impacts are expected from activities associated with license renewal.



**Table 2.5-1. Endangered and Threatened Species that could Occur in the Vicinity of SSES or in Counties Crossed by SSES Transmission Lines.**

Scientific Name	Common Name	Federal Status <sup>a</sup>	State Status <sup>a</sup>
<b>Mammals</b>			
<i>Neotoma magister</i>	Eastern woodrat	-	T
<i>Myotis sodalis</i>	Indiana bat	E	E
<i>Myotis leibii</i>	Small-footed myotis	-	T
<i>Sciurus niger vulpinus</i>	Eastern fox squirrel	-	T
<b>Birds</b>			
<i>Asio flammeus</i>	Short-eared owl	-	E
<i>Bartramia longicauda</i>	Upland sandpiper	-	T
<i>Botaurus lentiginosus</i>	American bittern	-	E
<i>Casmerodius alba</i>	Great egret	-	E
<i>Chlidonias niger</i>	Black tern	-	E
<i>Cistothorus platensis</i>	Sedge wren	-	T
<i>Falco peregrinus</i>	Peregrine falcon	-	E
<i>Haliaeetus leucocephalus</i>	Bald eagle	T	E
<i>Ixobrychus exilis</i>	Least bittern	-	E
<i>Pandion haliaetus</i>	Osprey	-	T
<b>Reptiles</b>			
<i>Clemmys muhlenbergii</i>	Bog turtle	T	E
<b>Plants</b>			
<i>Dicentra eximia</i>	Wild bleeding-hearts	-	E
<i>Carex polymorpha</i>	Variable sedge	-	E
<i>Dodecatheon radicum</i>	Jeweled shooting star	-	T
<i>Eleocharis intermedia</i>	Matted spike-rush	-	T
<i>Iris cristata</i>	Crested dwarf iris	-	E
<i>Juncus torreyi</i>	Torrey's rush	-	T
<i>Polygonum careyi</i>	Carey's smartweed	-	E
<i>Scirpus ancistrochaetus</i>	Northeastern bulrush	E	E
<i>Trollius laxus stricto</i>	Spreading globeflower	-	E

a. E = Endangered; T = Threatened; - = Not listed.

Source: FWS (2004) and PNHP (2004a, 2004b).