Alternative Site Evaluation Study

Prepared for
PSEG Power, LLC

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Prepared by

Sargent & Lundy LLC

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Alternative Site Evaluation Study

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ACRONYMS AND ABBREVIATIONS

Term	Definition or Clarification
7Q10	7-day, 10-year low flow
ABWR	Advanced Boiling Water Reactor
AP1000	Advanced Passive 1000
COL	Combined Operating License
DCA OSG	New Jersey Department of Community Affairs, Office of Smart Growth
DoD	Department of Defense
EAB	Exclusion Area Boundary
EPRI	Electric Power Research Institute
ESBWR	Economically Simplified Boiling Water Reactor (General Electric)
ESP	Early Site Permit
ESRI	Environmental Science Research Institute
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
gpm	Gallon(s) per minute
LLEA	Local law enforcement agency
LPZ	Low Population Zone
MMI	Modified Mercalli Intensity (Scale)
MNES	Mitsubishi Nuclear Energy Systems
NJDEP	New Jersey Department of Environmental Protection
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service

ACRONYMS AND ABBREVIATIONS (cont.)

Term	Definition or Clarification
NRCS	Natural Resource Conservation Service
OCA	Owner-Controlled Area
PA	Protected Area
$PM_{2.5}$	Particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers
PSE&G	Public Service Electric and Gas Incorporated
PSEG	PSEG Power, LLC
ROI	Region of Interest
SF	Summary File (U.S. Census Bureau)
SSE	Safe Shutdown Earthquake
UFSAR	Updated Final Safety Analysis Report
US-APWR	U.S. Advanced Pressurized Water Reactor
USEPA	U.S. Environmental Protection Agency
US-EPR	U.S. Evolutionary Power Reactor
USGS	U.S. Geological Survey
USNRC	U.S. Nuclear Regulatory Commission

1. EXECUTIVE SUMMARY

1.1 SCOPE

In April 2008, PSEG Power, LLC (PSEG) contracted Sargent & Lundy, LLC (Sargent & Lundy) to perform an Alternative Site Evaluation Study for a potential new nuclear power plant. In September 2009, PSEG requested that Sargent & Lundy finalize the Alternative Site Evaluation Study incorporating a revised Region of Interest and refined site layout information.

The primary objectives of the study were the following:

- Identify and evaluate alternative sites in a systematic, flexible, defensible, and quantitative manner
- Provide information for PSEG use in selecting a preferred/proposed site with desirable environmental, technical, and economic conditions
- Demonstrate that no "obviously superior" sites exist in the designated Region of Interest
- Document the results of the study in a form that provides source material/input for future licensing and permitting activities

The study was based on public domain and reconnaissance level information. No specific contacts with land owners or regulatory/political entities were made. PSEG provided inputs to the study for the final selection of a preferred/proposed site. Final site selection was made by PSEG after consideration of current business requirements as documented in this report.

The process used to perform the Alternative Site Evaluation Study complied with applicable U.S. Nuclear Regulatory Commission (USNRC) guidance provided in Section 9.2 of Regulatory Guide 4.2 and Section 9.3 of NUREG-1555. The process also generally followed the site selection procedures described in the Electric Power Research Institute (EPRI) report titled *Siting Guide: Site Selection and Evaluation Criteria for an Early Site Permit Application*, Final Report, March 2002 (EPRI Document 1006878). The process included the following major tasks:

- **Establish the Region of Interest (ROI).** As defined in NUREG-1555, the ROI is the area to be considered in searching for potential power plant sites.
- **Identify Candidate Areas.** As defined in NUREG-1555, Candidate Areas are areas within the ROI that remain after unsuitable areas are eliminated.

- **Identify Potential Sites.** As defined in NUREG-1555, Potential Sites are specific locations within the Candidate Areas that are identified for preliminary assessment in establishing Candidate Sites.
- **Identify Candidate Sites.** As defined in NUREG-1555, Candidate Sites are those Potential Sites that are considered to be among the best sites that can reasonably be found for the siting of a nuclear power plant.
- **Evaluate Candidate Sites.** In order to support PSEG's ultimate selection of a Proposed Site and Alternate Sites, the individual Candidate Sites were evaluated.

1.2 METHODS AND RESULTS

The ROI was established on the basis of several factors, including the existing corporate and physical presence of PSEG and other subsidiaries of Public Service Enterprise Group in the state of New Jersey, major load centers expected to be served by the new power plant, and diversity of environmental and geographic conditions for potential power plant sites. The new power plant would be a merchant facility and would not have a regulated service area. However, given the long history and strong presence of Public Service Enterprise Group in New Jersey, it is expected that the new plant would supply much of its output to important load centers in New Jersey via existing transmission circuits. Locating the facility in New Jersey would facilitate the delivery of power to these load centers and would allow Public Service Enterprise Group to make optimal use of its existing resources in the state. Locating the facility in New Jersey would also promote the state's energy self-sufficiency, which is one of the goals of the New Jersey Energy Master Plan. In addition, New Jersey provides a good diversity of environmental and geographic conditions for potential power plant sites. It is unlikely that any reasonable expansion of the ROI beyond New Jersey would significantly improve environmental diversity. Based on these considerations, the entire state of New Jersey was established as the ROI for the site evaluation study.

Candidate Areas were identified by constructing digitized Geographic Information System (GIS) maps of the entire ROI and applying exclusionary criteria to eliminate areas considered unsuitable for nuclear power plant siting. The purpose of the exclusionary criteria was to narrow-down the region to be considered for power plant siting and allow the study to focus on areas that have the greatest probability of containing desirable sites. The exclusionary criteria covered major factors that would make licensing, permitting, or development of a nuclear power plant impractical. The following exclusionary criteria were used:

- Areas more than 20 miles from a primary highway (Interstate, U.S., or State Route)

- Areas more than 20 miles from rail or barge transportation
- Areas more than 20 miles from a transmission line or substation with a voltage of 500 kV
- Areas more than 20 miles from a water source capable of supplying the minimum power plant make-up water requirement (35,000 gpm)
- Areas with a population density greater than 500 people per square mile, and buffer zones within 3 miles of those areas
- Designated parks, preserves, and recreation areas
- Active military bases

Application of these exclusionary criteria resulted in the identification of seven Candidate Areas, located from northern New Jersey to southern New Jersey.

Potential Sites were identified by examining the Candidate Areas to find specific locations that appeared, on the basis of high-level screening criteria, to be suitable for nuclear power plant siting. A key consideration was the availability of sufficient land suitable for arrangement of the power plant and other required facilities. Other required conditions included the following:

- Ground slope across the plant site not more than 5%
- Location as close as possible to water, transmission, and transportation resources
- Assessment of 100-year flood areas, wetlands, residences, and other sensitive land features

A total of 11 Potential Sites were identified, including at least one site in each of the Candidate Areas.

Candidate Sites were identified by examining the Potential Sites to determine whether they had any significant environmental or other issues that would make them impractical or otherwise undesirable for licensing, permitting, or development with a nuclear power plant. Issues considered in this evaluation included the following:

- **Environmental Acceptability.** The sites were reviewed with regard to major environmental issues, such as proximity to designated lands or waters and potential encroachment on sensitive land uses.
- **Nuclear Licensing.** The sites were reviewed with regard to major nuclear licensing issues, such as proximity to capable faults, proximity to hazardous land uses, and proximity to population centers.

- **Engineering and Cost.** The sites were reviewed with regard to major engineering and cost issues, such as the length and difficulty of required water, transmission, and rail connections, cooling water pumping head, and the ability to deliver large components to the site.

This evaluation resulted in the elimination of six of the Potential Sites from further consideration. The following sites were retained as Candidate Sites:

- Site 4-1 (Hunterdon County, New Jersey)
- Site 7-1 (Salem County, New Jersey)
- Site 7-2 (Salem County, New Jersey)
- Site 7-3, PSEG Bayside Tract (Cumberland County, New Jersey)
- Site 7-4, PSEG Nuclear Site (Salem County, New Jersey)

The Candidate Sites were evaluated in more detail, in order to provide a quantifiable basis for comparison. The primary purpose of these evaluations was to develop numerical scores that would allow the Candidate Sites to be ranked according to their overall suitability for development of a nuclear power plant. In order to support the numerical scoring, various specific aspects of the Candidate Sites were investigated and assessed, including the following:

- **Environmental and Permitting Conditions.** Factors related to environmental acceptability and permittability were evaluated in more detail than considered previously for the Potential Sites. Maps were obtained showing the property parcels on and near each Candidate Site. Information on zoning and land use planning was collected. Reviews were conducted of applicable state and local regulations concerning air quality, ambient noise, water withdrawal, land use, and other environmental, regulatory, and permitting issues. Site-specific information on threatened and endangered species and cultural resources was obtained from appropriate government agencies.
- **Transmission Interconnect and Stability Issues.** The feasibility of obtaining transmission interconnection for the Candidate Sites was evaluated through modeling of thermal overloads. The risk of transmission upgrades being required in order to maintain system stability was qualitatively evaluated. These evaluations allowed the sites to be scored based on potential interconnection and stability impacts.
- **Field Reconnaissance.** Field reconnaissance site visits were conducted. The field reconnaissance was intended to supplement and confirm the information collected from maps, aerial photographs, and other publicly available sources. Observations focused on issues such as the condition of wetlands and other natural habitats, recent residential developments, transportation routes, and constructability characteristics.
- **Refinement of Site Layouts.** Based on the information collected through the environmental evaluations and field reconnaissance, the site layouts were revised to make the best use of

existing property parcels and reduce impacts on environmentally sensitive areas. Summary descriptions of key site conditions were developed.

The numerical scores covered 40 site characteristics related to nuclear licensing issues, environmental issues, and engineering and economic issues. The possible score on each site characteristic ranged from 1 to 5, and each score was adjusted with an importance weighting factor ranging from 1 to 10, resulting in a maximum possible total weighted score of 1,400. The site characteristics, evaluation criteria, possible scores, and importance weighting factors were decided upon through discussions within the PSEG/Sargent & Lundy project team early in the project. They are generally consistent with the EPRI *Siting Guide* and with other nuclear power plant siting studies as reported in regulatory submittals to the USNRC.

The Candidate Sites were ranked according to the numerical scores developed using the methods described above. Based on their total weighted scores, the sites rank as shown in Table 1-1.

Table 1-1 — Site Rankings Based on Weighted Scores

Site	Total Weighted Score
7-4	1,014
7-3	904
7-2	886
7-1	875
4-1	772

1.3 CONCLUSIONS

The results of the evaluations indicate that all of the Candidate Sites are potentially viable nuclear power plant sites, and that Site 7-4 is the most favorable Candidate Site with regard to the factors considered in this study. As shown above, Site 7-4 was the highest-ranked site based on weighted overall scores, and it also was the highest-ranked site based on unweighted overall scores. In addition, Site 7-4 had the highest scores on environmental-related factors.

This study was performed in accordance with a standardized process, using applicable industry guidance from Regulatory Guide 4.2, NUREG-1555, and the EPRI *Siting Guide*. The process included many variables that should be considered as inputs in the selection of a Preferred Site for the new nuclear generating unit. Final site

selection was made by PSEG after consideration of current business requirements. PSEG has been evaluating the feasibility of a new nuclear generating unit since the summer of 2007, and this study was one step in that process.

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2. INTRODUCTION

In April 2008, PSEG Power, LLC, (PSEG) contracted Sargent & Lundy, LLC (Sargent & Lundy) to perform an Alternative Site Evaluation Study for a potential new nuclear power plant. In September 2009, PSEG requested that Sargent & Lundy finalize the Alternative Site Evaluation Study incorporating a revised Region of Interest and refined site layout information.

The primary objectives of the study were the following:

- Identify and evaluate alternative sites in a systematic, flexible, defensible, and quantitative manner
- Provide information for PSEG use in selecting a preferred/proposed site with desirable environmental, technical, and economic conditions
- Demonstrate that no "obviously superior" sites exist in the designated Region of Interest
- Document the results of the study in a form that provides source material/input for future licensing and permitting activities

The study was based on public domain and reconnaissance level information. No specific contacts with land owners or regulatory/political entities were made. PSEG provided inputs to the study for the final selection of a preferred/proposed site. Final site selection was made by PSEG after consideration of current business requirements as documented in this report.

The study was performed in accordance with a standardized process, generally following U.S. Nuclear Regulatory Commission (USNRC) guidance from Regulatory Guide 4.2 and NUREG-1555, and the Electric Power Research Institute (EPRI) report titled *Siting Guide: Site Selection and Evaluation Criteria for an Early Site Permit Application*, Final Report, March 2002 (EPRI Document 1006878). The approach and methods described in these source documents were used as guidance in developing the processes and evaluation criteria used in this study. Additional evaluation criteria were developed to address issues that were considered to be important in the siting of a new nuclear power plant. However, this study did not include all of the evaluations necessary to complete an Environmental Report as required under the National Environmental Policy Act to support an Early Site Permit (ESP) or Combined Operating License (COL) application to the USNRC. Those additional evaluations will be addressed during the future development of an Environmental Report to the degree they are applicable to any specific site.

The basic parameters of the Alternative Site Evaluation Study were determined based on regulatory guidance, benchmarking, the experience of current ESP and COL applicants, and input provided by PSEG. These basic parameters included the following:

- Site acreage and make-up water requirements should bound the requirements of the four reactor designs being considered by PSEG. The designs being considered are—
  - U.S. Evolutionary Power Reactor (US-EPR)
  - Advanced Boiling Water Reactor (ABWR)
  - U.S. Advanced Pressurized Water Reactor (US-APWR)
  - Advanced Passive 1000 (AP1000)
- Sites should be able to support one large unit (e.g., US-EPR) or two small units (i.e., AP1000) of the designs being considered.
- The potential to expand sites with additional units in the future should not be considered.
- Existing PSEG properties should be considered if they have sufficient size (at least 200 contiguous acres, not including linear rights-of-way).
- The potential power plant will have a maximum net generating capacity of approximately 2,200 MW (the nominal capacity of two AP1000 units).
- The potential power plant must interconnect with a transmission line or substation with a voltage of 500 kV (the maximum voltage currently available in New Jersey and the voltage considered necessary to provide maximum margin against thermal overloads).
- The potential power plant will use wet closed-loop cooling towers.
- The minimum make-up water requirement will be 35,000 gpm (conservative estimate of cooling tower and essential service water make-up for one US-EPR unit).

This report has been prepared to document the process and results of the Alternative Site Evaluation Study. The process and methods used to perform the study are described in the next section of this report.

Last page of Section 2.

3. SITE EVALUATION PROCESS

This section describes the process and methods used to perform the Alternative Site Evaluation Study.

The process used in this study complied with U.S. Nuclear Regulatory Commission (USNRC) guidance provided in Section 9.2 of Regulatory Guide 4.2 and Section 9.3 of NUREG-1555 and generally followed the site selection procedures described in the Electric Power Research Institute (EPRI) report titled *Siting Guide: Site Selection and Evaluation Criteria for an Early Site Permit Application,* Final Report, March 2002 (EPRI Document 1006878). The process also was consistent with other nuclear power plant siting studies as reported in regulatory submittals to the USNRC. The process included the following major tasks:

- Establish the Region of Interest (ROI)
- Identify Candidate Areas
- Identify Potential Sites
- Identify Candidate Sites
- Evaluate Candidate Sites
- PSEG selection of the preferred/proposed site

The specific methods used in performing these major tasks are described in the subsections below.

3.1 ESTABLISH THE REGION OF INTEREST

As defined in NUREG-1555, the ROI is the area to be considered in searching for potential power plant sites.

The ROI was established on the basis of several factors, including the existing corporate and physical presence of PSEG and other subsidiaries of Public Service Enterprise Group in the state of New Jersey, major load centers expected to be served by the new power plant, and diversity of environmental and geographic conditions for potential power plant sites. These considerations are described further in Section 4 of this report.

3.2 IDENTIFY CANDIDATE AREAS

As defined in NUREG-1555, Candidate Areas are areas within the ROI that remain after unsuitable areas (areas with features that would make nuclear power plant siting infeasible) are eliminated.

In order to identify Candidate Areas, digitized Geographic Information System (GIS) maps were constructed. These maps covered the entire ROI and included the following primary data layers:

- Administrative boundaries (state, county, municipal, etc.)
- Dense population (urban) areas
- Transportation routes (primary highways, rail)
- Water bodies (rivers, creeks, lakes)
- Electric transmission lines, substations, and power plants
- Designated parks, preserves, and recreation areas
- Federal lands

Data for the GIS maps were obtained from a variety of federal and state government agencies, data services, and other entities. The data sources used in preparing the GIS maps are summarized in Table 3-1 at the end of this section.

After the ROI maps were complete, exclusionary criteria were applied to eliminate areas that were clearly unsuitable for power plant siting. The purpose of the exclusionary criteria was to narrow-down the region to be considered for power plant siting, and allow the study to focus on areas that have the greatest probability of containing desirable sites. The exclusionary criteria covered major factors that would make licensing, permitting, or development of a nuclear power plant impractical. The exclusionary criteria included the following:

- Areas more than 20 miles from a primary highway (Interstate, U.S., or State Route)
- Areas more than 20 miles from rail or barge transportation
- Areas more than 20 miles from a transmission line or substation with a voltage of 500 kV
- Areas more than 20 miles from a water source capable of supplying the minimum power plant make-up water requirement (35,000 gpm)
- Areas with a population density greater than 500 people per square mile, and buffer zones within 3 miles of those areas
- Designated parks, preserves, and recreation areas
- Active military bases

The regulatory and technical bases of these exclusionary criteria are explained in Appendix A. In general, the criteria are based on considerations that are standard in the nuclear power industry, such as limiting the cost of each infrastructure connection to approximately 1% of the total project costs and ensuring compliance with USNRC licensing requirements. The results of the exclusionary screening are discussed in Section 5 of this report.

3.3 IDENTIFY POTENTIAL SITES

As defined in NUREG-1555, Potential Sites are specific locations within the Candidate Areas that are identified for preliminary assessment in establishing Candidate Sites.

In order to facilitate the identification of Potential Sites, more detailed GIS maps were developed for each of the Candidate Areas identified in the previous task. These maps showed the same spatial information as described above, plus available data on floodplains, wetlands, cultural resources, and other sensitive land features. Digital U.S. Geological Survey (USGS) topographic maps (digital raster graphics) and digital orthographic quadrangles (aerial photographs orthographically corrected) were used as base layers for these maps.

The topographic maps and aerial photographs of each Candidate Area were examined to identify specific locations that satisfied certain conditions considered appropriate for a viable nuclear power plant site. A key consideration was the availability of sufficient land suitable for arrangement of the power plant and other required facilities. Other required conditions included the following:

- Ground slope across the plant site not more than 5%
- Location as close as possible to water, transmission, and transportation resources
- Assessment of 100-year flood areas, wetlands, residences, and other sensitive land features

To the extent allowed by these required conditions, an effort was made to identify at least one Potential Site in each Candidate Area. More than one Potential Site was identified in the same Candidate Area if the sites appeared to offer a diversity of desirable conditions. Contiguous properties owned by PSEG and greater than 200 acres in size (not including linear rights-of-way) were considered if they were located in a Candidate Area. However, PSEG properties were not identified as Potential Sites unless they satisfied the required conditions listed above.

In order to confirm that each site had sufficient land suitable for arrangement of the power plant, a plant envelope footprint was developed based on vendor design documents for the reactor technologies being considered. The plant envelope footprint included a block for each major plant feature, based on the largest area required for any of the reactor technologies. The footprint blocks were then arranged on a topographic map of each Potential Site to create a preliminary site layout.

The results of the identification of Potential Sites are discussed in Section 6 of this report.

3.4 IDENTIFY CANDIDATE SITES

As defined in NUREG-1555, Candidate Sites are those Potential Sites that are considered to be among the best sites that can reasonably be found for the siting of a nuclear power plant. According to NUREG-1555, Candidate Sites can be selected on the basis of a screening process to identify unacceptable areas.

The Potential Sites identified in the previous task were examined in more detail to determine whether the sites had any significant environmental or other issues that would make them impractical or otherwise undesirable for licensing, permitting, or development with a nuclear power plant. The preliminary site layouts developed in the previous task were reviewed and used to screen the sites for the following major considerations:

- **Environmental Acceptability.** The sites were reviewed with regard to major environmental issues, such as proximity to designated lands or waters and potential encroachment on sensitive land uses.
- **Nuclear Licensing.** The sites were reviewed with regard to major nuclear licensing issues, such as proximity to capable faults, proximity to hazardous land uses, and proximity to population centers.
- **Engineering.** The sites were reviewed with regard to major engineering issues, such as the length and difficulty of required water, transmission, and rail connections, cooling water pumping head, and the ability to deliver large components to the site.

The issues evaluated during this screening were primarily environmental, combined with a qualitative assessment of the level of environmental impact and the necessary activities or considerations to mitigate or avoid the impact. While such issues often manifest themselves in either regulatory uncertainty or cost / schedule challenges, the primary focus of the screening was on the environmental suitability of the Potential Sites.

Based on these evaluations, five sites were found to have notably fewer significant negative issues than the other sites. In addition, a qualitative evaluation of the negative issues identified at these sites indicated that all of the

issues were manageable and could reasonably be expected to be resolved. Each site also had other highly desirable characteristics. Therefore, the sites with significantly more negative issues were eliminated from further consideration, and the more desirable sites were retained as Candidate Sites.

The results of the identification of Candidate Sites are discussed in Section 7 of this report.

3.5 EVALUATE CANDIDATE SITES

The final task was to evaluate the Candidate Sites in more detail, in order to support the ultimate selection of a Proposed Site and Alternate Sites. The primary purpose of this evaluation was to produce numerical scores that would allow the Candidate Sites to be ranked according to their overall suitability for development of a nuclear power plant.

Early in the study, the PSEG/Sargent & Lundy project team identified certain conditions that were considered necessary in order for a site to be feasible to license and develop, and other conditions that were desired so that a site would be favorable to license and develop. The required (or *Must*) conditions and desired (or *Want*) conditions are shown in Appendix B. As can be seen, the *Must* and *Want* conditions covered 40 site characteristics related to nuclear licensing issues, environmental issues, and engineering and economic issues. The *Must* conditions were applied throughout the project, as more detailed information became available for each site; violation of a *Must* condition was normally sufficient to eliminate a site from further consideration. The *Want* conditions were applied primarily in the final evaluation of Candidate Sites, as described below.

Quantitative criteria were developed to generate numerical scores that reflect how well each site satisfied the *Want* conditions for each of the 40 site characteristics. The criteria included both an objective means of assigning a numerical score for each site characteristic and importance weighting factors, which were used to adjust the numerical scores based on the relative importance of the site characteristics. The possible score on each site characteristic ranged from 1 to 5, and each importance weighting factor ranged from 1 to 10. The maximum possible total weighted score was 1,400. The site characteristics, *Must* and *Want* conditions, numerical scoring criteria, possible scores, and importance weighting factors were decided upon through discussions within the PSEG/Sargent & Lundy project team early in the project. They are consistent with the EPRI *Siting Guide* and with the methods used in other nuclear power plant siting studies as reported in regulatory submittals to the USNRC. The numerical scoring criteria and importance weighting factors are shown

in Appendix B. The regulatory bases of the criteria related to nuclear licensing issues are explained in Appendix C.

In order to support the numerical scoring, various specific aspects of the Candidate Sites were investigated and assessed, including the following:

- **Environmental and Permitting Conditions.** Factors related to environmental acceptability and permittability were evaluated in more detail than considered previously for the Potential Sites. Maps were obtained showing the property parcels on and near each Candidate Site. Information on zoning and land use planning was collected. Reviews were conducted of applicable state and local regulations concerning air quality, ambient noise, water withdrawal, land use, and other environmental, regulatory, and permitting issues. Site-specific information on threatened and endangered species and cultural resources was obtained from appropriate government agencies.
- **Transmission Interconnect and Stability Issues.** The feasibility of obtaining transmission interconnection for the Candidate Sites was evaluated through modeling of thermal overloads. The risk of transmission upgrades being required in order to maintain system stability was qualitatively evaluated. These evaluations allowed the sites to be scored based on potential interconnection and stability impacts.
- **Field Reconnaissance.** Field reconnaissance site visits were conducted. For those sites where property access was available, the sites were examined on foot; at other sites, the field reconnaissance consisted of a survey from public roads and other public vantage points. The field reconnaissance was intended to supplement and confirm the information collected from maps, aerial photographs, and other publicly available sources. Observations focused on issues such as the condition of wetlands and other natural habitats, recent residential developments, transportation routes, and constructability characteristics.
- **Refinement of Site Layouts**. Based on the information collected through the environmental evaluations and field reconnaissance, the site layouts were revised to make the best use of existing property parcels and reduce impacts on environmentally sensitive areas. Summary descriptions of key site conditions were developed.

The information collected in the previous activities was used to generate numerical scores for the 40 site characteristics shown in Appendix B. The total numerical scores were used to rank the Candidate Sites in order of their overall suitability. The results of the detailed evaluation of Candidate Sites are discussed in Section 8 of this report.

Table 3-1 — Data Sources Used in GIS Mapping

Layer	Area	Creator	Date of Data	Publication
Boundaries				
State boundaries	Entire study area	Tele Atlas North America and Environmental Science Research Institute (ESRI)	2006	ESRI Data & Maps; ESRI, Redlands, CA, 2006; www.esri.com
County boundaries	Entire study area	Tele Atlas North America and ESRI	2006	ESRI Data & Maps
Potential Sites				
Site Boundary	Entire study area	Sargent & Lundy	2009	S&L, 2009
Plant Layout	Entire study area	Sargent & Lundy	2009	S&L, 2009
Transmission Line to Plant	Entire study area	Sargent & Lundy	2009	S&L, 2009
Rail Spur to Plant	Entire study area	Sargent & Lundy	2009	S&L, 2009
Improved Roadway to Plant Access	Entire study area	Sargent & Lundy	2009	S&L, 2009
Makeup Water Pipeline	Entire study area	Sargent & Lundy	2009	S&L, 2009
Roads				
Interstates	Entire study area	Bureau of Transportation Statistics and ESRI	2002	ESRI Data & Maps
Other highways and major roads	Entire study area	Tele Atlas North America and ESRI	2000	ESRI Data & Maps
Rail Lines				
Railways	New Jersey	NJ Transit (with manual updates)	2008	NJ Railways; NJ Transit, GIS Department; 2004; www.njtransit.com
Railways	Entire study area	Federal Railroad Administration, Bureau of Transportation Statistics and ESRI	2002	ESRI Data & Maps
Electric				
Transmission lines	Entire study area	Platts (with manual updates)	2008	Platts Transmission Line Geospatial Data Layer; Platts, 2008; www.platts.com

Layer	Area	Creator	Date of Data	Publication
Substations	Entire study area	Platts	2008	Platts Electric Substation Geospatial Data Layer; Platts, 2008; www.platts.com
Power plants	Entire study area	Platts	2008	Platts Power Plant Geospatial Data Layer; Platts, 2008; www.platts.com
Pipelines				
Natural gas pipelines	Entire study area	Platts	2008	Platts Gas Pipeline Geospatial Data Layer; Platts 2008; www.platts.com
Oil pipelines	Entire study area	PennWell (with manual updates)	2008	Schedule 1 – Pipeline, Facilities and Interconnects; PennWell MAPSearch; www.maapsearch.com
Census				
Densely Populated Areas	Entire study area	ESRI Community Data	2005	ESRI Data & Maps
Census block groups	Entire study area	Tele Atlas North America and ESRI	2000	ESRI Data & Maps
Minority and poverty populations	3-Mile potential site study area	U.S. Census Bureau, 2000 Census, SF1 and SF3	2000	ESRI Data & Maps
Population Density	3-Mile potential site study area	U.S. Census Bureau, 2000 Census, SF1	2000	ESRI Data & Maps
Parks and Recreation				
Recreation Areas	Entire study area	Tele Atlas North America and ESRI	2006	ESRI Data & Maps
Parks and Preserves	Entire study area	Tele Atlas North America, Geographic Data Technologies, and ESRI	2005	ESRI Data & Maps
Parks and Preserves	New Jersey	New Jersey Department of Environmental Protection (NJDEP)	2004	Open Space – State Owned'; NJDEP, 2005; www.state.nj.us/dep/gis/
Parks and Preserves	New Jersey	NJ Office of State Planning	2000	New Jersey Office of State Planning, www.state.nj.us/dca/osg
Federally-Owned Land	Entire study area	National Atlas of the US, the US Geological Survey, and ESRI	2004	ESRI Data & Maps

Layer	Area	Creator	Date of Data	Publication
Highlands	New Jersey	New Jersey Highlands Water Protection and Planning Council (Highlands Council)	2007	'Zone'; Highlands Council, 2007; www.highlands.state.nj.us
Pinelands	New Jersey	NJDEP, Office of Information Resources Management	2002	'Pinelands Area Boundary'; NJDEP, 2008; www.state.nj.us/dep/gis/
Hydrography				
U.S. water bodies	Entire study area	US Geological Survey, US Environmental Protection Agency, and ESRI	2004	ESRI Data & Maps
U.S. rivers and streams	Entire study area	US Geological Survey, US Environmental Protection Agency, and ESRI	2004	ESRI Data & Maps
Rivers with 7Q10 low-flow > = 175,00 gpm	Entire study area	US Geological Survey, Basin Characteristics File	varies	2007, Delaware StreamStats
Barge-Capable Waterways	Entire study area	National Oceanic and Atmospheric Administration (NOAA)	2008	NOAA, 2008; ocs-spatial.ncd.noaa.gov/encdirect/viewer.htm
Wild and scenic rivers	Entire study area	National Atlas of the US, the US Geological Survey, and ESRI	2001	ESRI Data & Maps
Natural Features				
Ramapo Fault	New Jersey	US Geological Survey, and Sargent & Lundy	2008	'Bedrock Geology of New Jersey' and S&L Ramapo Fault Line Edits; USGS, S&L, 2008; http://www.nj.gov/dep/njgs/geodata/
Public Institutions				
Churches, Hospitals, Schools, Cemeteries	Entire Study Area	Geographic Names Information System	2005	ESRI Data & Maps
Hospitals	Entire Study Area	American Hospital Association	2004	ESRI Data & Maps
Airports				
Airports	Entire Study Area	US National Atlas Airports	2002	ESRI Data & Maps
Historic Sites				
Historic Sites	Entire Study Area	National Park Service (NPS)	2008	'Spatial.mdb'; NPS, National Register Information System, 2008; www.nr.nps.gov/nrgsa.htm

Layer	Area	Creator	Date of Data	Publication
Historic Districts				
Historic Districts	Entire Study Area	National Park Service	2008	'Spatial.mdb'
Historic Districts	New Jersey	New Jersey Historic Preservation Office	2008	'Historic Districts'; NJDEP, 2008; http://www.state.nj.us/dep/gis/
Critical Environmental Sites				
Critical Environmental Sites	New Jersey	New Jersey Department of Community Affairs, Office of Smart Growth (DCA OSG)	2007	'Critical Environmental Sites'; DCA OSG, 2007; http://www.state.nj.us/dca/osg/ resources/maps/
Public Drinking Water Intakes				
Wells	New Jersey	New Jersey Department of Environmental Protection	2007	'Public Community Water Supply Wells'; NJDEP, 2007; www.state.nj.us/dep/gis/
Protected Groundwater Resources				
Wellhead protection areas	New Jersey	New Jersey Department of Environmental Protection, New Jersey Geological Survey	2007	'Wellhead Protection Areas,' NJDEP, 2007; www.state.nj.us/dep/gis/
100-Year Flood Areas				
100-Year Flood Zones	New Jersey	Federal Emergency Management Agency (FEMA)	2006	100-Year Q3 Flood Zones; FEMA, 2006; www.msc.fema.gov
Wetlands				
Wetlands	New Jersey	New Jersey Department of Environmental Protection	1986	NJDEP, https://njgin.state.nj.us/NJ_NJGIN Explorer/BrowseByTheme.jsp

Last page of Section 3.

4. REGION OF INTEREST

NUREG-1555 defines the ROI as the area to be considered in searching for potential power plant sites. NUREG-1555 provides the following guidance on the selection of the ROI:

> The ROI is typically selected based on geographic boundaries (e.g., the State in which the proposed site is located) or the relevant service area for the proposed plant. In cases where the proposed plant would not have a service area, the applicant should define a reasonable ROI and provide a justification. The ROI must be more extensive if environmental diversity would be substantially improved or if candidate sites do not meet initial threshold criteria (including the site criteria in 10 CFR 100), and added geographic areas would not increase costs substantially. The ROI may be smaller if sufficient environmental diversity exists, threshold criteria are satisfied, and costs would be exorbitant for considering sites outside the State or relevant service area.

The nuclear facility being studied by PSEG would be a merchant plant and would not have a regulated service area. However, PSEG's parent company, Public Service Enterprise Group, is primarily a New Jersey company, with its Corporate Headquarters located in Newark. As shown in Figure 4-1, Public Service Enterprise Group has power plants and offices located throughout New Jersey. One of Public Service Enterprise Group's principal subsidiaries is Public Service Electric and Gas Incorporated (PSE&G), which is a regulated public utility company engaged in the transmission and distribution of gas and electricity. As shown in Figure 4-2, PSE&G's electric service area is limited to New Jersey and extends throughout much of the state, encompassing most of the higher population areas of the state. As noted earlier, Public Service Enterprise Group's generation subsidiary is PSEG Power, LLC, one of the nation's largest independent power producers. PSEG Nuclear is a subsidiary of PSEG Power, LLC, with its Nuclear Headquarters located at the existing Salem-Hope Creek Nuclear Site in southern New Jersey. Most of the electricity generated by the Salem and Hope Creek power plants is sold into New Jersey markets.

Given Public Service Enterprise Group's long history (over 100 years) and strong presence in New Jersey, it is expected that the new nuclear facility will supply much of its output to important load centers in New Jersey via existing transmission circuits. Locating the facility in New Jersey will facilitate the delivery of power to these load centers and will allow Public Service Enterprise Group to make optimal use of its existing resources in the state. Locating the facility in New Jersey also will promote the state's energy self-sufficiency, which is one of the goals of the New Jersey Energy Master Plan. In addition, New Jersey provides a good diversity of environmental and geographic conditions for potential power plant sites, as illustrated in Figure 4-3. It is

unlikely that any reasonable expansion of the ROI beyond New Jersey would significantly improve environmental diversity.

Based on the considerations discussed above, the entire state of New Jersey was established as the ROI for the site evaluation study. This ROI is consistent with the guidance provided in NUREG-1555.

The ROI is shown in Figure 4-4. The ROI encompasses an area of approximately 8,700 square miles, including water areas. Major cities located within the ROI include Newark, Jersey City, Paterson, Elizabeth, Camden, and Trenton, New Jersey. Major water bodies available as a potential source of cooling water for a nuclear power plant include the Delaware River, Hudson River, and Atlantic Ocean. Major highways within the ROI include Interstate Routes 78, 80, 95, 280, 287, and 295, as well as the New Jersey Turnpike, Garden State Parkway, and Atlantic City Expressway. There are several major railroads in the ROI, including Amtrak, Norfolk Southern/Canadian Pacific Railway, Southern Railroad Company of New Jersey, and New York & Atlantic Railroad. Major land use categories found in the ROI include residential, agricultural, urban, industrial, commercial, public facilities, parks, public and private recreation areas, natural areas, transportation, communications, utilities, government special designation, and education. Topographic features in the ROI range from flat floodplains along the rivers and coastal areas to steep bluffs, rolling hills, deep ravines, and mountain ranges. There are several military bases in the ROI, including Fort Dix Military Reservation, McGuire Air Force Base, Lakehurst Naval Air Station, Fort Monmouth, and Earle Naval Weapons Station.

Figure 4-1 — Public Service Enterprise Group Power Plants and Offices in New Jersey

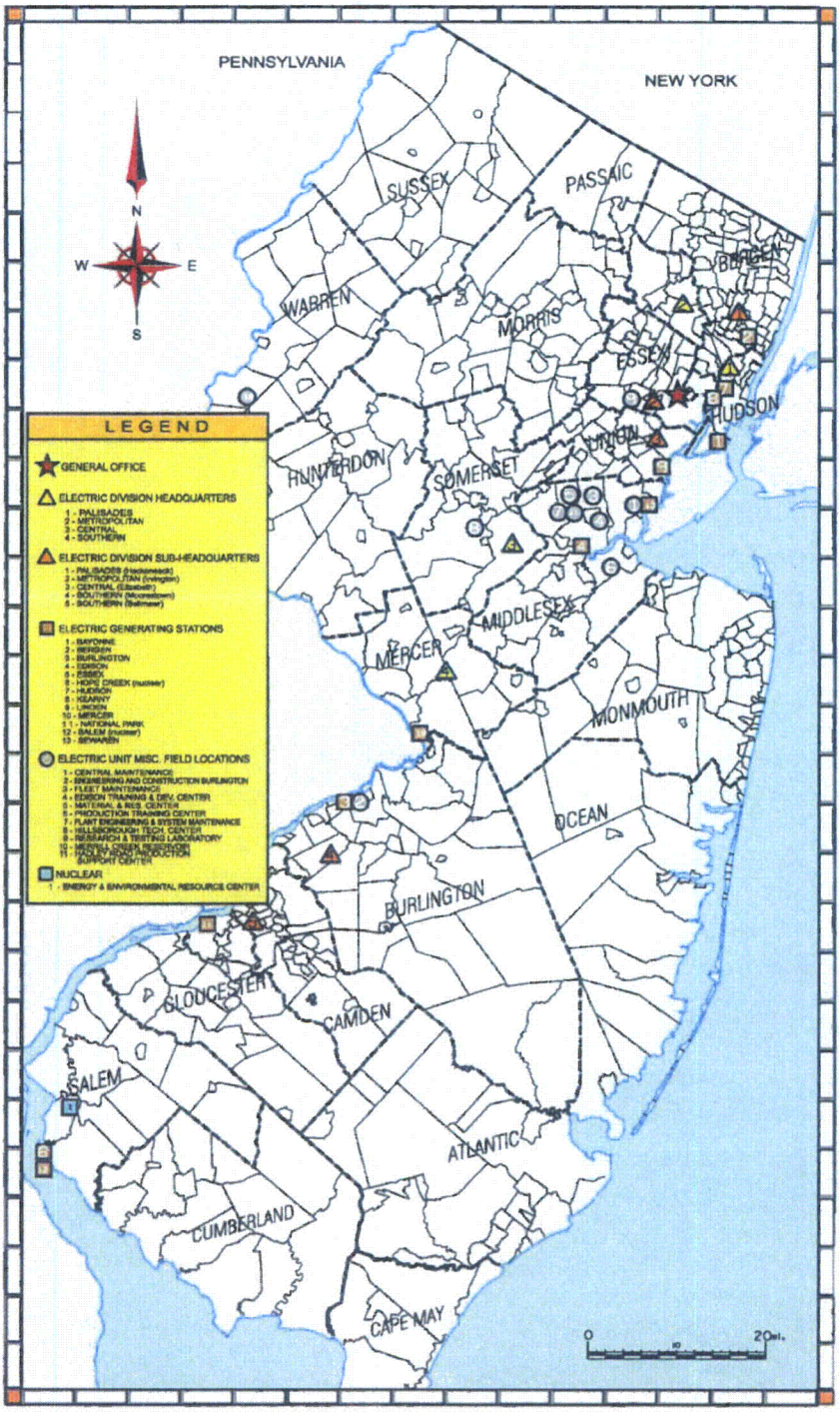


Figure 4-2 — PSE&G Electric Service Area

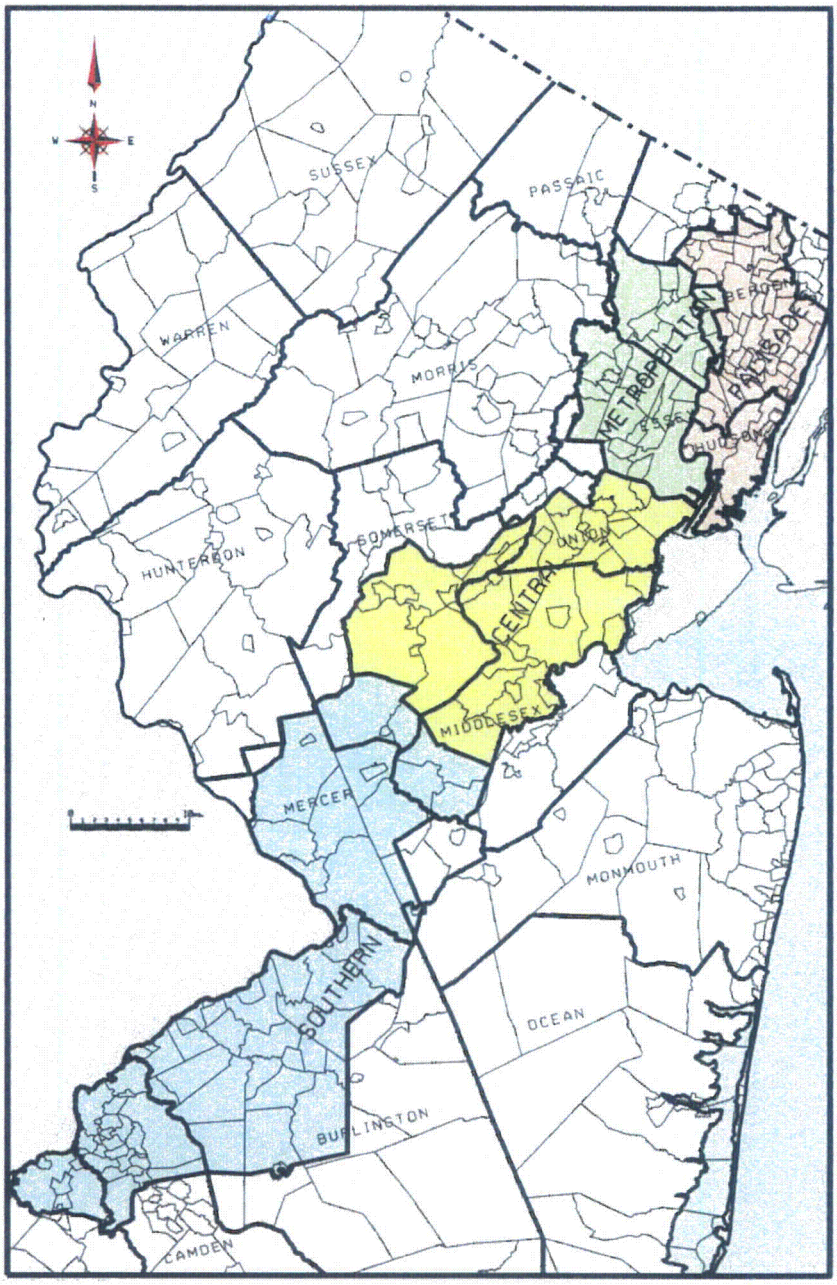


Figure 4-3 — Major Landforms in New Jersey

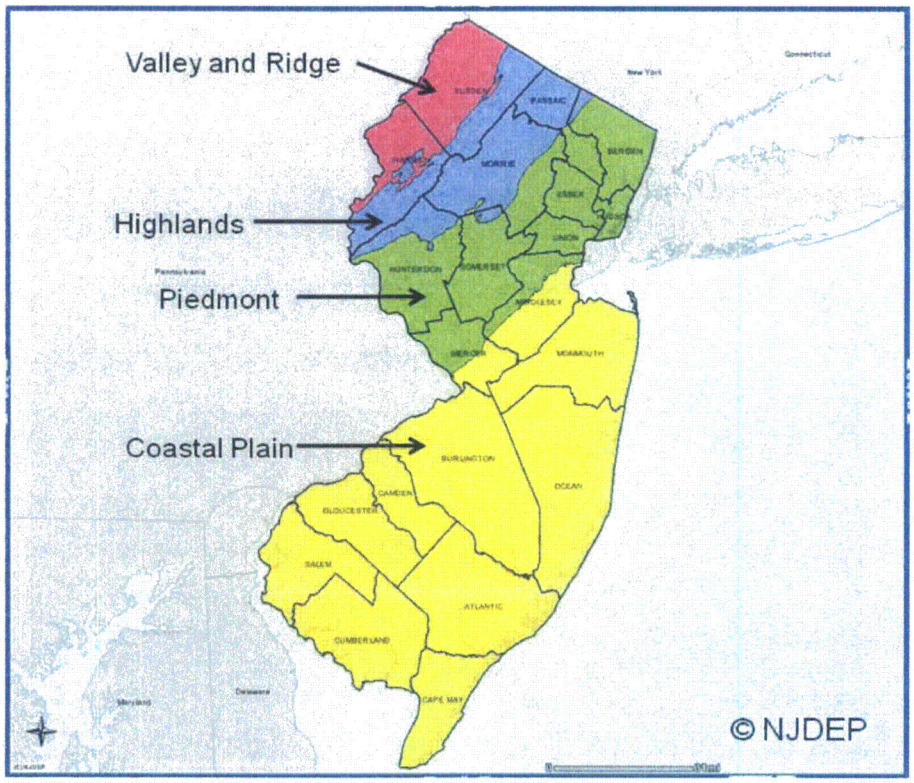


Figure 4-4 — Region of Interest

Last page of Section 4.

5. CANDIDATE AREAS

NUREG-1555 defines Candidate Areas as areas within the ROI that remain after unsuitable areas (areas with features that would make nuclear power plant siting infeasible) are eliminated.

As discussed in Subsection 3.2, the first step in identifying Candidate Areas was to construct digitized GIS maps of the entire ROI. Data for the GIS maps were obtained from a variety of federal and state government agencies, data services, and other entities. The data sources used in preparing the GIS maps are summarized in Table 3-1.

Exclusionary criteria were applied to the ROI map data in order to eliminate areas that were clearly unsuitable for power plant siting. The exclusionary criteria covered major factors that would make licensing, permitting, or development of a nuclear power plant impractical. The following exclusionary criteria were used:

- Areas more than 20 miles from a primary highway (Interstate, U.S., or State Route)
- Areas more than 20 miles from rail or barge transportation
- Areas more than 20 miles from a transmission line or substation with a voltage of 500 kV
- Areas more than 20 miles from a water source capable of supplying the minimum power plant make-up water requirement (35,000 gpm)
- Areas with a population density greater than 500 people per square mile, and buffer zones within 3 miles of those areas
- Designated parks, preserves, and recreation areas
- Active military bases

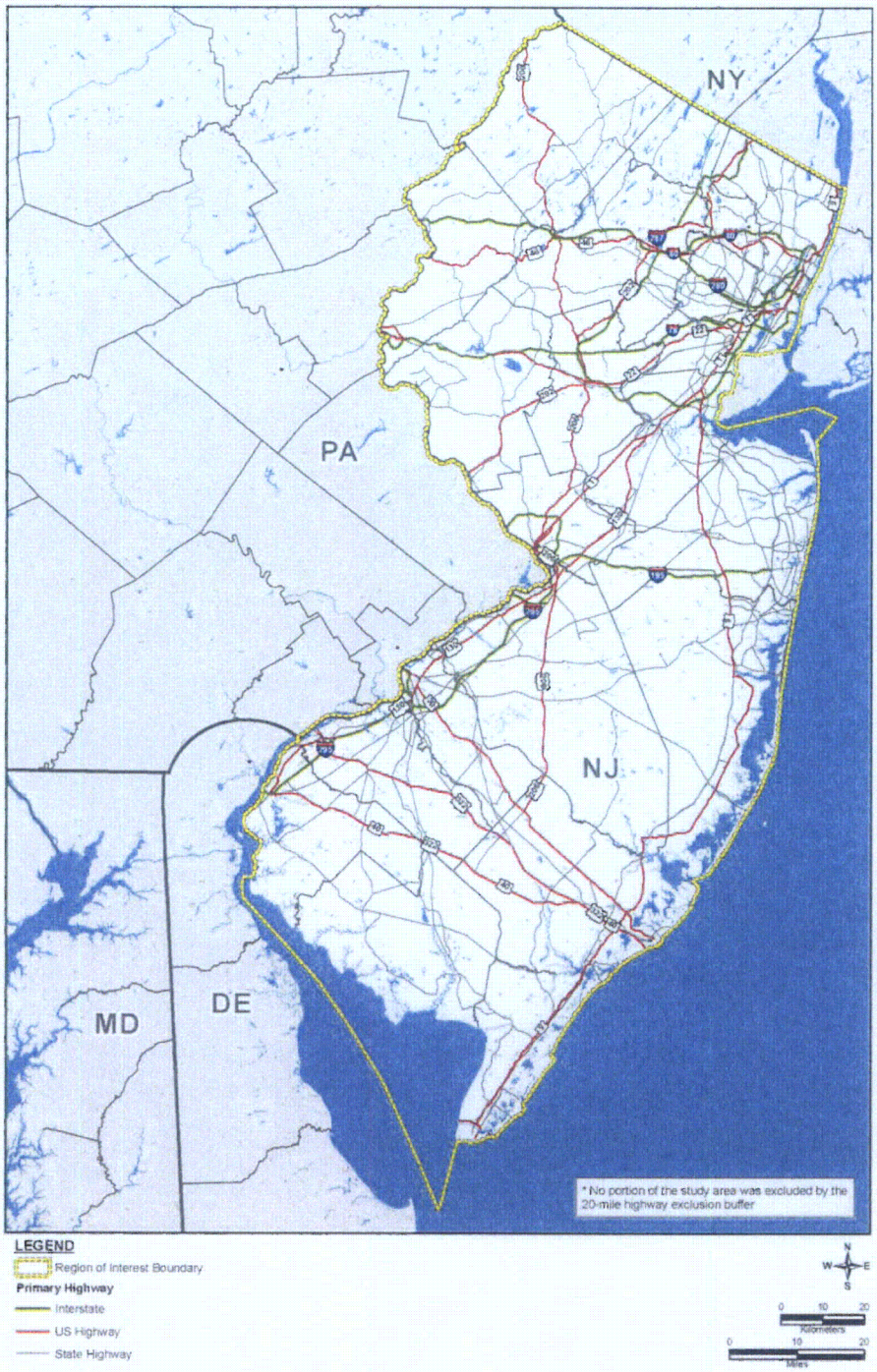
The regulatory and technical basis of these exclusionary criteria is explained in Appendix A. The results of applying these exclusionary criteria are discussed in the following subsections.

5.1 HIGHWAYS

Access to a primary highway (Interstate, U.S., or State Route) is important so that workers can safely and efficiently commute to the site during power plant construction and operation. Areas more than 20 miles from a primary highway were considered unsuitable for power plant siting because of the difficulty and expense of constructing a plant access road more than 20 miles in length.

Figure 5-1 shows the primary highways that were mapped in the ROI, as well as any areas more than 20 miles from those primary highways. It can be seen that the entire ROI is within 20 miles of a primary highway; therefore, no areas were eliminated due to this factor.

Figure 5-1 — Primary Highways and Excluded Areas

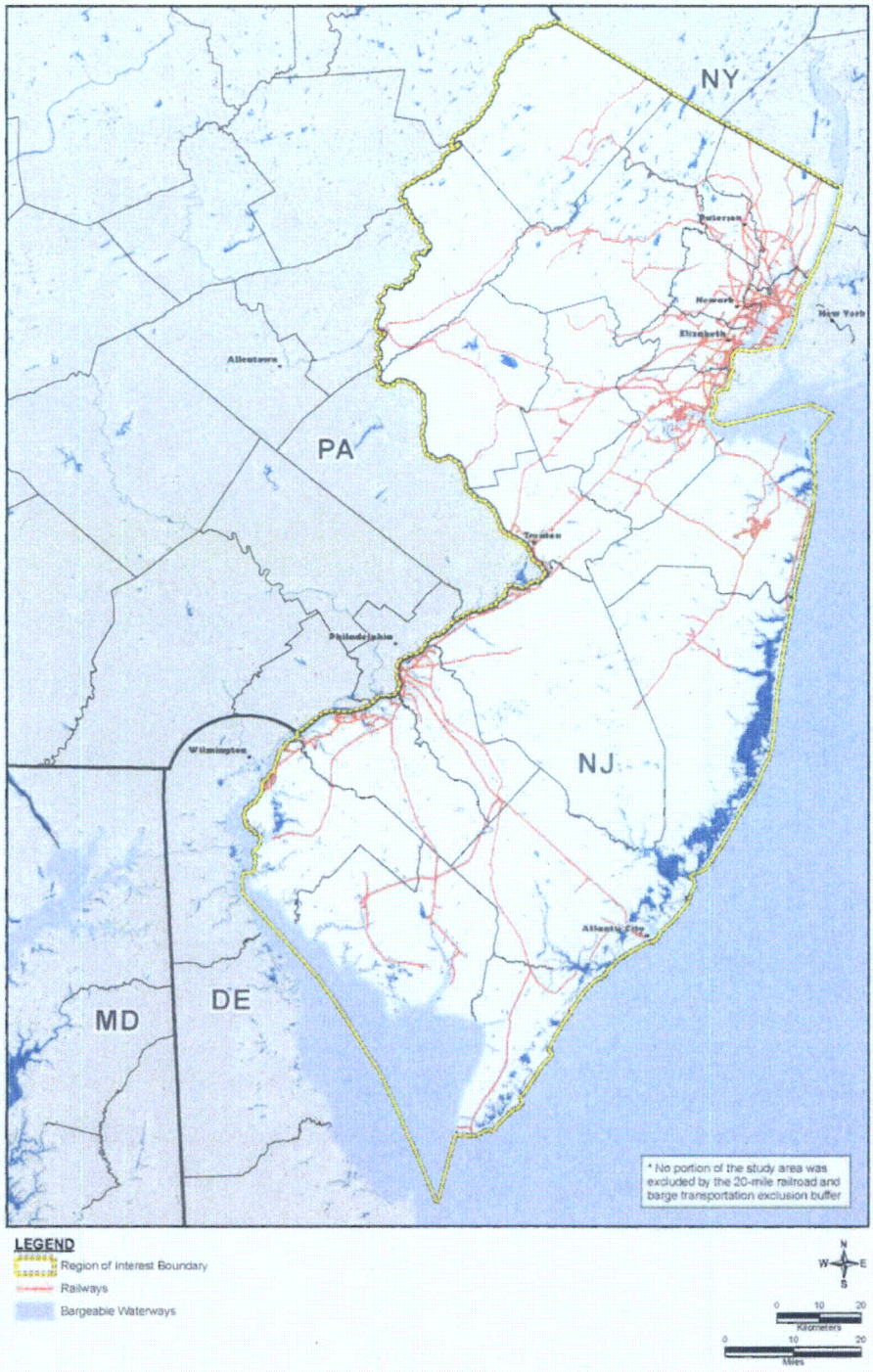


5.2 RAIL AND BARGE TRANSPORTATION

Access to rail and/or barge transportation is important so that large equipment and components can be efficiently delivered to the site during power plant construction. Areas more than 20 miles from an existing rail line or water body suitable for barge navigation were considered unsuitable for power plant siting because of the difficulty and expense of constructing a rail spur or barge connecting road more than 20 miles in length.

Figure 5-2 shows the rail lines and barge-capable waterways that were mapped in the ROI, as well as any areas more than 20 miles from those features. It can be seen that the entire ROI is within 20 miles of a rail lines and barge-capable waterway; therefore, no areas were eliminated due to this factor.

Figure 5-2 — Rail and Barge Transportation and Excluded Areas

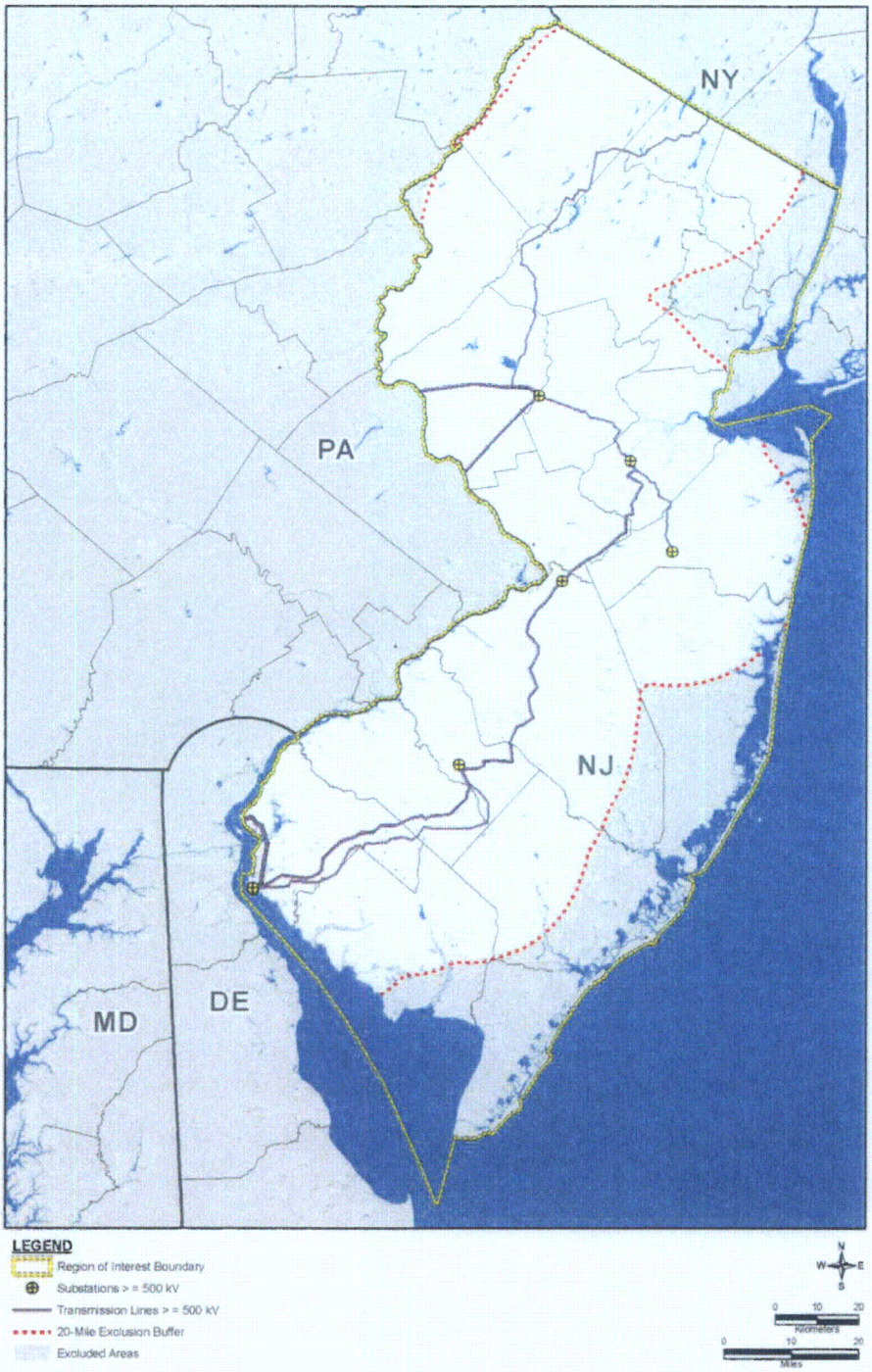


5.3 TRANSMISSION

Access to suitable transmission facilities is important so that the electrical output of the power plant can be transmitted to potential users. For this study, suitable transmission facilities were considered to be transmission lines or substations with a voltage of at least 500 kV, the voltage necessary to provide maximum margin against possible thermal overloads. Areas more than 20 miles from a transmission line or substation with a voltage of at least 500 kV were considered unsuitable for power plant siting because of the difficulty and expense of constructing a new transmission line more than 20 miles in length.

Figure 5-3 shows the transmission lines and substations with a voltage of 500 kV that were mapped in the ROI, as well as any areas more than 20 miles from those lines or substations. It can be seen that most of the ROI is within 20 miles of a suitable transmission line or substation. However, two areas along the coast of the Atlantic Ocean were eliminated due to this factor.

Figure 5-3 — Transmission Lines and Excluded Areas

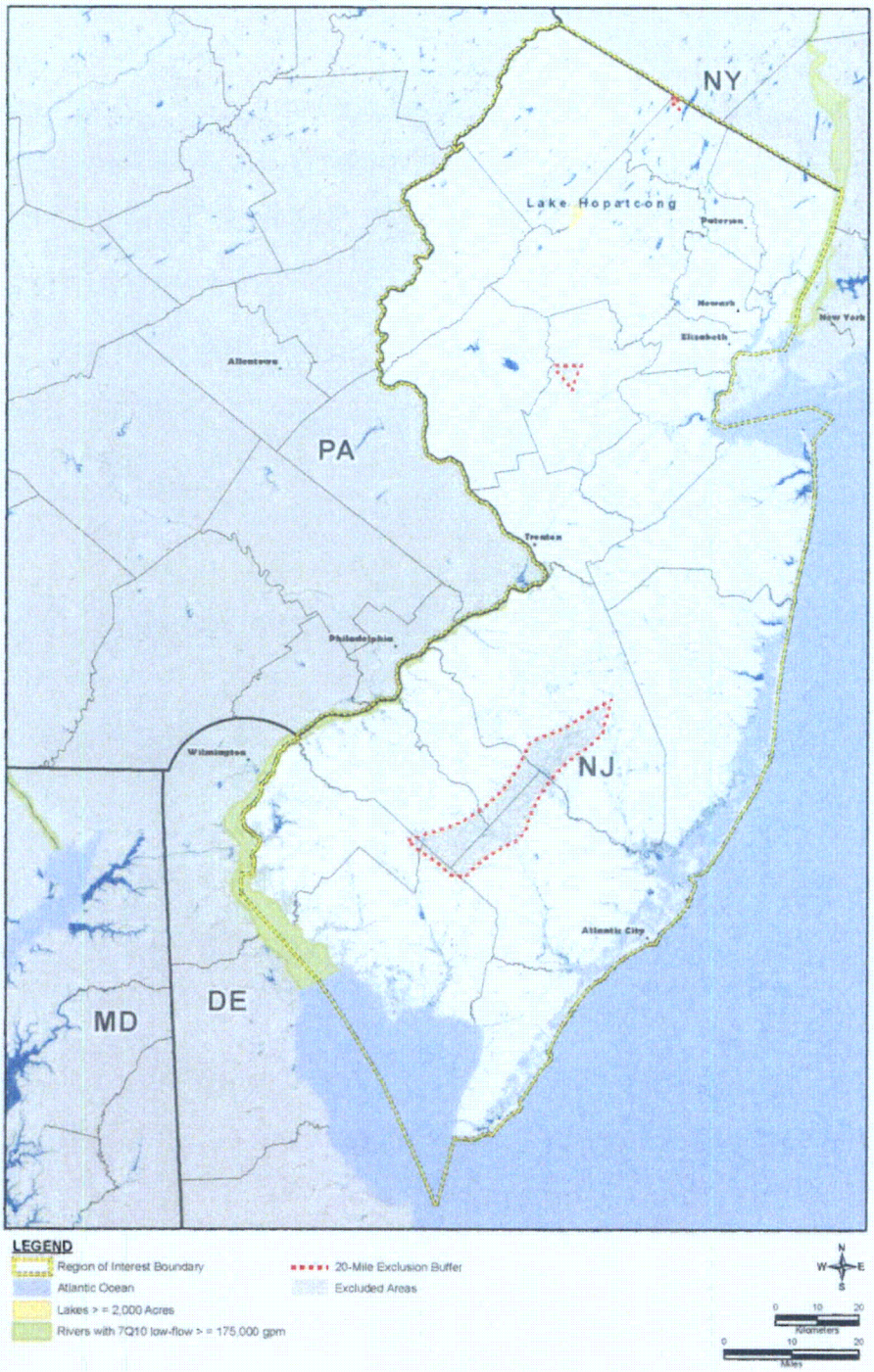


5.4 WATER SOURCE

Access to a suitable water source is important so that the make-up water necessary for power plant operation will be available even during drought periods. For this study, a suitable water source was considered to be a body of water capable of supplying at least 35,000 gpm without the need to withdraw more than 20% of the 7-day, 10-year low flow (7Q10). The 35,000-gpm value was considered to be the minimum make-up water requirement for any of the reactor designs considered in this study, representing cooling tower and essential service water make-up for one US-EPR unit. Using the minimum make-up requirement was conservative for exclusionary screening purposes so that the screening did not eliminate areas that might be suitable if the US-EPR technology ultimately is selected for the potential new unit. Areas more than 20 miles from a body of water capable of supplying 35,000 gpm were considered unsuitable for power plant siting because of the difficulty and expense of constructing a make-up water pipeline more than 20 miles in length.

Figure 5-4 shows the water bodies capable of supplying the minimum plant make-up requirement of 35,000 gpm that were mapped in the ROI, along with any areas more than 20 miles from those water bodies. It can be seen that most of the ROI is within 20 miles of a suitable water source. However, two areas in the ROI were eliminated due to this factor.

Figure 5-4 — Water Sources and Excluded Areas

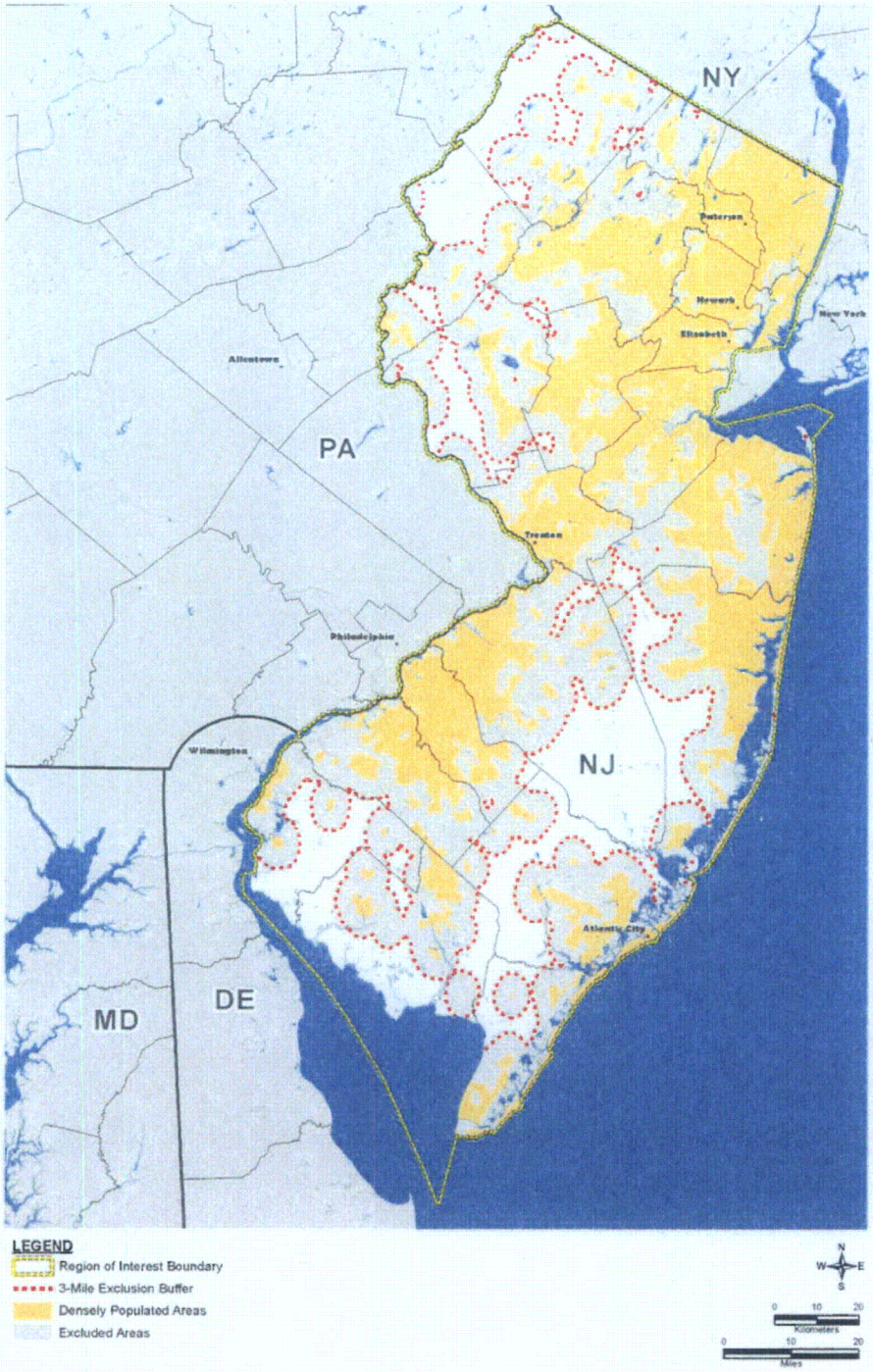


5.5 POPULATION DENSITY

Population density is an important factor in the licensing process for a nuclear power plant. In particular, USNRC regulatory guidance strongly discourages siting a nuclear power plant in an area where the Low Population Zone (LPZ) would have a population density greater than 500 people per square mile. As explained in Appendix A, an LPZ distance of 3 miles was used in this study as a conservative distance that would bound virtually all site conditions and reactor designs. Therefore, any areas with a population density greater than 500 people per square mile, and buffer zones within 3 miles of those areas, were considered unsuitable for power plant siting.

Figure 5-5 shows the areas with a population density greater than 500 people per square mile that were mapped in the ROI, as well as buffer zones within 3 miles of those areas. It can be seen that this factor resulted in the elimination of large parts of the ROI.

Figure 5-5 — Densely Populated Zones and Excluded Areas

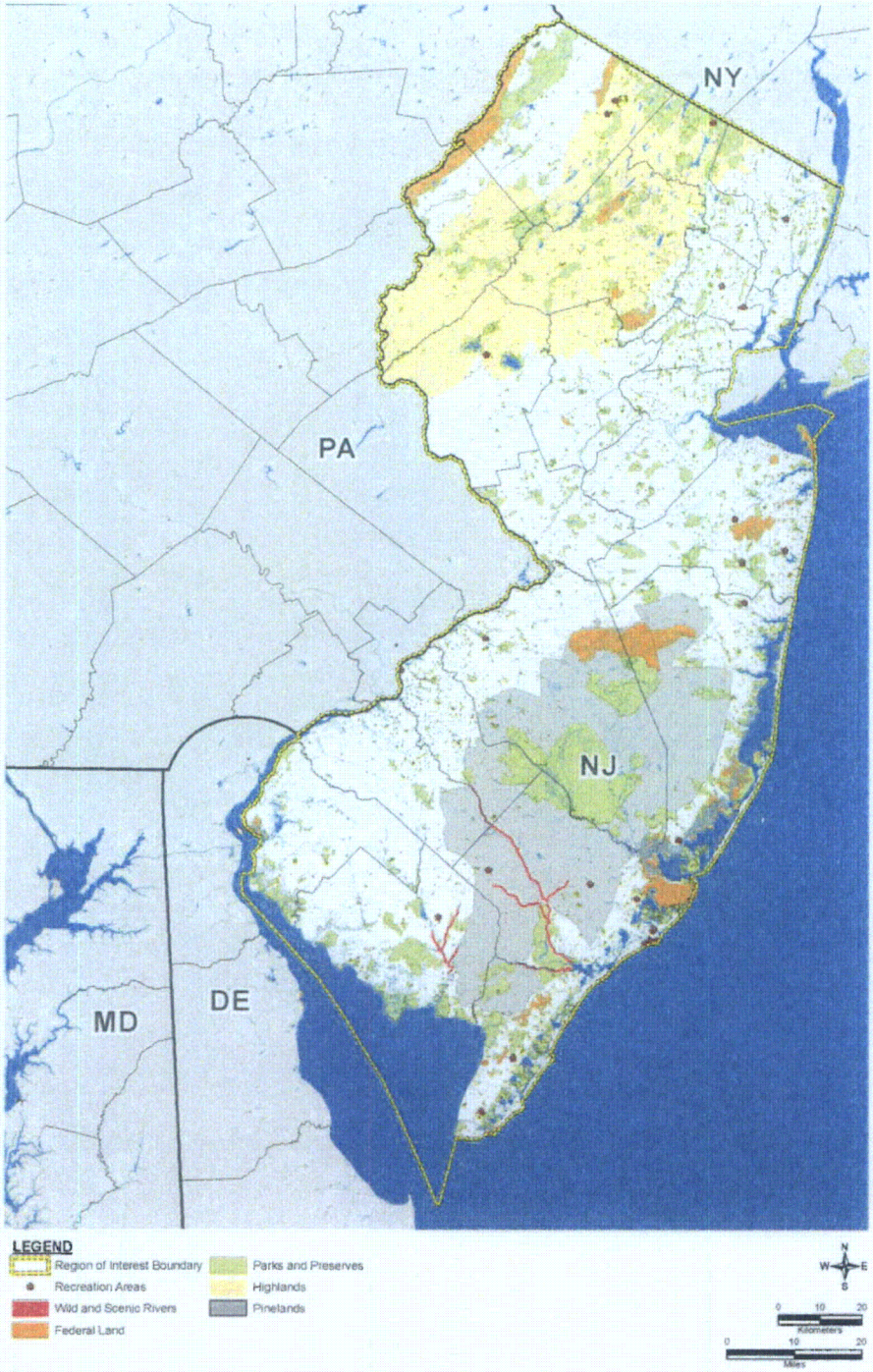


5.6 DESIGNATED LANDS

Designated lands such as publicly held parks, preserves, and recreation areas typically cannot be purchased for private development. If the land could be purchased, a proposal to develop such land for a power plant typically would generate intense public opposition. Therefore, designated lands were considered unsuitable for power plant siting.

Figure 5-6 shows the designated lands that were mapped in the ROI, including the New Jersey Pinelands and New Jersey Highlands. It can be seen that this factor resulted in the elimination of large parts of New Jersey.

Figure 5-6 — Designated Lands and Excluded Areas



5.7 ACTIVE MILITARY BASES

Active military bases typically cannot be purchased for private development. Even if the land could be purchased, the available acreage and prior or existing uses of such land are frequently not compatible with a nuclear power plant. Therefore, active military bases are normally considered unsuitable for power plant siting.

In order to ensure that potentially suitable military lands were not overlooked, all military lands within the ROI were reviewed. This review included the following lands:

- Belle Mead General Depot — Somerset County, NJ
- Earle Naval Weapons Station — Monmouth County, NJ
- Fort Dix Military Reservation — Ocean and Burlington counties, NJ
- Fort Monmouth Military Reservation — Monmouth County, NJ
- Lakehurst Naval Air Station — Ocean County, NJ
- McGuire Air Force Base — Ocean and Burlington counties, NJ
- Picatinny Arsenal — Morris County, NJ

With the exception of the central portion of Fort Dix, all of these lands are in areas that were eliminated because of the population density factor discussed in Subsection 5.5. Specifically, each is in an area (based on census blocks) that has a population density greater than 500 people per square mile or is within 3 miles of such an area. Therefore, even if the population density on the military land itself were less than 500 people per square mile, it would not be feasible to identify a suitable LPZ that meets USNRC regulatory guidance regarding population density.

The central portion of Fort Dix is located between densely populated areas in Ocean, Burlington, and Monmouth counties, and it would be difficult to identify an acceptable LPZ in a portion of Fort Dix not currently in use. In addition, the Department of Defense (DoD) is in the process of merging Fort Dix, McGuire Air Force Base, and Lakehurst Naval Air Station to form Joint Base McGuire-Dix-Lakehurst. DoD currently is moving some functions from other installations to the Joint Base, which may affect existing land uses.

Population density issues aside, other factors were considered that further reduced the likelihood of successfully siting a nuclear power plant on the military lands.

DoD has published plans to close Fort Monmouth by September 2011 and has indicated that most transfers of personnel are expected to take place in 2010 and the first part of 2011. However, it is still not certain that the closing will proceed. Fort Monmouth covers 1,126 acres, and a large portion of the property would be required to build a nuclear power plant. However, the Fort Monmouth Economic Revitalization Planning Authority has a Development Plan that calls for housing, retail, education facilities, and green spaces. It seems very unlikely that these economic development land uses would be compatible with and leave sufficient land available for a nuclear plant site.

DoD has proposed Earle Naval Weapons Station for a realignment, with about 120 jobs moving to Picatinny Arsenal, but there is no indication that land will become available. In addition, portions of the existing land would be expected to require significant remediation due to past uses.

Figure 5-7 shows the military lands that were mapped in the ROI. Based on the information presented above, none of these lands were considered suitable for power plant siting.

Figure 5-7 — Military Lands Considered

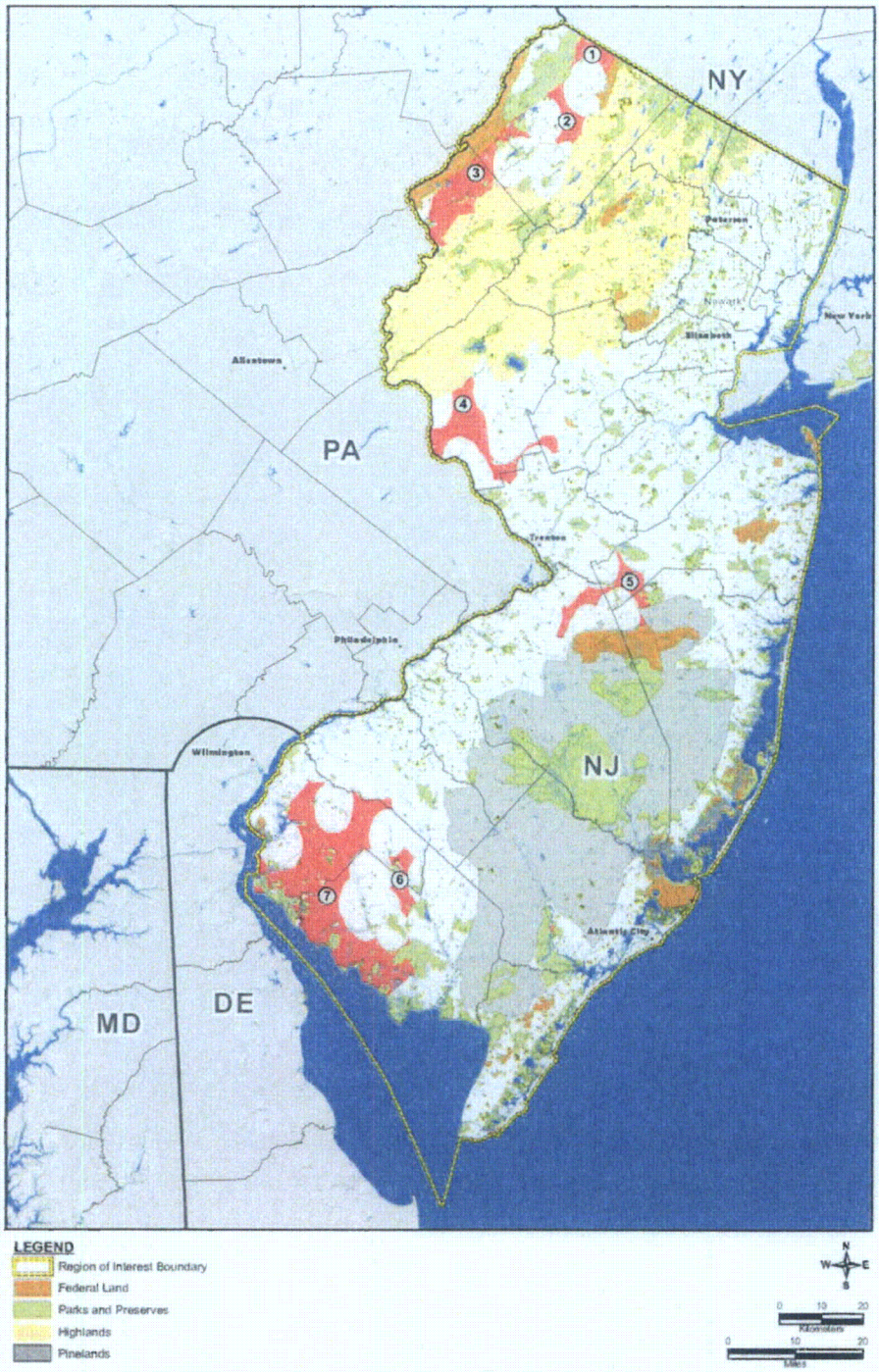
5.8 IDENTIFICATION OF CANDIDATE AREAS

Figure 5-8 shows the Candidate Areas that remained after elimination of other parts of the ROI due to the exclusionary factors discussed above. To facilitate discussion of the Candidate Areas, they are numbered 1 through 7. The locations of these areas can be summarized as follows:

- Candidate Area 1 is located in the extreme northern part of Sussex County, New Jersey, adjacent to the New York state line. This area is approximately 15.2 square miles (9,739 acres) in size.
- Candidate Area 2 is located in the central part of Sussex County, New Jersey. This area is approximately 21.0 square miles (13,462 acres) in size.
- Candidate Area 3 is located in parts of Sussex County and Warren County, New Jersey. This area is approximately 72.7 square miles (46,509 acres) in size.
- Candidate Area 4 is located in parts of Hunterdon, Mercer, and Somerset counties, New Jersey. This area is approximately 66.9 square miles (42,812 acres) in size.
- Candidate Area 5 is located in parts of Burlington, Monmouth, and Ocean counties, New Jersey. This area is approximately 34.7 square miles (22,209 acres) in size.
- Candidate Area 6 is located in parts of Salem County and Cumberland County, New Jersey. This area is approximately 19.1 square miles (12,192 acres) in size.
- Candidate Area 7 is located in parts of Gloucester, Salem, and Cumberland counties, New Jersey. This area is approximately 227.3 square miles (145,495 acres) in size.

These Candidate Areas were considered for the identification of Potential Sites, as described in the next section of this report.

Figure 5-8 — Candidate Area Locations



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6. POTENTIAL SITES

NUREG-1555 defines Potential Sites as specific locations within the Candidate Areas that are identified for preliminary assessment in establishing Candidate Sites.

As discussed in Subsection 3.3, the first step in identifying Potential Sites was to construct larger-scale GIS maps for each of the Candidate Areas identified in the previous task. These maps showed the same spatial information mapped for the ROI, plus available data on floodplains, wetlands, cultural resources, and other sensitive land features. Digital U.S. Geological Survey (USGS) topographic maps (digital raster graphics) and digital orthographic quadrangles (aerial photographs orthographically corrected) were used as base layers for these maps.

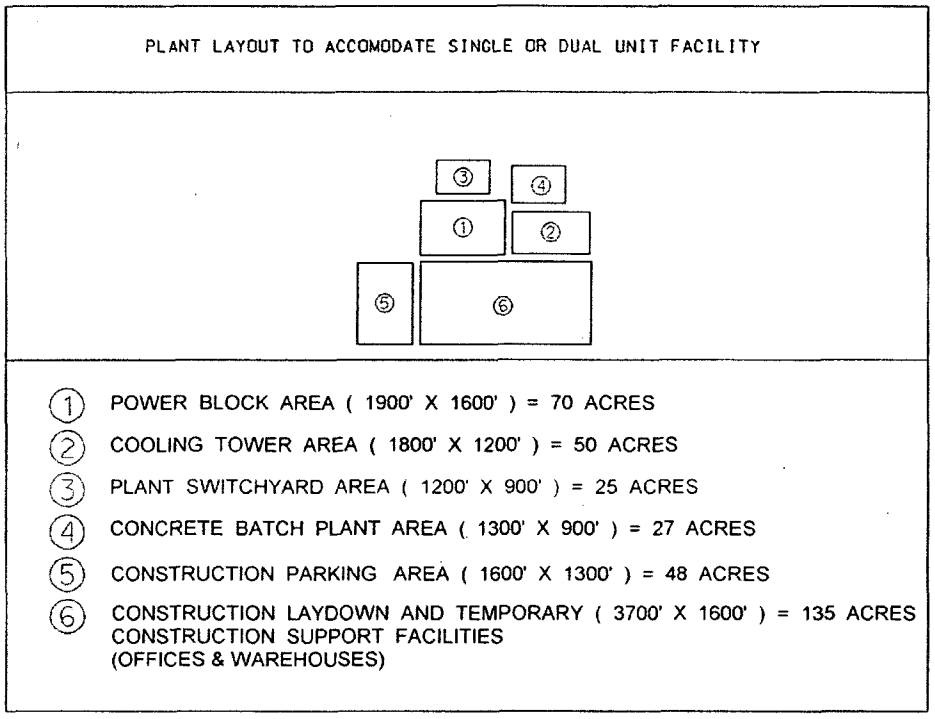
The topographic maps and aerial photographs of each Candidate Area were examined to identify specific locations that satisfied the following conditions considered appropriate for a viable nuclear power plant site. A key consideration was the availability of sufficient land suitable for arrangement of the power plant and other required facilities. Other required conditions included the following:

- Ground slope across the plant site not more than 5%
- Location as close as possible to water, transmission, and transportation resources
- Assessment of 100-year flood areas, wetlands, residences, and other sensitive land features

In order to confirm that each site had sufficient land suitable for arrangement of the power plant, a plant envelope footprint was developed based on vendor design documents for the reactor technologies being considered. The plant envelope footprint included a block for each major plant feature, based on the largest area required for any of the reactor technologies. The conceptual plant footprint blocks and their associated land requirements are shown in Figure 6-1. It should be noted that all potential sites have some impacts on sensitive environmental features, but significant impacts were avoided as much as possible both in identifying sites and in arranging the plant footprint blocks.

To the extent allowed by the required conditions listed above, an effort was made to identify at least one Potential Site in each of the seven Candidate Areas. More than one Potential Site was identified in the same Candidate Area if the sites appeared to offer a diversity of desirable conditions. In all cases, the Potential Sites retained for further study included the most favorable site identified in each Candidate Area.

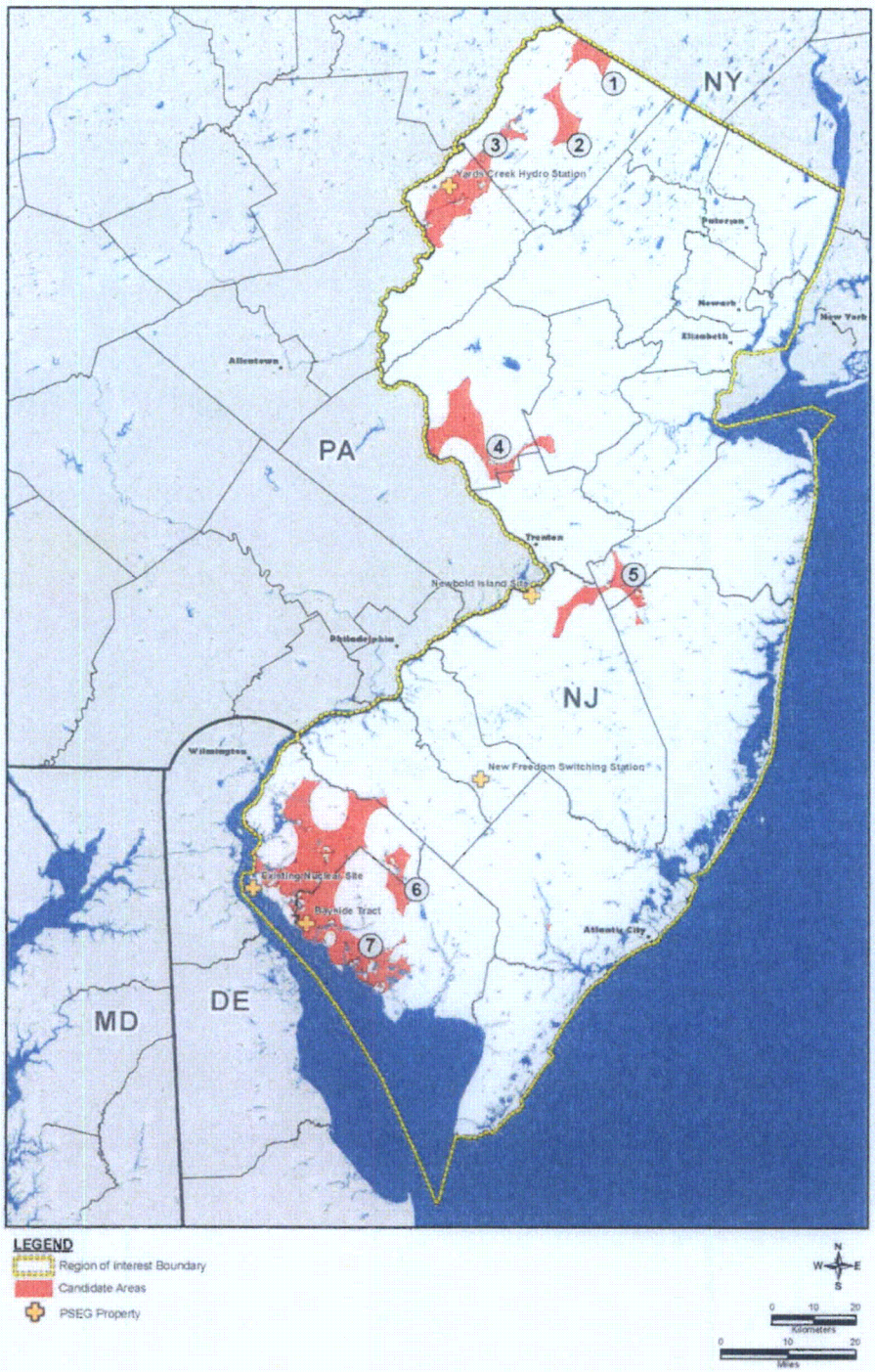
Figure 6-1 — Plant Footprint Blocks



Properties that were currently owned by PSEG and that might have sufficient land available to support a nuclear power plant were identified for review. Five such properties were identified, as shown in Figure 6-2. These properties included the following:

- Yards Creek Pumped Hydro Generating Station, located in the northern part of Warren County, New Jersey
- Newbold Island Site, located in the northern part of Burlington County, New Jersey
- New Freedom Switching Station, located in the southern part of Camden County, New Jersey
- Existing PSEG Nuclear Site (the location of the existing Salem and Hope Creek nuclear power plants), located in the southwestern part of Salem County, New Jersey
- Bayside Tract, located in the northwestern part of Cumberland County, New Jersey

Figure 6-2 — PSEG Properties Considered



As shown in Figure 6-2, the Yards Creek Pumped Hydro Generating Station, Bayside Tract, and PSEG Nuclear Site are located in identified Candidate Areas. Therefore, these properties were considered as possible locations of Potential Sites. However, the Newbold Island Site and New Freedom Switching Station are in areas that were eliminated due to high population density. Therefore, these properties were not considered further.

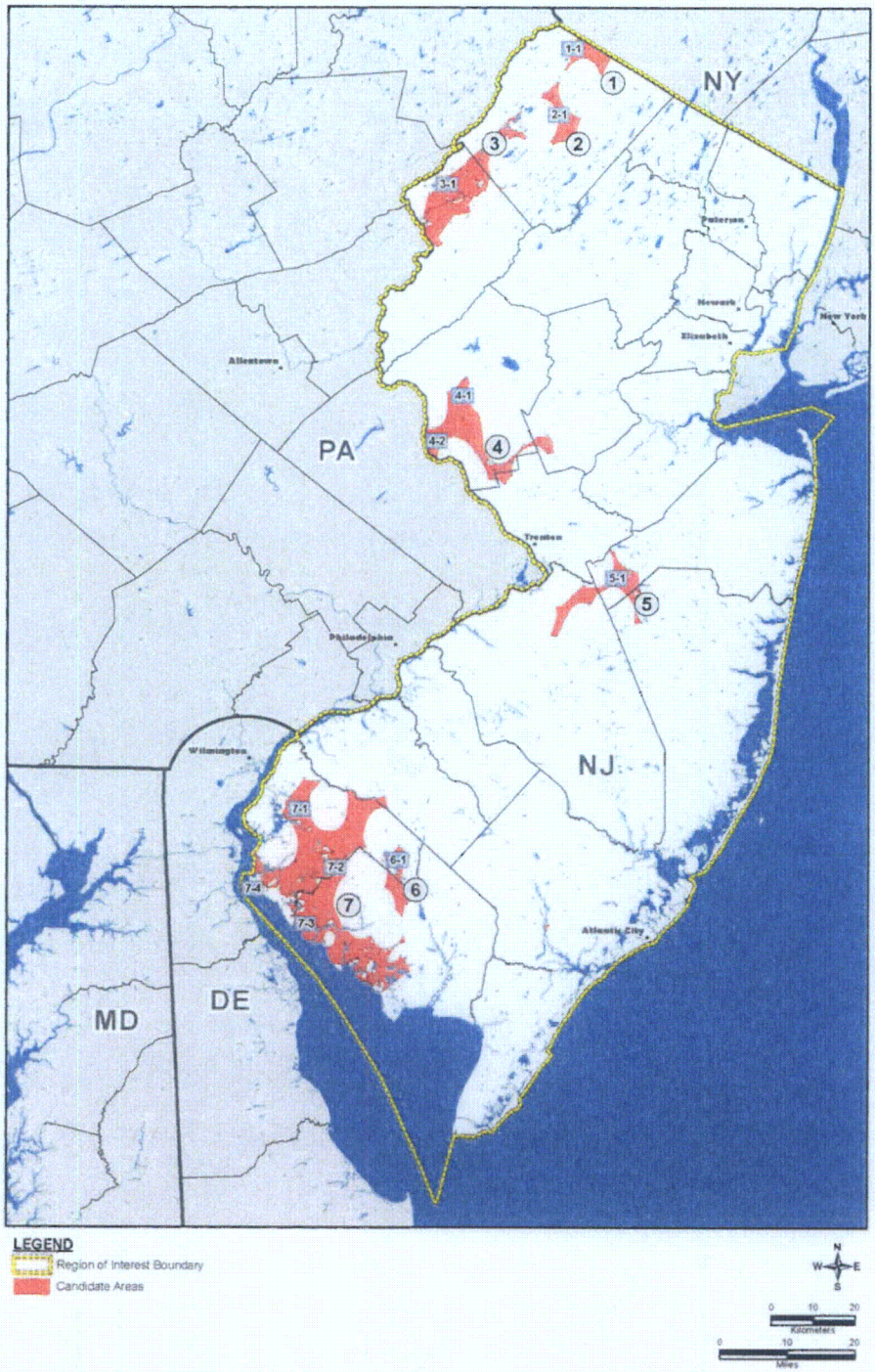
Based on reviewing topographic maps and aerial photographs, the Bayside Tract and PSEG Nuclear Site appeared to have sufficient open land to support arrangement of the nuclear power plant, and these properties appeared to be suitable in other respects. Therefore, these two properties were identified as Potential Sites. The open land at the Yards Creek Pumped Hydro Generating Station was not sufficient to support arrangement of the nuclear power plant, but land adjacent to the PSEG property appeared to be suitable. Therefore, this adjacent land was identified as a Potential Site.

Based on the reviews described above, 11 Potential Sites were identified. These 11 Potential Sites included at least one site in each of the Candidate Areas. The locations of the Potential Sites are shown in Figure 6-3.

After the Potential Sites were identified, the conceptual plant footprint blocks shown in Figure 6-1 were arranged on a topographic map of each site to create a preliminary site layout. The site topography, orientation of existing roads and other infrastructure, and locations of sensitive environmental features were considered in developing these preliminary site layouts. The layouts for the 11 Potential Sites are provided as Figures 1 through 11 in Appendix D. A legend showing the symbols used on the maps is included as Figure 12 in Appendix D.

The 11 Potential Sites were screened in order to identify Candidate Sites, as described in the next section of this report.

Figure 6-3 — Potential Site Locations



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7. CANDIDATE SITES

NUREG-1555 defines Candidate Sites as those Potential Sites that are considered to be among the best sites that can reasonably be found for the siting of a nuclear power plant. NUREG-1555 indicates that there should be a "reasonable number" of Candidate Sites, and that four to six Candidate Sites generally is adequate. According to NUREG-1555, Candidate Sites can be selected on the basis of a screening process to identify unacceptable areas.

As discussed in Subsection 3.4, the Potential Sites identified in the previous task were examined in more detail to determine whether the sites had any significant environmental or other issues that would make them impractical or otherwise undesirable for development of a nuclear power plant. More detailed information was collected on environmental and technical conditions at each site. Summary site descriptions were developed for each site, as included in Appendix E.

The preliminary site layouts included in Appendix D and the site descriptions included in Appendix E were used to screen the sites for the following major considerations:

- **Environmental Acceptability.** The sites were reviewed with regard to major environmental issues, such as proximity to designated lands or waters and potential encroachment on sensitive land uses.
- **Nuclear Licensing.** The sites were reviewed with regard to major nuclear licensing issues, such as proximity to capable faults, proximity to hazardous land uses, and proximity to population centers.
- **Engineering.** The sites were reviewed with regard to major engineering issues, such as the length and difficulty of required water, transmission, and rail connections, cooling water pumping head, and the ability to deliver large components to the site.

The issues evaluated during this screening were primarily environmental, combined with a qualitative assessment of the level of environmental impact and the necessary activities or considerations to mitigate or avoid the impact. While such issues often manifest themselves in either regulatory uncertainty or cost / schedule challenges, the primary focus of the screening was on the environmental suitability of the Potential Sites.

The sites were compared with the *Must* and *Want* conditions shown in Appendix B. Violation of a *Must* condition normally was sufficient to eliminate a site from further consideration, whereas violation of a *Want* condition was evaluated for significance. Identified issues were considered to be significant if they introduced the potential for adverse environmental impacts or schedule delays associated with environmental / regulatory

permitting or nuclear licensing. Other significant issues included environmental conditions that introduced overall regulatory uncertainty by raising the possibility of unusual and restrictive licensing or permit conditions or increased project costs by requiring unusual and costly site development efforts or impact mitigation measures.

Based on these evaluations, certain significant issues were identified at each site. As noted below, only one of the identified issues violates a *Must* condition shown in Appendix B. The other issues do not violate *Must* conditions, and therefore do not by themselves indicate that a site would not be feasible to license, permit, or develop. Rather, these issues would be expected to make licensing, permitting, or development of the site more difficult, complicated, and/or costly. In general, all sites being developed for a project of the size and magnitude of a nuclear power plant are expected to have some significant issues of this kind, but the extent of such issues is important in determining the overall desirability of a site.

The bullet items below summarize the substantive issues that were judged to be significant at each site. Issues that were judged not to have the potential to introduce significant challenges are not included below.

- Site 1-1
  - State park within 1 mile
  - Several local parks within 1 mile
  - Water pipeline must cross state park
  - Transmission line must cross New Jersey Highlands
  - Delaware River in the site area is classified as an Outstanding Water; wastewater discharges to the river would introduce permitting complications
  - Delaware River in the site area is classified as Wild & Scenic; a water intake structure on the river would introduce permitting complications
  - Transmission line connection 18 miles long
  - Static head for pumping make-up water 900 feet
  - No barge access; rail spur 16 miles long
- Site 2-1
  - Water pipeline must cross state park or national recreation area
  - Transmission line must cross New Jersey Highlands
  - Rail spur must cross local park
  - Delaware River in the site area is classified as an Outstanding Water; wastewater discharges to the river would introduce permitting complications

- Delaware River in the site area is classified as Wild & Scenic; a water intake structure on the river would introduce permitting complications
- Transmission line connection 13 miles long
- Water pipeline 11 miles long, static head 500 feet
- No barge access, rail spur 10 miles long

- Site 3-1
  - National recreation area within 1 mile
  - State forest within 1 mile
  - Several local parks within 1 mile
  - Transmission line must cross New Jersey Highlands
  - Delaware River in the site area is classified as an Outstanding Water; wastewater discharges to the river would introduce permitting complications
  - Delaware River in the site area is classified as Wild & Scenic; a water intake structure on the river would introduce permitting complications
  - Transmission line 20 miles long
  - No barge access, rail spur 11 miles long
- Site 4-1
  - New Jersey Highlands within 1 mile
  - Rail spur must cross New Jersey Highlands
  - Possible capable fault within 10 miles
  - Delaware River in the site area is classified as a Significant Water; wastewater discharges to the river would raise permitting issues
  - No barge access, rail spur 8 miles long
- Site 4-2
  - State park within 1 mile
  - State wildlife management areas within 1 mile
  - Two local parks within 1 mile
  - Two public water supply wells within 1 mile
  - Water pipeline must cross state park
  - Possible capable fault within 10 miles
  - Delaware River in the site area is classified as a Significant Water; wastewater discharges to the river would raise permitting issues
  - No barge access, rail spur 11 miles long

- Site 5-1
  - Local park within 1 mile
  - School athletic fields within 1 mile
  - Private golf course within 1 mile
  - Historic mill site within 1 mile
  - Six Flags amusement park within 5 miles
  - Trenton urban area within 5 miles
  - Water pipeline 11 miles, static head 120 feet
  - Rail spur must cross two Interstate highways
- Site 6-1
  - Two population centers (>25,000 people) within 10 miles (VIOLATES *MUST* CRITERION)
  - State park within 1 mile
  - Two schools within 1 mile
  - Local recreation area within 1 mile
  - Private golf course within 1 mile
  - Water pipeline 20 miles, static head 120 feet
  - No barge access, rail spur 6 miles long
- Site 7-1
  - State wildlife management area within 1 mile
  - Hospital and nursing home within 5 miles
  - Prison within 5 miles
  - Major population center (Wilmington, Delaware) within 10 miles
- Site 7-2
  - State wildlife management area within 1 mile
  - Local recreation area within 1 mile
  - One historical building within 1 mile
  - Water pipeline 13 miles long, static head 140 feet
- Site 7-3 (Bayside Tract)
  - State wildlife management area within 1 mile
  - One historical building within 1 mile
  - Former historical building within site boundaries
  - Significant wetlands within site boundaries

- Site 7-4 (PSEG Nuclear Site)
  - State wildlife management area within 1 mile
  - Available land area is constrained
  - Significant wetlands within site boundaries

Site 6-1 was eliminated from further consideration because it had a condition that violated one of the established *Must* criteria. None of the other sites violated a *Must* criterion, and therefore all of the sites are considered potentially feasible to license, permit, and develop. However, as discussed above, the number of significant issues is important in determining the overall desirability of a site, because a larger number indicates that a site would have more challenges likely to cause delays, increase costs, and introduce regulatory uncertainty. Grouping the significant issues into the three primary areas of evaluation, the number of issues identified for each of the remaining sites can be summarized as shown in Table 7-1.

Table 7-1 — Evaluation Summary (Number of Significant Issues)

Site	Nuclear Licensing	Environmental Acceptability	Engineering and Cost	Total
1-1	0	6	3	9
2-1	0	5	3	8
3-1	0	6	2	8
4-1	1	3	1	5
4-2	1	6	1	8
5-1	2	4	2	8
7-1	3	1	0	4
7-2	0	3	1	4
7-3	0	4	0	4
7-4	0	2	1	3

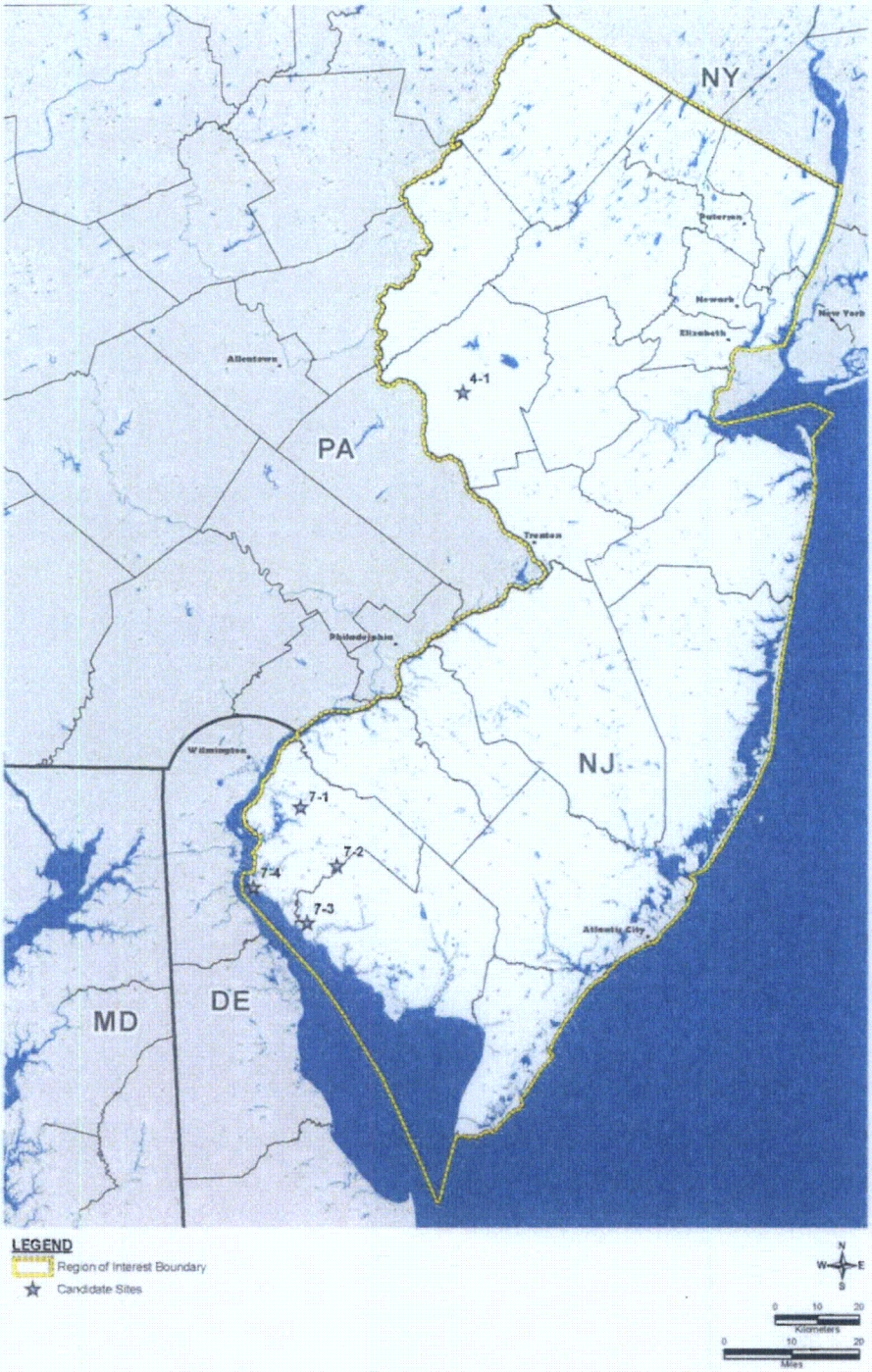
In accordance with NUREG-1555, an attempt was made to identify four to six Candidate Sites, by focusing on those Potential Sites with significantly fewer significant issues than the other Potential Sites. Based on the results in Table 7-1, it can be seen that five sites — Sites 4-1, 7-1, 7-2, 7-3, and 7-4 — have at least 40% fewer identified issues than all of the other sites. In addition, qualitative evaluation of the issues at these sites indicated that all of the issues appeared to be manageable and that each of the sites had several highly desirable

characteristics. On the basis of these evaluations, Sites 1-1, 2-1, 3-1, 4-2, and 5-1 were eliminated from further consideration, and the following sites were retained as Candidate Sites for further study:

- Site 4-1 (Hunterdon County, New Jersey)
- Site 7-1 (Salem County, New Jersey)
- Site 7-2 (Salem County, New Jersey)
- Site 7-3 (Cumberland County, New Jersey)
- Site 7-4 (Salem County, New Jersey)

The locations of these candidate sites are shown in Figure 7-1. These sites were evaluated in more detail, as described in the next section of this report.

Figure 7-1 — Candidate Site Locations



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8. EVALUATION OF CANDIDATE SITES

The Candidate Sites were evaluated in more detail, in order to support PSEG's selection of a Preferred Site and Alternative Sites. The primary focus of these evaluations was to develop numerical scores that would allow the Candidate Sites to be ranked according to their overall suitability for development with a nuclear power plant. In order to support the numerical scoring, various investigations and assessments were performed, including transmission evaluations, environmental and permitting evaluations, field reconnaissance, and refinement of the site layouts. The results of these evaluations and the final numerical scoring are discussed in the following subsections.

8.1 TRANSMISSION EVALUATIONS

The transmission evaluations included separate assessments of interconnection issues and stability issues, as summarized below.

8.1.1 Interconnection Issues

The feasibility of obtaining transmission interconnection for the Candidate Sites was evaluated through modeling of thermal overloads that would result if 2,234 MW were injected into the transmission system at each site location. High-level cost estimates, based on an average $/mile cost for re-conductoring transmission lines to upgrade and mitigate transmission overloads, were developed. These cost estimates, which are intended only for the purpose of comparing Candidate Sites, are shown below.

Table 8-1 — Comparative Network Upgrade Costs due to Thermal Overloads

	Site 4-1	Site 7-1	Site 7-2	Site 7-3	Site 7-4
Total Cost (millions)	$13.0	$13.0	$8.0	$8.0	$13.0

This transmission analysis did not model line additions that may be required to mitigate stability issues. Therefore, some network upgrades determined by this thermal transmission analysis may be eliminated when the results of a detailed stability study are known and the power flow study is re-performed with additional transmission lines modeled.

8.1.2 Stability Issues

The risk of transmission upgrades being required in order to maintain system stability was qualitatively evaluated using engineering judgment. The transmission network topology for each Candidate Site was reviewed to assess the risk of additional upgrades being required due to transient stability under loss of generation and/or fault conditions. The evaluation took into consideration the total generating capacity (existing and proposed) in each site area and the number of 500 kV transmission lines (existing and proposed) connecting to the site location. Based on the available information, it was considered likely that all of the Candidate Sites would require one or two additional 500 kV transmission lines in order to maintain stability under fault conditions. In addition, PJM has performed a system impact study for a project located near the Candidate Sites, which revealed significant upgrades required to mitigate stability issues. Due to the proximity of this project to the Candidate Sites, all of the sites are considered to have a high level of risk in terms of additional transmission upgrades required to mitigate stability issues.

8.2 ENVIRONMENTAL AND PERMITTING EVALUATIONS

Environmental and permitting issues were evaluated in more detail. Maps were obtained showing the property parcels on and near each Candidate Site. Information on zoning and land use planning also was collected. Reviews were conducted of applicable state and local regulations concerning air quality, ambient noise, water withdrawal, and other permitting issues. Site-specific information on threatened/endangered species and cultural resources was requested from appropriate government agencies.

The information collected and any significant differences among the Candidate Sites in each of these areas are summarized below.

8.2.1 Property Parcels

Property plat maps were obtained for the three Candidate Sites not already owned by PSEG (Sites 4-1, 7-1, and 7-2). The purpose of collecting this information was not to identify specific property owners but to identify the boundaries of existing property parcels so that appropriate site boundaries could be delineated for the Candidate Sites. The property parcel boundaries were considered when the site layouts were refined, as discussed in Subsection 8.4.

Figures 8-1 through 8-3 show the property parcel maps and final site boundaries for Sites 4-1, 7-1, and 7-2, respectively.

Figure 8-1 — Candidate Site 4-1 Property Map

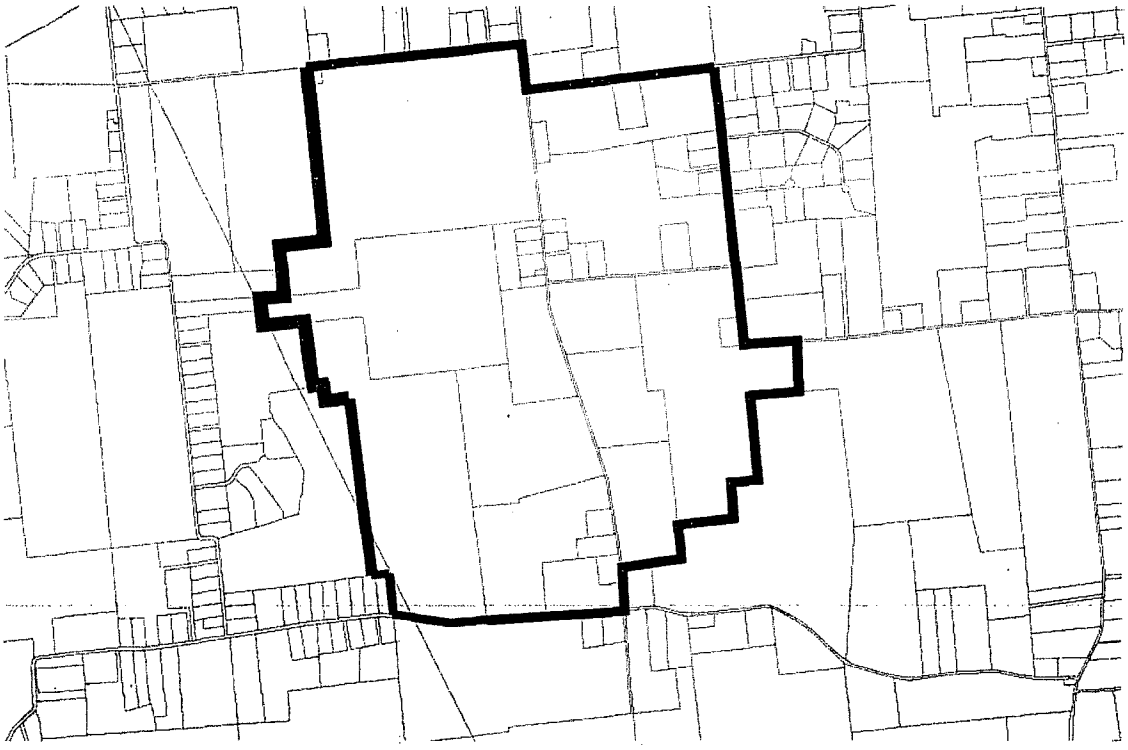


Figure 8-2 — Candidate Site 7-1 Property Map

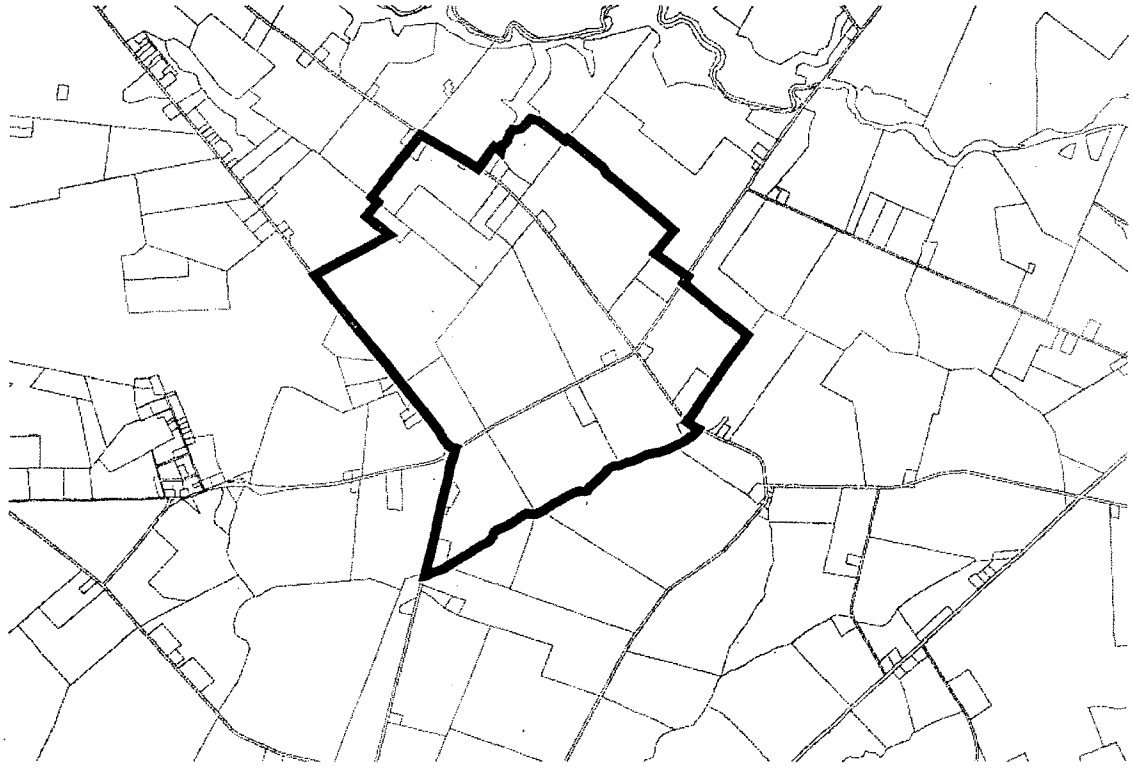
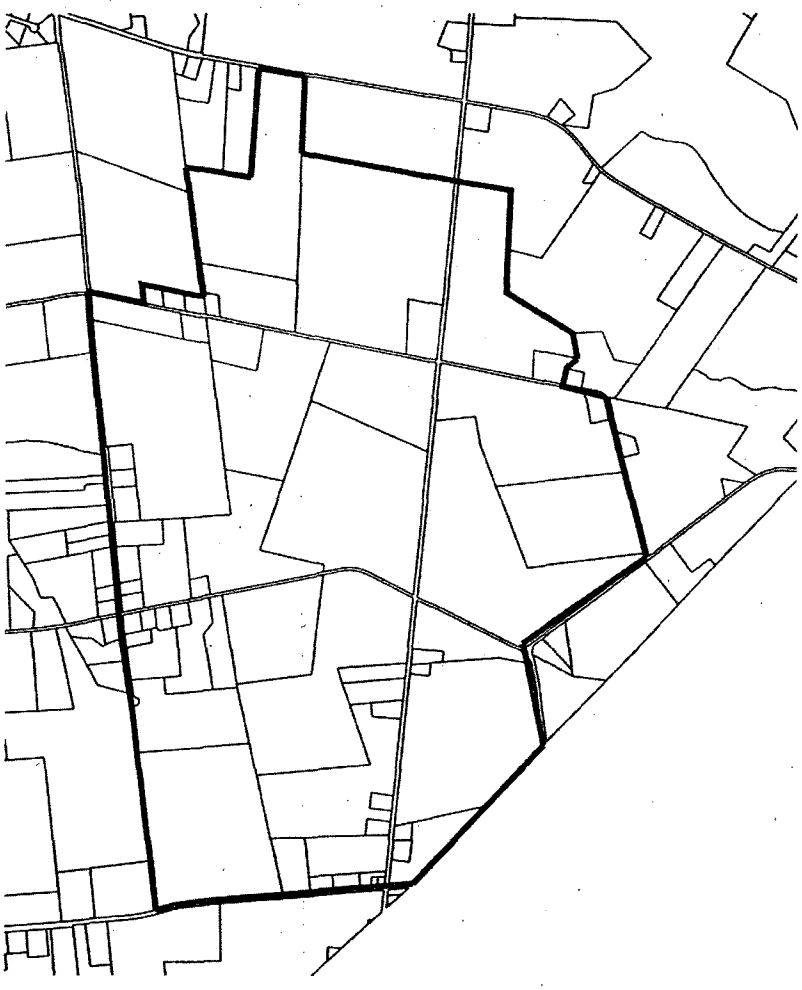


Figure 8-3 — Candidate Site 7-2 Property Map



8.2.2 Zoning and Land Use Planning

Zoning maps were obtained as available for all of the Candidate Sites. Land use planning information also was obtained for the sites, but that information was less specific and less prescriptive than the zoning information.

Figures 8-4 through 8-8 show the zoning maps and final site boundaries for the Candidate Sites. It can be seen that Site 7-4 is the only site currently zoned for Industrial use. Site 4-1 is predominantly zoned for Residential use, while Sites 7-1 and 7-2 are predominantly zoned for Agriculture. A zoning map was not available for Site 7-3, but the Greenwich Township Zoning Office indicated that the site is predominantly zoned Rural

Residential. The definitions for all of these zoning classifications indicate that power generation is not an allowable use; therefore, all of the Candidate Sites except Site 7-4 would require a zoning variance.

Figure 8-4 — Candidate Site 4-1 Zoning Map

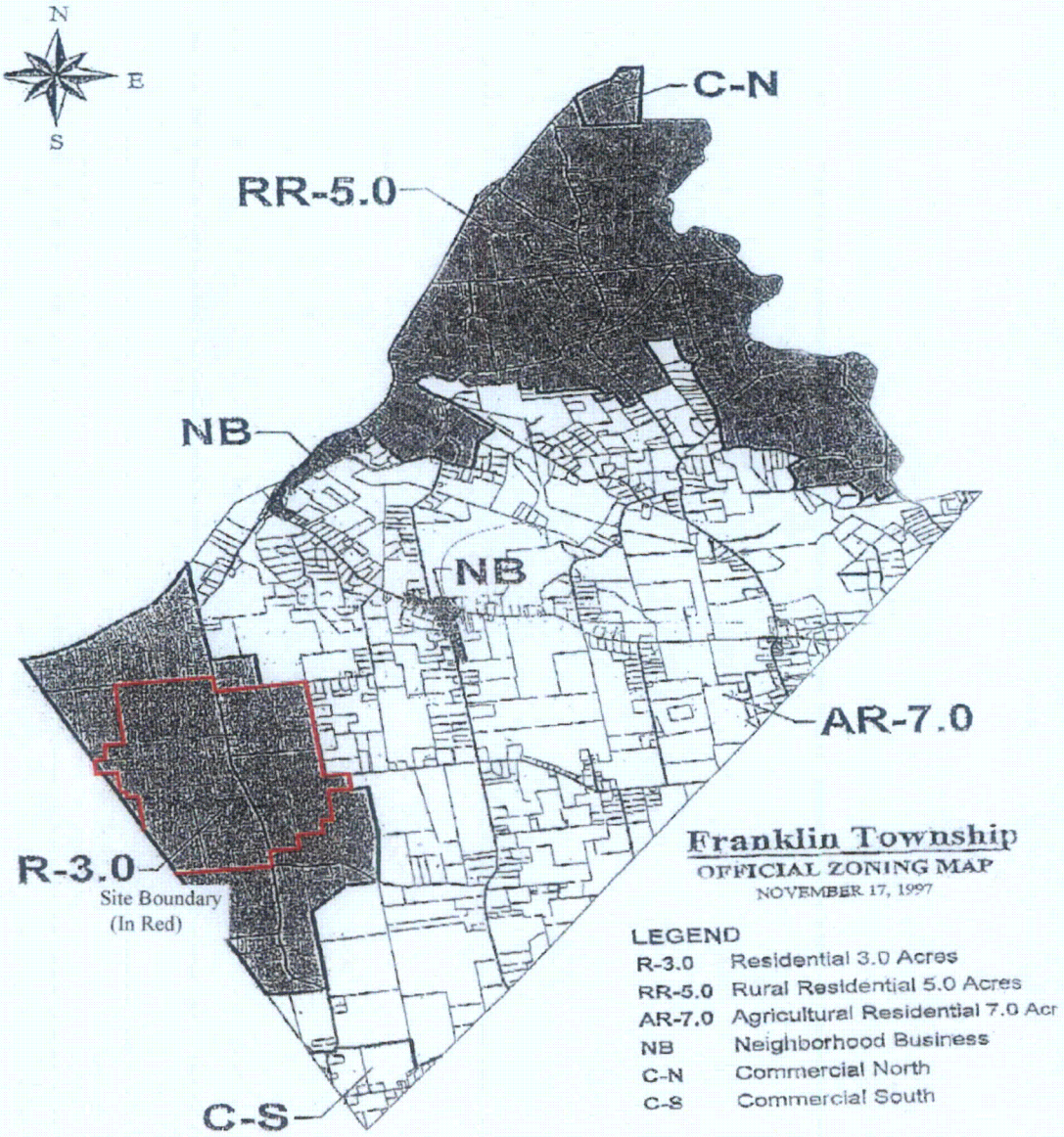


Figure 8-5 — Candidate Site 7-1 Zoning Map

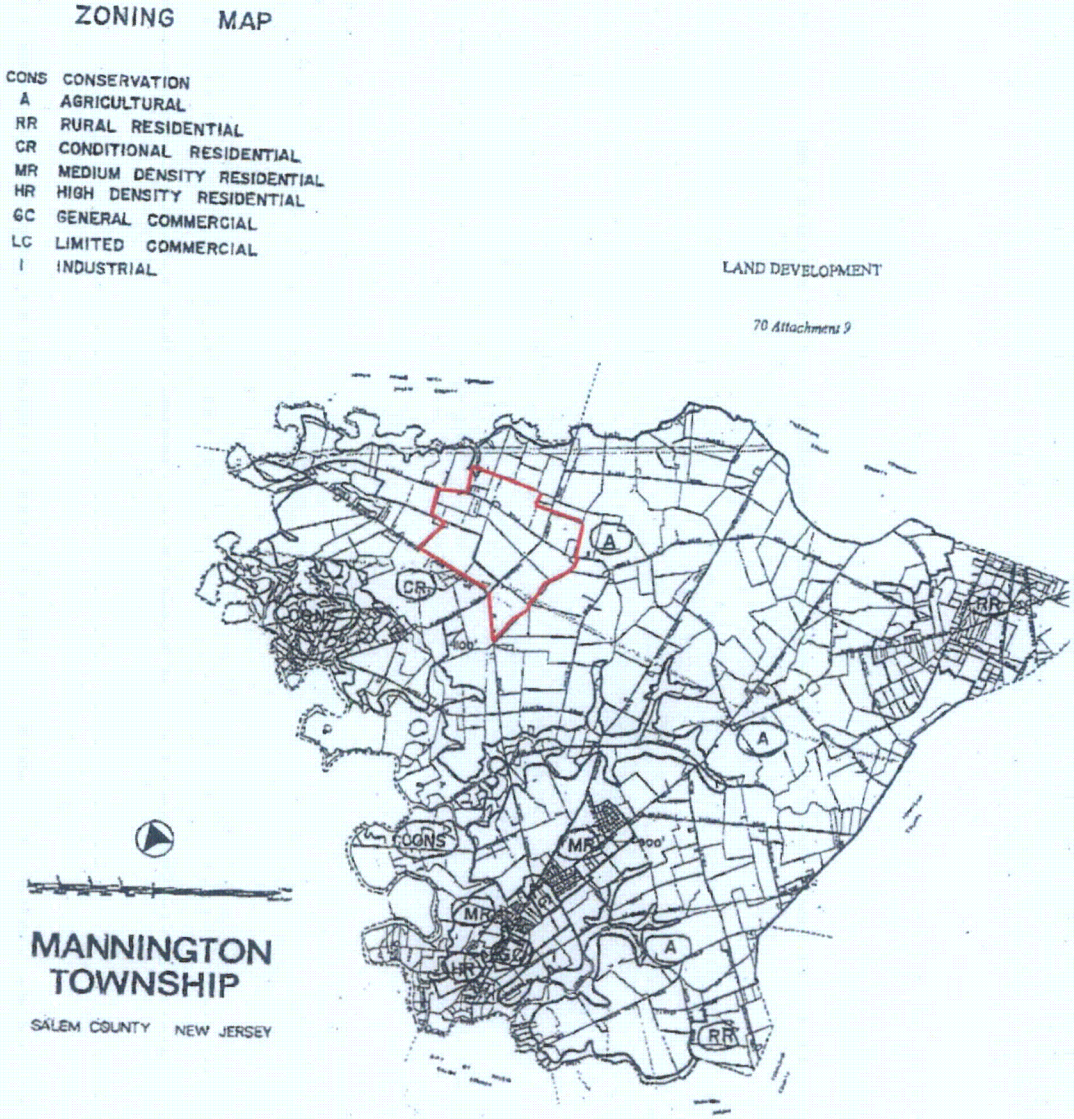


Figure 8-6 — Candidate Site 7-2 Zoning Map

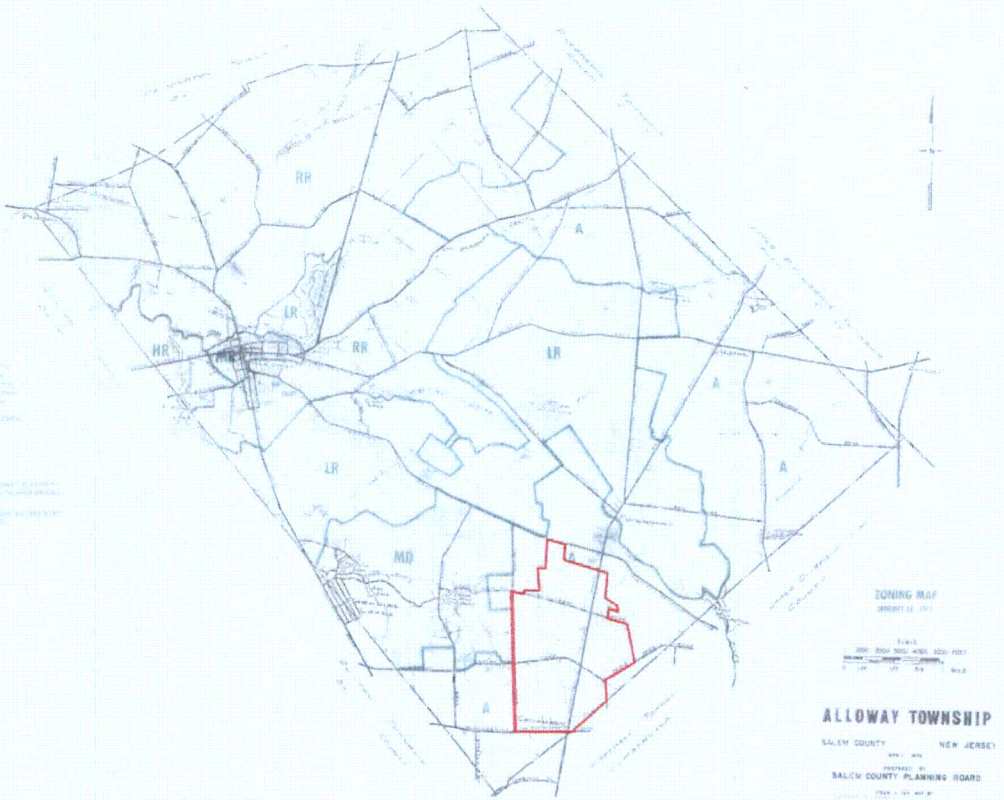
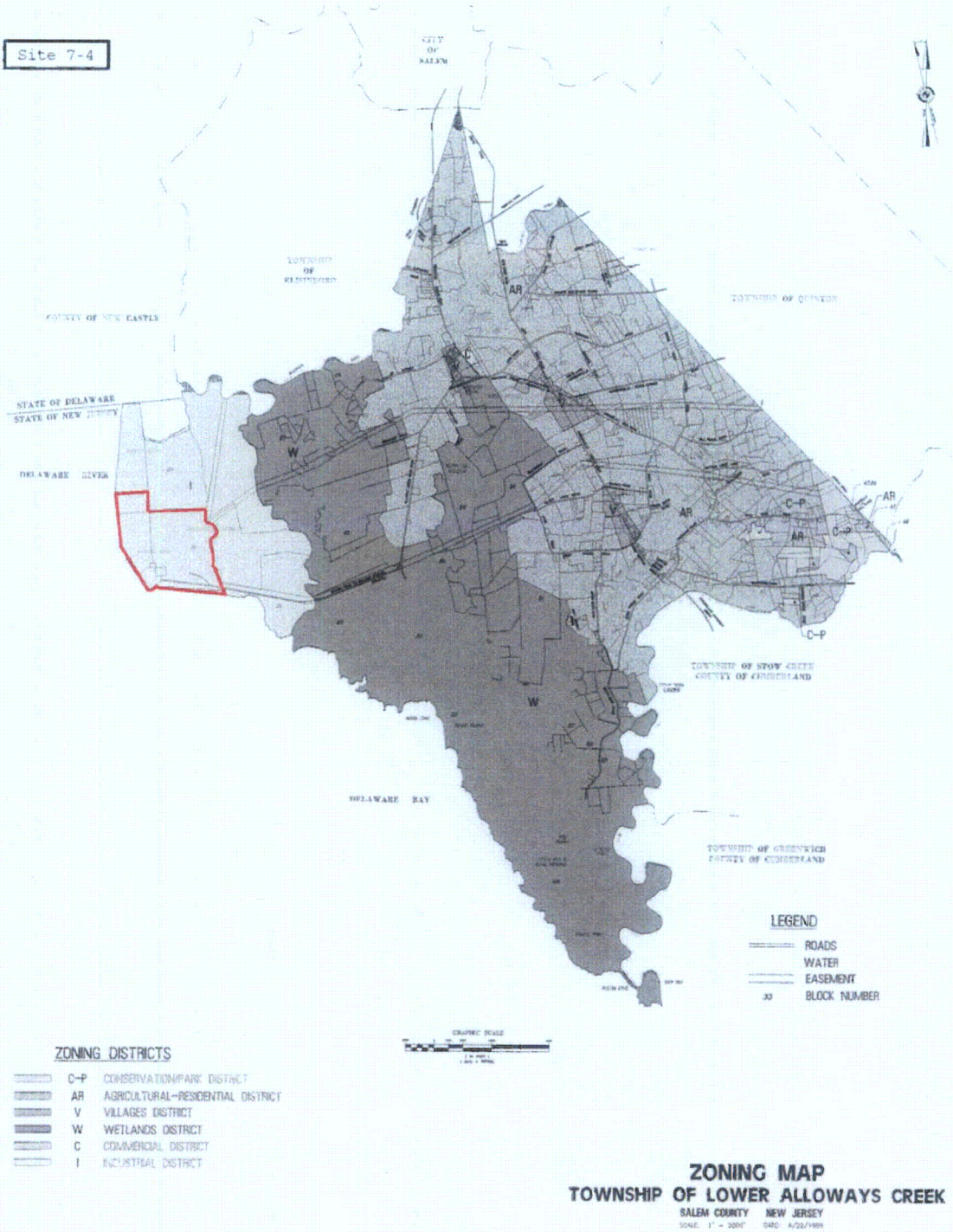


Figure 8-7 — Candidate Site 7-3 Zoning Map

Not Available

Figure 8-8 — Candidate Site 7-4 Zoning Map



The definitions of the predominant zoning classifications at each site are reproduced in Appendix F. Summaries of the applicable zoning variance procedures also are included in Appendix F. All of the zoning variance procedures appear to be relatively burdensome, requiring several separate submittals, public hearings, and long lead times. Therefore, Site 7-4 appears to have a significant advantage compared to the other Candidate Sites with regard to zoning issues.

8.2.3 Air Quality

No significant local air quality regulations or programs were found for any of the Candidate Sites. Therefore, air quality permitting and air pollution control requirements at all of the sites would be governed by applicable federal and state regulations and programs. Generally, these requirements would be the same for all of the sites. In addition, all of the sites are in areas classified as non-attainment for ozone but attainment for other pollutants.

8.2.4 Ambient Noise

No significant local ambient noise regulations or standards were found for any of the Candidate Sites. Therefore, ambient noise requirements at all of the sites would be governed by applicable New Jersey regulations and standards. Therefore, none of the Candidate Sites is considered to have a significant advantage or disadvantage with regard to ambient noise requirements. New Jersey ambient noise regulations and standards are summarized in Appendix G.

8.2.5 Water Withdrawal

No significant local water withdrawal regulations or standards were found for any of the Candidate Sites. Therefore, water withdrawal requirements at all of the sites would be governed by applicable state regulations and standards and none of the Candidate Sites is considered to have a significant advantage or disadvantage with regard to water withdrawal requirements. New Jersey water withdrawal regulations and standards are summarized in Appendix G.

8.2.6 Threatened and Endangered Species

Information on documented occurrences of threatened and endangered species in each site area was requested from the New Jersey Natural Heritage Inventory Program. The state provided general information indicating the potential occurrence of several listed species in each of the site areas. On that basis, none of the Candidate Sites

is considered to have a significant advantage or disadvantage with regard to threatened and endangered species. The information provided by the New Jersey Natural Heritage Inventory Programs is included in Appendix G.

8.2.7 Cultural Resources

Information on archaeological and historical resources recorded in each site area was requested from the New Jersey Historic Preservation Offices. The state did not provide information directly, but allowed a search of its files of known archaeological and historical properties. None of the Candidate Sites is considered to have a significant advantage or disadvantage with regard to cultural resources. The information obtained through file searches at the New Jersey historical office is included in Appendix G.

8.3 FIELD RECONNAISSANCE

Field reconnaissance site visits were conducted at each of the Candidate Sites in September 2008 and September 2009. At Sites 7-3 and 7-4, where property access was available, the sites were examined on foot. At the other sites, the field reconnaissance consisted of a survey from public roads and other public vantage points.

Field reconnaissance observations focused on issues such as the condition of wetlands and other natural habitats, recent residential developments, transportation routes, and constructability characteristics. No significant unexpected conditions were observed at any of the sites, but the field reconnaissance succeeded in confirming and supplementing the information collected from maps, aerial photographs, and other publicly available sources.

Notes of the field reconnaissance site visits are included in Appendix H. Representative photographs taken at the sites are included in Appendix I.

8.4 REFINEMENT OF SITE LAYOUTS

Based on the information collected through the environmental evaluations and field reconnaissance, the site layouts were revised to make the best use of existing property parcels and to reduce potential impacts on environmentally sensitive areas to the extent possible. The revised site layouts are included in Appendix J. Summary descriptions of the key characteristics of the Candidate Sites (revised from the Potential Site descriptions presented earlier) are included in Appendix K.

8.5 NUMERICAL SITE ASSESSMENT

The information collected in previous activities was used to generate numerical scores that allowed the Candidate Sites to be ranked according to their overall suitability for development of a nuclear power plant. The quantitative criteria shown in Appendix B provided numerical scores on 40 site characteristics related to the suitability of the sites with regard to nuclear licensing issues, environmental issues, and engineering and economic issues. These criteria were applied as described in the following paragraphs.

8.5.1 Item 1a – Proximity to Population Centers

10 CFR 100 defines a "population center" as a densely populated area with at least 25,000 residents. U.S. Census Bureau year 2005 population estimates were used to determine which towns near the Candidate Sites have populations greater than 25,000 people. Distances were measured from the middle of the power block, as shown on the site layout drawings, to the nearest border of the town in question.

8.5.2 Item 1b – Low Population Zone Feasibility

U.S. Census Bureau year 2000 GIS data were used to determine the population density (number of persons per square mile) in the area within a 3-mile radius of each Candidate Site. The population density of each census block that has its statistical center within 3 miles of the center of the power block was considered. The population densities of these census blocks were averaged to produce a single number for comparison with the numerical scoring criteria.

8.5.3 Item 1c – Exclusion Area Feasibility

The rating for this characteristic was based on the geographic features included within the exclusion area boundary (EAB) and the extent to which the EAB extended beyond the site property boundary. The geographic features considered were residences and roads located within the EAB but not on site property, and railroads and waterways located anywhere within the EAB. These geographic features were identified from USGS topographic maps and available aerial photographs.

An EAB distance of 0.95 mile (5,000 feet) was used, as explained in Appendix C. This distance was measured from the center of the power block shown on the site layout drawing. It should be noted that the actual EAB distance used to license a site would be measured from the reactor containment building, and the containment building might not be at the center of the power block. However, because the containment building location has

not been determined for the Candidate Sites, the center of the power block was used as an approximation of the containment location.

8.5.4 Item 1d – Emergency Planning Zone Feasibility

As explained with regard to Item 1a, U.S. Census Bureau data were used to the find the population center nearest to each Candidate Site. Meteorological data from the National Weather Service Station considered most representative of each site area was obtained from the National Climatic Data Center. The meteorological data was used to produce "wind roses," which show the frequency of winds in each direction. The population center was considered to be downwind if it was within any of the three directional sectors opposite the most commonly measured (prevailing) wind direction.

8.5.5 Item 2a – Proximity to Capable Faults

The Updated Final Safety Analysis Reports for the Salem and Hope Creek power plants were used to identify capable faults within 200 miles of each Candidate Site. Only the Ramapo Fault in central New Jersey was identified as a capable fault as defined in 10 CFR 100. The location of the Ramapo Fault was determined from USGS seismic hazard map data, and the distance to each Candidate Site was scaled from topographic maps.

8.5.6 Item 2b – Safe Shutdown Earthquake (SSE) Maximum Acceleration

Determination of the SSE maximum acceleration for licensing purposes requires detailed calculations and a thorough evaluation of the geologic and seismic characteristics of the entire region around the power plant site. The approach used for the Candidate Site evaluations provides a preliminary approximation of maximum accelerations.

The USGS produces maps that show peak horizontal seismic acceleration for 2% probability of exceedance in 50 years and 10% probability of exceedance in 50 years. Using these maps (Seismic Hazard Maps for 1996, 2002, and 2008), the maximum acceleration at each site was estimated as follows:

- The peak horizontal acceleration with 2% and 10% probability of exceedance in 50 years was determined for each site location.
- The two acceleration points and their percentage of exceedance were plotted to a straight line. Extension of the line to 0.5% probability of exceedance in 50 years provided the peak horizontal acceleration corresponding to the site location. This 0.5% probability corresponds to one occurrence in 10,000 years or an annual probability of exceedance at the site of 0.0001. This annual probability meets the Regulatory Guide 1.165 requirement for the SSE.

For Sites 7-1, 7-2, 7-3, and 7-4, the 0.5% probability acceleration value is approximately 0.095 g. These four sites are located in a rectangular area approximately 30 miles long (east to west) and 15 miles wide (north to south). This rectangular area is aligned approximately in parallel with an equal peak acceleration contour per the USGS seismicity maps. Therefore, the seismic risk associated with these sites is approximately the same. For Site 4-1, the 0.5% probability acceleration value is approximately 0.15 g.

The above values refer to bedrock acceleration. During an earthquake, bedrock accelerations are propagated to the ground surface, and this process generally results in the amplification of the bedrock accelerations near the ground surface. The seismic evaluations provided in the Updated Final Safety Analysis Reports (UFSARs) for the existing Salem and Hope Creek power plants estimate the SSE maximum acceleration assuming that a Modified Mercalli Intensity Scale VII (MMI VII) earthquake occurs near the plant site. On that basis, the UFSARs estimate a maximum acceleration of 0.20 g near the ground surface (at the foundation level). This value is based on the mean peak acceleration plus one standard deviation for a MMI VII earthquake, and it is considered to be conservative.

Since the Salem and Hope Creek power plants are within the rectangular area described above for Sites 7-1, 7-2, 7-3, and 7-4, the numerical site evaluations used a maximum ground surface acceleration of 0.20 g for all of these sites. At Site 4-1, the maximum ground surface acceleration was considered to be at least 0.25 g, based on the bedrock acceleration being approximately 0.05 g higher at this site relative to the other four sites. However, the maximum ground surface acceleration at Site 4-1 could be higher than 0.25 g, because this is the only site in close proximity to an active fault system (the Ramapo Fault). Therefore, the numerical score was reduced by one point in order to account for this uncertainty.

8.5.7 Item 2c – Liquefaction Potential

Information on soil conditions at the Candidate Sites was obtained from County Soil Survey maps provided by the Natural Resource Conservation Service (NRCS). These maps provide the soil conditions within the upper six to seven feet of the subsoil at the site. The NRCS soil survey reports provide data on the soil types and a range of physical and engineering properties, including stratification with depth, depth to water, depth to rock for shallow soil profiles, and ground suitability for buildings. Location-specific evaluation of several factors discussed in these reports provides a preliminary picture of the liquefaction susceptibility of the soils at the sites.

USGS and state geological survey maps also provide some information regarding the type of soil deposits above the bedrock, groundwater depth, type of bedrock, and approximate depth to bedrock. The following maps were consulted for additional information on the Candidate Sites:

- U.S. Geological Survey Open File Map OF 95-543B "Surficial Geologic Map of the Northern Sheet, New Jersey.
- U.S. Geological Survey Open File Report 95-254 "Geologic Map of New Jersey: Southern Sheet."
- U.S. Geological Survey Open File Report 95-253 "Geologic Map of New Jersey: Central Sheet."

Site 7-4 is considered the most susceptible to liquefaction because the existing in-situ soils consist of uncompacted hydraulic fill material. It is expected, based on geotechnical/geophysical data from the existing Salem and Hope Creek power plants, that the soil at Site 7-4 would be improved to address potential liquefaction issues, as was done for the existing stations. Based on County Soil Survey maps, Site 4-1 has shallow rock and is therefore considered the least susceptible to liquefaction. The other sites have liquefaction potentials intermediate between Sites 7-4 and 4-1.

8.5.8 Item 3a – Proximity to Hazardous Land Uses

Potentially hazardous land uses near the Candidate Sites were identified from aerial photographs, topographic maps, field reconnaissance, and GIS data on pipelines and industrial facilities. Potentially hazardous land uses include oil and gas wells and pipelines, industrial facilities that may use explosive or toxic substances, quarry or mining operations, and military bases. All such land uses within 5 miles of the power block were counted. Airports and airways were not counted in this evaluation, because proximity to airports and airways is evaluated separately under Items 5e and 5f.

8.5.9 Item 3b – Malevolent Watercraft or Vehicles

The shortest distance from a public road or navigable waterway to the edge of the power block was measured using topographic maps. A river or lake was considered "navigable" for this analysis if it had an effective depth of at least 3 feet, as identified in National Oceanic and Atmospheric Administration GIS data. Any Federal, State, County, or Township road was considered to be a "public road" for this analysis except for the portions of roads within the identified site boundary. For purposes of evaluating Site 7-4, the existing access road for the PSEG Nuclear Site was considered to be public up to the plant security checkpoint.

8.5.10 Item 3c – Suitable Terrain for Protected Area (PA) Fence and Owner-Controlled Area (OCA) Surveillance

The terrain and ground cover along the power block boundary and a 1,000-foot buffer were evaluated using aerial photographs and topographic maps to identify any potential obstructions. It was assumed that it would be feasible to grade terrain with a slope of less than 5% and to remove trees and structures located with the identified site boundaries.

8.5.11 Item 3d – Response Time for Local Law Enforcement Agency

The response time for local law enforcement agency (LLEA) personnel to reach the Candidate Sites was determined based on typical driving times. It was assumed that law enforcement personnel would be dispatched from the nearest state police station or county police station in counties with a significant police force. In addition, the existing Salem and Hope Creek nuclear power plants have an agreement with the Lower Alloways Creek Township police department to provide emergency support from the town of Hancocks Bridge, New Jersey, so this location was assumed for Site 7-4. MapQuest was queried to determine typical driving times from the nearest of the above locations to each site.

8.5.12 Item 4a – Wetlands Impact Potential

National Wetlands Inventory and state wetlands GIS data were used to map wetlands in the site areas. The acreage of wetlands within the identified site boundaries was then calculated using GIS computational capabilities.

8.5.13 Item 4b– Other Natural Habitats Impact Potential

Field reconnaissance and National Land Cover Data GIS mapping were the basis for determining what areas could be considered a "natural habitat" other than wetlands. Forested areas were the only such natural habitats identified on any of the Candidate Sites. The percentage of forest within the identified site boundaries was then calculated using GIS computational capabilities.

8.5.14 Item 4c – Documented Occurrence of Threatened and Endangered Species

The New Jersey Natural Heritage Program provided information on the federal and state threatened and endangered species known to occur in each site area. Based on this information and the presence of suitable habitats within the site boundaries, all of the Candidate Sites are considered to have the potential for threatened

and endangered species occurrence within the site boundaries. In addition, on-site observations at Sites 7-3 and 7-4 have confirmed the occurrence of threatened and endangered species at those sites.

8.5.15 Item 4d – Proximity to Designated Natural Areas

Designated natural areas, including parks, nature preserves, wildlife management areas, and wildlife refuges were identified from topographic maps, state tourism maps, and GIS map data. The distance from the site boundary to the nearest natural area was then measured on topographic maps.

8.5.16 Item 5a – Existing Land Use on the Site

The existing land uses at each Candidate Site were determined from field reconnaissance and aerial photographs. The predominant land use within the identified site boundaries was then used to determine the numerical score. If there were two significant land uses within the site boundaries, the numerical scores for those land uses were averaged to produce a single score.

8.5.17 Item 5b – Existing Land Use within 1 Mile of the Site

The nearby existing land uses within 1 mile of the potential site boundaries were determined from field reconnaissance and aerial photographs. The predominant land use was then used to determine the numerical score as described in Item 5a.

8.5.18 Item 5c –Land Planning/Zoning

For each county and township within which a Candidate Site was located, the websites of the county and township governments were searched for information on land use planning and/or zoning. If necessary, county and township offices were contacted in order to confirm the land use plans and zoning classifications applicable to the site. Other land planning restrictions, such as the existence of County Preserved Farms, were also identified and evaluated.

8.5.19 Item 5d – Prime Farmland

NRCS County Soil Survey maps were used to identify the soil types found within the boundaries of each Candidate Site, along with the soil types considered to be Prime Farmland soils. The soil survey maps and topographic maps were then used to estimate the percentage of Prime Farmland soils within the identified site boundaries.

8.5.20 Item 5e –Proximity to Public Airports

Airports registered for public use were identified on Federal Aviation Administration aeronautical charts. The distance from the site boundaries to the nearest airport was then measured on topographic maps.

8.5.21 Item 5f – Proximity to Federal Airways

Federal (Victor) Airways were identified on Federal Aviation Administration aeronautical charts. The distance from the site boundaries to the nearest airway was then measured on topographic maps.

8.5.22 Item 6a – Potential for Hazardous Material Contamination

The potential for soil or groundwater to be contaminated with hazardous materials was evaluated based on the existence of potential sources of contamination at the Candidate Sites and proximity to properties identified as contaminated in federal or state government listings. Field reconnaissance did not reveal existing or potential sources of contamination at any of the sites except Site 7-4, where some areas have been used historically for the disposal of construction debris and material dredged from the Delaware River. Neither of these is considered to be a likely source of significant contamination, but they create some possibility of low-level contamination. Contaminated properties were identified from the U.S. Environmental Protection Agency (USEPA) EnviroMapper database and the New Jersey Department of Environmental Protection (NJDEP) list of Known Contaminated Sites. No contaminated properties were identified within 1 mile of any of the Candidate Sites, but Site 4-1 was found to be within 5 miles of 32 state-listed properties and within 3 miles of one Superfund property.

8.5.23 Item 6b – Community Acceptance

The expected level of community acceptance for a power plant project at each site was evaluated based on knowledge of local conditions, including experience with local governments and area residents, the existence of prior commitments, and the presence of environmental issues that could trigger public opposition.

8.5.24 Item 6c – Cultural Resources (Archaeological and Historical)

File searches were conducted at the offices of the New Jersey State Museum in order to identify known archaeological and historical resources in the vicinity of each Candidate Site. GIS map data provided by the National Park Service and the New Jersey Historic Preservation Office were used as additional information on

the presence of archaeological and historical resources. Numerical scores were assigned based on whether the sites had previously been surveyed for cultural resources and whether significant resources had been found.

8.5.25 Item 6d – Potential Aesthetic and Noise Impacts

Sensitive receptors for aesthetic and noise impacts were identified from USGS topographic maps, field reconnaissance, and aerial photographs. Potential sensitive receptors included residences, parks, churches, schools, and hospitals. Numerical scores were assigned based on the number of sensitive receptors identified within one-half mile of the boundaries of each site. Sensitive receptors inside the site boundaries were not counted, since those facilities would be purchased and removed before the site was developed.

8.5.26 Item 6e – Social/Economic Impact Potential

The potential for positive socio-economic impacts in each site area was evaluated based on the unemployment rate in the county where the site is located compared to the state-wide unemployment rate and on the percentage of minority and low-income populations within 5 miles of the site. Counties with a higher-than-average unemployment rate were considered more likely to experience significant socio-economic benefits, as long as the project would not disproportionately impact minorities or low-income populations. Maps showing census block groups with minority or low-income populations above the state averages are provided in Appendix L.

8.5.27 Item 7a – Plant Site Topography and Size

Plant site topography was evaluated based on two factors, ground slope and volume of required fill material, as explained below. As shown in the scoring criteria, numerical scores were assigned based on either the slope or the fill requirements, depending on which produced the lowest score. This approach reflects the fact that either the slope or the fill requirements could have a significant effect on the cost and difficulty of site development.

USGS topographic maps were used to estimate the maximum ground slope across each site. Slopes were determined by dividing the maximum vertical elevation change across the site by the horizontal distance associated with the vertical change. The slope factor is an indication of the expected effort associated with regrading and leveling the site to accommodate power plant facilities.

In addition, topographic maps were used to identify the desired final grade elevation (at least 5 feet above 100-year flood areas or the expected maximum storm surge, whichever was greater) for the power block and associated plant areas. Generally, cut-and-fill quantities were estimated by identifying a grade elevation in each

area that would balance the cut-and-fill requirements. If it was not possible to balance the cut-and-fill requirements, the fill quantities necessary to bring the area up to the desired grade elevation were estimated.

8.5.28 Item 7b – Foundation, Earthwork, and Pipe Installation Conditions

Foundation, earthwork, and pipe installation conditions were evaluated based on surficial soil quality and other available information. NRCS County Soil Survey maps, USGS maps and reports, and field reconnaissance were used to obtain information on the soil and bedrock conditions at each site. The soil maps did not indicate evidence of bedrock outcrops, and outcrops were not observed during site visits.

8.5.29 Item 7c – Flood Potential

The 100-year flood elevation at each Candidate Site was taken from the on-line floodplain mapping tool on the Federal Emergency Management Agency website (www.fema.gov). This elevation was compared to the existing site elevations in the power block and other major plant areas (as determined from the site layout drawing plotted on a topographic map background) to identify any plant features below the 100-year flood elevation. At Sites 7-3 and 7-4, the maximum storm surge elevation (as determined from elevations used for licensing of the existing Salem and Hope Creek nuclear power plants) was used instead of the 100-year flood elevation.

8.5.30 Item 7d – Constructability

The site layouts and other factors were considered in evaluating how a nuclear facility could be constructed at each Candidate Site. The factors used to evaluate the major constructability issues included the following:

- Barge access
- Access from barge landing to plant and storage areas
- Rail access
- Road access
- Land available for preassembly and storage areas
- Access from assembly area to erection area
- Land available for staging and lifting large pieces

8.5.31 Item 8a – Distance from Transmission Interconnection

The maximum generating capacity of the power plant considered in the site evaluations is 2,234 MW. In order to transmit this electrical output, the plant will need to interconnect with a transmission line or substation with a voltage of at least 500 kV (the voltage considered necessary to provide maximum margin against thermal overloads). Therefore, Item 8a was evaluated based on the distance from the plant switchyard, as shown on the site layout drawings, to the nearest existing transmission line or substation with a voltage of 500 kV or above. The locations of existing transmission lines and substations were determined from GIS map data and field reconnaissance.

8.5.32 Item 8b – Upgrades Required for Transmission Interconnection

As described in Subsection 8.1, the transmission system upgrades required for interconnection with the nearest existing transmission line or substation were identified by modeling the thermal overloads that would result from injecting 2,234 MW at each Candidate Site. The comparative cost of upgrading the transmission lines or substations that would overload was then estimated using standard cost factors. These comparative cost estimates determined the numerical score in accordance with the scoring criteria.

8.5.33 Item 8c – Transmission System Stability

As described in Subsection 8.1, potential impacts on transmission system stability were qualitatively evaluated by reviewing the transmission network topology for each Candidate Site to assess the risk of additional upgrades being required due to transient stability under fault conditions. The evaluation considered the ultimate amount of generating capacity (existing and proposed) in each site area, the number of 500 kV transmission lines (existing and proposed) connecting to the site location, and the number of additional 500 kV transmission lines that might be needed in order to maintain stability under fault conditions. The results of a PJM system impact study in the same area also were reviewed. Based on the available information, all of the Candidate Sites were considered to have "High" stability risk.

8.5.34 Item 9a – Distance from Barge Access

Bodies of water navigable by large barges were identified from GIS map data and aerial photographs (evidence of existing barge traffic). The terrain and potential obstructions between the site and potential barge access points were then evaluated on topographic maps to determine whether it would be feasible to deliver large equipment and plant components to the site. Any bodies of water from which delivery was judged to be

infeasible were not considered. The distance from the nearest feasible barge access point to the boundary of the site was measured on topographic maps.

8.5.35 Item 9b – Distance from Railroad Access

Existing rail lines within 20 miles of each Candidate Site were identified from GIS map data and field reconnaissance. The terrain and potential obstructions between the site and each rail line were then evaluated on topographic maps to determine whether it would be feasible for a train to deliver large equipment and plant components to the site. Any rail lines from which delivery was judged to be infeasible were not considered. The distance from the nearest feasible rail line to the boundary of the site was measured on topographic maps.

8.5.36 Item 9c – Distance from Highway Access

Existing primary highways (Interstate, U.S., or State Routes) were identified from GIS map data and available highway maps. The distance from the nearest highway to the boundary of the site was then measured on topographic maps.

8.5.37 Item 10a – Distance from Adequate Source of Cooling Water

A water source was considered "adequate" if it was capable of providing the minimum plant make-up water requirement (35,000 gpm) under low-flow drought conditions. Specifically, a water source was considered "adequate" if the 35,000-gpm make-up requirement represented no more than 20% of the 7-day 10-year (7Q10) low flow. For the identification of adequate water sources, 7Q10 values were determined from USGS and state GIS mapping data. The distance from the nearest adequate water source to the power block was then measured on topographic maps.

8.5.38 Item 10b – Adequacy of Cooling Water Source

For the evaluation of water source adequacy, data on 7Q10 flows were obtained from the USGS gauging station closest to each Candidate Site. The most representative available 7Q10 value was then compared to the maximum plant make-up water requirement (62,470 gpm). It should be noted that the most representative 7Q10 value available for Sites 7-1, 7-2, 7-3, and 7-4 was from the Trenton gauging station on the Delaware River, which is considerably upstream of the sites. Because Delaware River flows in the vicinity of these sites are influenced by both the tidal prism and freshwater tributaries that enter the river downstream of Trenton, the

actual 7Q10 value is expected to be considerably higher than the Trenton value. Therefore, the numerical scores for Sites 7-1, 7-2, 7-3, and 7-4 are considered conservatively low.

8.5.39 Item 10c – Cooling Water Static Head

The static head for pumping cooling water from the nearest adequate water source to each Candidate Site was estimated based on the elevation change shown on USGS topographic maps.

8.5.40 Item 10d – Potential to Degrade Water Quality

The potential for adverse water quality impacts due to construction or operation of a nuclear power plant at the Candidate Sites was evaluated for both surface water and ground water resources. The existing water quality classifications for surface water bodies in the vicinity of each site were determined by reviewing applicable state water quality regulations. Any site that might impact, either through construction site runoff or discharge of operational wastewaters, a body of water with a sensitive water quality classification was considered to have an increased potential to degrade water quality. In addition, information on public water supply wells and protected ground water resources was collected from state GIS mapping data. Any site close to such areas, or with off-site rail or wastewater corridors routed through such areas, was considered to have an increased potential to degrade water quality.

8.6 NUMERICAL SITE RANKING

Table 8-10 at the end of this section documents the numerical score given to each site for each characteristic, the reason for each score, and the information source used to develop the scores. Table 8-10 also shows the total weighted score for each site (obtained by summing the numerical scores after multiplying each score by its Importance Weighting Factor) and the total unweighted score for each site (obtained by summing the numerical scores without applying Importance Weighting Factors).

Based on the total weighted scores, the sites rank as shown below.

Table 8-2 — Site Rankings Based on Weighted Scores

Site	Total Weighted Score
7-4	1,014
7-3	904
7-2	886
7-1	875
4-1	772

In order to check the impact of the Importance Weighting Factors, the sites also were ranked according to their total unweighted scores. Based on the total unweighted scores, the sites rank as shown below.

Table 8-3 — Site Rankings Based on Unweighted Scores

Site	Total Unweighted Score
7-4	138
7-3	124
7-1 and 7-2	120
4-1	108

It can be seen that the Weighting Factors did not have a significant impact on the site rankings. According to weighted or unweighted scores, Site 7-4 is the highest-ranked site and Site 7-3 is the second-ranked site.

As an additional check on the results of the site evaluations, the numerical scores were totaled within three categories of site characteristics. As can be seen in the scoring criteria provided in Appendix B, the site characteristics are grouped into various issues that affect site favorability. The first three issues (Demography & Emergency Planning, Seismic, and Site Security) are primarily related to nuclear licensing. Therefore, the numerical scores for the site characteristics included in these issues were totaled as an indication of site favorability with regard to nuclear licensing. The next three issues (Ecology, Land Use, and Social) are primarily related to environmental impacts. Therefore, the numerical scores for the site characteristics included in these issues were totaled as an indication of site favorability with regard to environmental impacts. The last four issues (Site Development, Transmission, Transportation, and Water Supply) are primarily related to the engineering feasibility and cost of project development. Therefore, the numerical scores for the site

characteristics included in these issues were totaled as an indication of site favorability with regard to engineering and cost. The following tables rank the sites according to their total weighted scores in these three categories.

Table 8-4 — Site Rankings Based on Nuclear Licensing Weighted Scores
(Demography & Emergency Planning, Seismic, and Site Security Issues)

Site	Total Weighted Score
7-3	305
7-4	300
7-2	289
4-1	286
7-1	262

Table 8-5 — Site Rankings Based on Environmental Weighted Scores
(Ecology, Land Use, and Social Issues)

Site	Total Weighted Score
7-4	361
7-2	260
7-3	258
7-1	256
4-1	196

Table 8-6 — Site Rankings Based on Engineering/Cost Weighted Scores
(Site Development, Transmission, Transportation, and Water Supply Issues)

Site	Total Weighted Score
7-1	357
7-4	353
7-3	341
7-2	337
4-1	290

The results summarized above indicate that Site 7-4 is the most favorable Candidate Site with regard to the issues considered in this study. Site 7-4 is the highest-ranked site based on both weighted and unweighted overall scores. In addition, Site 7-4 has the highest environmental scores and the second-highest scores for both nuclear licensing issues and engineering/cost issues. No other site ranked among the top two sites in all three categories.

In any numerical scoring system, questions can be raised about the relative importance of particular site characteristics and whether the evaluation criteria and numerical weighting factors accurately reflect the actual importance of those issues. For example, the numerical scores summarized above incorporate scores on four site characteristics related to Ecology. Given the weighting factors assigned to those four characteristics, a site that received the highest possible score on all four characteristics would have a total of 145 points related to Ecology issues. In contrast, a site that received the highest possible score on all Land Use issues would have a total of 195 points, and a site that received the highest possible score on all Social issues would have a total of 175 points.

Considering the above, a concern could be raised about whether the weighting factors for Ecology-related issues underestimate the actual importance of these issues and unfairly represent sites with desirable scores related to Ecology. As a check on the sensitivity of the site rankings, the weighting factors for all characteristics related to Ecology were arbitrarily doubled. This meant that Ecology issues then had a potential total of 290 points, compared with 195 for Land Use and 175 for Social issues. The following tables summarize the site rankings according to overall scores and scores on environmental issues only, with the weighting factors doubled for Ecology.

Table 8-7 — Site Rankings Based on Adjusted Overall Weighted Scores

Site	Total Weighted Score
7-4	1,058
7-2	967
7-3	948
7-1	926
4-1	823

Table 8-8 — Site Rankings Based on Adjusted Environmental Weighted Scores (Ecology, Land Use, and Social Issues)

Site	Total Weighted Score
7-4	405
7-2	341
7-1	307
7-3	302
4-1	247

Comparing Tables 8-7 and 8-8 with Tables 8-2 and 8-5, it can be seen that doubling the weighting factors for Ecology had a slight impact on the ranking of some of the intermediate sites. However, Site 7-4 continued to be the highest-ranked site by a wide margin according to both overall scores and scores on environmental issues only. No reasonable adjustment of weighting factors would prevent Site 7-4 from being the highest-ranked site.

The primary advantages and disadvantages of each Candidate Site, as derived from the numerical scoring and other observations, are summarized in Table 8-9. Based on all available information, each of the sites is considered to be a potentially licensable nuclear power plant site, and Site 7-4 is considered to be the most favorable site.

The findings discussed above are the results of a process that included many variables relevant to the selection of a Preferred Site for a new nuclear power plant. Final site selection was made by PSEG after consideration of current business requirements and other relevant factors as described in the next section.

Table 8-9 — Summary of Significant Site Advantages and Disadvantages

Site	Primary Advantages	Primary Disadvantages
4-1	Flat land above 100-year flood levels Soils have low liquefaction risk 500 kV transmission line within 1 mile Relatively low minority and poverty populations within 5 miles	Zoned for Residential use, considerable housing nearby Parts of site are County Preserved Farms Parts of site are research farm (Rutgers University) New Jersey Highlands are within 1 mile and crossed by rail spur Capable fault within 10 miles Delaware River classified as Significant Water - wastewater probably permittable but complicated No barge access 106 acres of wetlands within site boundaries
7-1	Not far from 500 kV transmission, water, rail, or road connections	Church and cemetery within site boundaries State wildlife management area adjacent to site Transmission routing through National Wildlife Refuge Prison, hospital, and two nursing homes within 5 miles Relatively high minority and poverty populations within 5 miles 96 acres of wetlands within site boundaries
7-2	Flat land above 100-year flood levels Adjacent to 500 kV transmission line 9 acres of wetlands within site boundaries	School within ½ mile Small airport within ½ mile State wildlife management area and local recreation area within 1 mile New housing developments within 1 mile Relatively high minority and poverty populations within 5 miles Water pipeline 13 miles; static head 140 feet
7-3	Site is adjacent to Delaware River – excellent water source and barge access Relatively low population density within 3 miles (22 people per square mile) Relatively low minority and poverty populations within 5 miles	Property is covered by Deed of Conservation restriction Historic house within ½ mile State wildlife management area within 1 mile Significant fill required to raise site above storm surge 157 acres of wetlands within site boundaries

Site	Primary Advantages	Primary Disadvantages
7-4	Site is adjacent to currently licensed nuclear power plants No housing on-site or within 2 miles Zoned for industrial use Predominant existing land use is previously disturbed land Very low population density within 3 miles (2 people per square mile) Relatively low minority and poverty populations within 5 miles Site is adjacent to Delaware River – excellent water source and barge access Site is adjacent to 500 kV transmission lines and substation	State wildlife management area within 1 mile Significant fill required to raise site above storm surge Available land area is constrained 362 acres of wetlands within site boundaries (based on GIS mapping)

Table 8-10 — Summary of Numerical Scores

Item No.	Description of Characteristic	Numerical Weighting Factor	Site 4-1				Site 7-1				Site 7-2				Site 7-3				Site 7-4			
			Rating	Product	Reason for Rating	Source of Information	Rating	Product	Reason for Rating	Source of Information	Rating	Product	Reason for Rating	Source of Information	Rating	Product	Reason for Rating	Source of Information	Rating	Product	Reason for Rating	Source of Information
1a	Proximity to Population Centers	10	4	40	Nearest population center is Easton, PA, 15.6 miles NW of site	Census Bureau GIS data	1	10	Nearest population center is Wilmington, DE, 5.8 miles WNW of site	Census Bureau GIS data	3	30	Nearest population center is Millville, NJ, 10.5 miles SE of site	Census Bureau GIS data	3	30	Nearest population center is Millville, NJ, 12.7 miles E of site	Census Bureau GIS data	4	40	Nearest population center is Wilmington, DE, 15.6 miles N of site	Census Bureau GIS data
1b	Low Population Zone Feasibility	8	4	32	Average population density within 3 miles of power block area is 132/square mile	Census Bureau GIS data	5	40	Average population density within 3 miles of power block area is 56/square mile	Census Bureau GIS data	5	40	Average population density within 3 miles of power block area is 75/square mile	Census Bureau GIS data	5	40	Average population density within 3 miles of power block area is 22/square mile	Census Bureau GIS data	5	40	Average population density within 3 miles of power block area is 2/square mile	Census Bureau GIS data
1c	Exclusion Area Feasibility	7	1	7	EAB extends into land beyond site property line, and public roads and residences are within the EAB	Aerial Photo and Topographic Map	1	7	EAB extends into land beyond site property line, and public roads and residences are within the EAB	Aerial Photo and Topographic Map	1	7	EAB extends into land beyond site property line, and public roads and residences are within the EAB	Aerial Photo and Topographic Map	1	7	EAB extends into land beyond site property line, and public roads and residences are within the EAB	Aerial Photo and Topographic Map	2	14	EAB extends into land beyond site property line, but no public roads, railroads, or residences are within the EAB	Aerial Photo and Topographic Map
1d	Emergency Planning Zone (EPZ) Feasibility	5	4	20	Prevailing wind is from W Population center is 15.6 miles NW of site (not downwind)	Allentown Windrose	2	10	Prevailing wind is from WNW Population center is 5.8 miles WNW of site (not downwind)	Wilmington Windrose	3	15	Prevailing wind is from WNW Population center is 10.5 miles SE of site (downwind)	Wilmington Windrose	3	15	Prevailing wind is from W Population center is 12.7 miles E of site (downwind)	Dover Windrose	4	20	Prevailing wind is from WNW Population center is 15.6 miles N of site (not downwind)	Wilmington Windrose
2a	Proximity to Capable Faults	10	1	10	Ramapo Fault is approximately 7 miles N of site	USGS seismic hazard GIS map database	3	30	Ramapo Fault is approximately 70 miles N of site	USGS seismic hazard GIS map database	3	30	Ramapo Fault is approximately 75 miles N of site	USGS seismic hazard GIS map database	3	30	Ramapo Fault is approximately 85 miles N of site	USGS seismic hazard GIS map database	3	30	Ramapo Fault is approximately 80 miles N of site	USGS seismic hazard GIS map database
2b	Safe Shutdown Earthquake (SSE) Maximum Acceleration	10	2	20	Maximum acceleration at least 0.25 g. However, score was reduced by 1 point because uncertainty in data means the value could be more than 0.25 g	USGS seismic hazard maps	5	50	Maximum acceleration 0.20 g	Salem and Hope Creek UFSAR	5	50	Maximum acceleration 0.20 g	Salem and Hope Creek UFSAR	5	50	Maximum acceleration 0.20 g	Salem and Hope Creek UFSAR	5	50	Maximum acceleration 0.20 g	Salem and Hope Creek UFSAR
2c	Liquefaction Potential	8	5	40	Rock site	County Soil Survey	3	24	Site has interbedded sand/clay layers below groundwater level	County Soil Survey	4	32	Cohesive soil site	County Soil Survey	3	24	Site has sand/silt below groundwater level	County Soil Survey	1	8	New power block area has uncompacted hydraulic fills	County Soil Survey
3a	Proximity to Hazardous Land Uses	6	5	30	No hazardous land uses identified within 5 miles of power block area	Topographic Maps, GIS pipeline data, industrial facilities data, field reconnaissance	2	12	One natural gas pipeline less than 1 mile from power block area	Topographic Maps, GIS pipeline data, industrial facilities data, field reconnaissance	2	12	One natural gas pipeline less than 1 mile from power block area	Topographic Maps, GIS pipeline data, industrial facilities data, field reconnaissance	5	30	No hazardous land uses identified within 5 miles of power block area	Topographic Maps, GIS pipeline data, industrial facilities data, field reconnaissance	5	30	No hazardous land uses identified within 5 miles of power block area	Topographic Maps, GIS pipeline data, industrial facilities data, field reconnaissance
3b	Protection Against Malevolent Watercraft or Vehicles	8	4	32	Public road approximately 0.7 mile from power block area	Aerial Photo and Topographic Map	3	24	Public road approximately 0.4 mile from power block area	Aerial Photo and Topographic Map	4	32	Public road approximately 0.6 mile from power block area	Aerial Photo and Topographic Map	3	24	Public road approximately 0.4 mile from power block area	Aerial Photo and Topographic Map	1	8	Delaware River approximately 300 feet from power block area	Aerial Photo and Topographic Map
3c	Suitable Terrain for Protected Area (PA) Fence and Owner Controlled Area (OCA) Surveillance	7	5	35	Site is flat and clear of obstructions for an area of at least 1000' on all sides of power block area	Aerial Photo and Topographic Map	5	35	Site is flat and clear of obstructions for an area of at least 1000' on all sides of power block area	Aerial Photo and Topographic Map	3	21	Site can be made clear of obstructions for an area of at least 1000' on all sides of power block area	Aerial Photo and Topographic Map	5	35	Site is flat and clear of obstructions for an area of at least 1000' on all sides of power block area	Aerial Photo and Topographic Map	5	35	Site is flat and clear of obstructions for an area of at least 1000' on all sides of power block area	Aerial Photo and Topographic Map
3d	Response Time for Local Law Enforcement Agency (LLEA)	5	4	20	15 minutes from Perryville, NJ, (state police station) to site	Mapquest driving time calculation	4	20	11 minutes from Woodstown, NJ, (state police station) to site	Mapquest driving time calculation	4	20	15 minutes from Bridgeton, NJ, (state police station) to site	Mapquest driving time calculation	4	20	14 minutes from, Bridgeton, NJ, (state police station) to site	Mapquest driving time calculation	5	25	7 minutes from Hancocks Bridge, NJ, (township police station) to site	Mapquest driving time calculation
4a	Wetlands Impact Potential	10	1	10	106 acres of wetlands within site boundaries	National Wetlands Inventory GIS mapping	1	10	96 acres of wetlands within site boundaries	National Wetlands Inventory GIS mapping	4	40	9 acres of wetlands within site boundaries	National Wetlands Inventory GIS mapping	1	10	157 acres of wetlands within site boundaries	National Wetlands Inventory GIS mapping	1	10	362 acres of wetlands within site boundaries	National Wetlands Inventory GIS mapping
4b	Other Natural Habitats Impact Potential	5	4	20	13% forest within site boundaries	National Land Cover Data GIS mapping	4	20	8% forest within site boundaries	National Land Cover Data GIS mapping	4	20	4% forest within site boundaries	National Land Cover Data GIS mapping	4	20	13% forest within site boundaries	National Land Cover Data GIS mapping	4	20	1% forest within site boundaries	National Land Cover Data GIS mapping
4c	Documented Occurrence of Threatened and Endangered Species	7	2	14	Nearest occurrence potentially within the site boundaries	New Jersey Natural Heritage Program data	2	14	Nearest occurrence potentially within the site boundaries	New Jersey Natural Heritage Program data	2	14	Nearest occurrence potentially within the site boundaries	New Jersey Natural Heritage Program data	1	7	Nearest occurrence definitely within the site boundaries	Previous on-site data collection	1	7	Nearest occurrence definitely within the site boundaries	Previous on-site data collection
4d	Proximity to Designated Natural Areas	7	1	7	NJ Highlands less than 1 mile from site	Topographic Maps and GIS data on designated areas	1	7	Salem River WMA adjacent to site	Topographic Maps and GIS data on designated areas	1	7	Thunderpt Pond WMA less than 1 mile from site	Topographic Maps and GIS data on designated areas	1	7	Mad Horse Creek WMA less than 1 mile from site	Topographic Maps and GIS data on designated areas	1	7	Mad Horse Creek WMA adjacent to site	Topographic Maps and GIS data on designated areas
5a	Existing Land Use on the Site	10	3	30	Predominant on-site land use is agriculture	Field reconnaissance and aerial photographs	3	30	Predominant on-site land use is agriculture	Field reconnaissance and aerial photographs	3	30	Predominant on-site land use is agriculture	Field reconnaissance and aerial photographs	3	30	Predominant on-site land use is agriculture	Field reconnaissance and aerial photographs	5	50	Predominant on-site land use is fallow land previously disturbed for existing nuclear power plant	Field reconnaissance and aerial photographs
5b	Existing Land Use within 1 Mile of the Site	8	3	24	Predominant land use within 1 mile is agriculture	Field reconnaissance and aerial photographs	3	24	Predominant land use within 1 mile is agriculture	Field reconnaissance and aerial photographs	3	24	Predominant land use within 1 mile is agriculture	Field reconnaissance and aerial photographs	3	24	Predominant land use within 1 mile is agriculture	Field reconnaissance and aerial photographs	3	24	Predominant land use within 1 mile is mixture of wildlife management area, existing power plant, and dredge spoil disposal (score is average of those uses)	Field reconnaissance and aerial photographs
5c	Zoning / Land Use Planning	8	1	8	Predominant on-site zoning is Residential. In addition, parts of site are County Preserved Farms, which limits potential development of the property.	Franklin Township Zoning Map and Hunterdon County GIS data	2	16	Predominant on-site zoning is Agriculture	Mannington Township Zoning Map	2	16	Predominant on-site zoning is Agriculture	Alloway Township Zoning Map	1	8	Predominant on-site zoning is Rural Residential. In addition, the property has an existing Deed of Conservation Restriction, which limits potential development.	Greenwich Township Zoning Office and Deed of Conservation Restriction with NJ DEP	5	40	On-site zoning is Industrial (CAFRA node modifications not considered for this evaluation.)	Lower Alloways Creek Township Zoning Map
5d	Prime Farmland	5	2	10	61% Prime Farmland within site boundaries	NRCS Soil Survey GIS Mapping	4	20	11% Prime Farmland within site boundaries	NRCS Soil Survey GIS Mapping	1	5	85% Prime Farmland within site boundaries	NRCS Soil Survey GIS Mapping	1	5	83% Prime Farmland within site boundaries	NRCS Soil Survey GIS Mapping	5	25	No Prime Farmland within site boundaries	NRCS Soil Survey GIS Mapping
5e	Proximity to Public Airports	8	1	8	Sky Manor Airport approximately 2,800 feet from site	AirNav.com and Topo Map	4	32	Spitfire Aerodrome Airport approximately 31,200 feet from site	AirNav.com and Topo Map	1	8	Alloway Airfield approximately 2,300 feet from site	AirNav.com and Topo Map	4	32	Li Calzi Airport approximately 35,900 feet from site	AirNav.com and Topo Map	5	40	Summit Airport approximately 55,400 feet from site	AirNav.com and Topo Map
5f	Proximity to Federal (Victor) Airways	5	1	5	Less than 1 mile to V30	Online FAA Aeronautical Chart	1	5	Less than 1 mile to V186 469	Online FAA Aeronautical Chart	1	5	Less than 2 miles to V213	Online FAA Aeronautical Chart	1	5	Less than 2 miles to V213	Online FAA Aeronautical Chart	1	5	Less than 1 mile to V123 312	Online FAA Aeronautical Chart

Item No.	Description of Characteristic	Numerical Weighting Factor	Site 4-1				Site 7-1				Site 7-2				Site 7-3				Site 7-4			
			Rating	Product	Reason for Rating	Source of Information	Rating	Product	Reason for Rating	Source of Information	Rating	Product	Reason for Rating	Source of Information	Rating	Product	Reason for Rating	Source of Information	Rating	Product	Reason for Rating	Source of Information
6a	Potential for Hazardous Material Contamination	8	2	16	One Superfund site (Myers Property) approximately 3 miles away and 32 state-listed contaminated sites within 5 miles. No on-site sources of contamination identified.	US EPA EnviroMapper database and NJ DEP database	2	16	More than 40 state listed contamination sites within 5 miles, nearest is 1.5 miles. No on-site sources of contamination identified.	US EPA EnviroMapper database and NJ DEP database	3	24	Two state-listed contamination sites within 5 miles. No on-site sources of contamination identified.	US EPA EnviroMapper database and NJ DEP database	5	40	No contamination sites identified within 5 miles. No on-site sources of contamination identified.	US EPA EnviroMapper database and NJ DEP database	3	24	No contamination sites identified within 5 miles except existing Salem Hope Creek Power Plants. Construction debris and dredge spoils observed on site.	US EPA EnviroMapper database and NJ DEP database
6b	Community Acceptance	8	1	8	Site is not in PSEG gas or electric service area, so PSEG has limited history of direct involvement with local governments. Greenfield site development near New Jersey Highlands would introduce expected opportunities for environmental group opposition. Good quality agricultural land would be developed, and restrictions on County Preserved Farms would have to be released.	PSEG knowledge of local area conditions	3	24	Greenfield site development with agricultural and limited residential development in area. Good quality agricultural land would be the primary land utilized for development. Salem County government is generally supportive, but support for new site would need to be expanded beyond current levels.	PSEG knowledge of local area conditions	3	24	Greenfield site development with agricultural and limited residential development in area. Good quality agricultural land would be the primary land utilized for development. Salem County government is generally supportive, but support for new site would need to be expanded beyond current levels.	PSEG knowledge of local area conditions	3	24	Cumberland County government generally is supportive, but Fishery Enhancement Program history with Greenwich Township indicates a general opposition to development. New Jersey Department of Environmental Protection would be required to release Deed of Conservation Restriction on the property.	PSEG knowledge of local area conditions	5	40	Strong support exists from both Salem County government and local communities. Rural environment with no adjacent residents or nearby farms. Existing facility favorably supported.	PSEG knowledge of local area conditions
6c	Cultural Resources (Archaeological and Historical)	7	2	14	Some cultural resources identified within the site boundaries.	NJ State Museum and State Historic Preservation Office file searches	3	21	Site not covered in previous cultural resources surveys.	NJ State Museum and State Historic Preservation Office file searches	3	21	Site not covered in previous cultural resources surveys.	NJ State Museum and State Historic Preservation Office file searches	2	14	Some cultural resources identified within the site boundaries.	NJ State Museum and State Historic Preservation Office file searches	4	28	Site partially covered in previous cultural resources surveys; no resources were identified.	Cultural resources surveys conducted for licensing of existing Salem/ Hope Creek nuclear plants
6d	Aesthetic and Noise Impacts	7	1	7	More than 10 receptors within 1/2 mile from site.	Aerial Photo and Topographic Map	1	7	More than 10 receptors within 1/2 mile from site.	Aerial Photo and Topographic Map	1	7	More than 10 receptors within 1/2 mile from site.	Aerial Photo and Topographic Map	1	7	More than 10 receptors within 1/2 mile from site.	Aerial Photo and Topographic Map	3	21	Less than 10 receptors within 1/2 mile of existing site.	Aerial Photo and Topographic Map
6e	Social / Economic Impact Potential	5	3	15	8.2% unemployment in Hunterdon County, 8.6% in New Jersey. 5.1% minorities within 5 miles from site, 34.0% in New Jersey. 2.7% poverty within 5 miles from site, 8.5% in New Jersey.	FDIC RECON / NJ Dept Labor and Workforce Development statistics, and Census Bureau GIS data	2	10	10.5% unemployment in Salem County, 8.6% in New Jersey. 21.8% minorities within 5 miles from site, 34.0% in New Jersey. 10.0% poverty within 5 miles from site, 8.5% in New Jersey.	FDIC RECON / NJ Dept Labor and Workforce Development statistics, and Census Bureau GIS data	3	15	10.5% unemployment in Salem County, 8.6% in New Jersey. 18.9% minorities within 5 miles from site, 34.0% in New Jersey. 9.6% poverty within 5 miles from site, 8.5% in New Jersey.	FDIC RECON / NJ Dept Labor and Workforce Development statistics, and Census Bureau GIS data	5	25	12.0% unemployment in Cumberland County, 8.6% in New Jersey. 8.5% minorities within 5 miles from site, 34.0% in New Jersey. 7.2% poverty within 5 miles from site, 8.5% in New Jersey.	FDIC RECON / NJ Dept Labor and Workforce Development statistics, and Census Bureau GIS data	4	20	10.5% unemployment in Salem County, 8.6% in New Jersey. 4.3% minorities within 5 miles from site, 34.0% in New Jersey. 3.8% poverty within 5 miles from site, 8.5% in New Jersey.	FDIC RECON / NJ Dept Labor and Workforce Development statistics, and Census Bureau GIS data
7a	Plant Site Topography	8	5	40	Elevations 540' to 640'. Slope less than 1%. Fill 460,000 cubic yards.	Topographic Maps	4	32	Elevations 15' to 35'. Slope less than 1%. Fill 900,000 cubic yards.	Topographic Maps	4	32	Elevations 120' to 140'. Slope less than 1%. Fill 870,000 cubic yards.	Topographic Maps	3	24	Elevations 0' to 20'. Slope less than 1%. Fill 1,360,000 cubic yards.	Topographic Maps	2	16	Site has been graded. Slope 0%. Fill 1,890,000 cubic yards.	Topographic Maps
7b	Foundation, Earthwork, and Pipe Installation Conditions	5	3	15	Lean Clay, Silt (Weathered bedrock within 10 feet of the surface)	NRCS Soil Survey GIS Mapping	2	10	Loamy Sand and Silt Loam. Classified as a sand/silt mix, silt percentages could be as high as 60%	NRCS Soil Survey GIS Mapping	4	20	Poorly graded sand with silt	NRCS Soil Survey GIS Mapping	3	15	Silty Clayey Sand	NRCS Soil Survey GIS Mapping	2	10	Clayey Sand surrounded by Mucky Peat	NRCS Soil Survey GIS Mapping
7c	Flood Potential	5	5	25	Entire Site is out of the 100 year flood plain.	GIS flood hazard zone data	3	15	Power Block above the 100 year flood plain.	GIS flood hazard zone data	5	25	Entire site above the 100 year flood plain.	GIS flood hazard zone data	3	15	Power Block above the 100 year flood plain.	GIS flood hazard zone data	3	15	Power Block above the 100 year flood plain.	GIS flood hazard zone data
7d	Constructibility	7	3	21	Site provides good options for laydown and assembly areas. Multiple road access options but no barge access potential.	Topographic maps and field reconnaissance	5	35	Site provides good options for laydown and assembly areas. Multiple road access options and adequate barge access potential.	Topographic maps and field reconnaissance	5	35	Site provides good options for laydown and assembly areas. Multiple road access options and adequate barge access potential.	Topographic maps and field reconnaissance	5	35	Site provides good options for laydown and assembly areas. Adequate road access options and good barge access potential.	Topographic maps and field reconnaissance	3	21	Site provides limited options for laydown and assembly areas. Road access options also are limited, but barge access is excellent.	Topographic maps and field reconnaissance
8a	Distance from Transmission	10	5	50	Less than 1 mile of connecting transmission line required.	GIS site layout tabulations	3	30	5.4 miles of connecting transmission line required.	GIS site layout tabulations	4	40	500 kV transmission line crosses the site; 1.8 miles of relocated transmission line required.	GIS site layout tabulations	3	30	6.8 miles of connecting transmission line required.	GIS site layout tabulations	5	50	Existing 500 kV switchyard on-site.	GIS site layout tabulations
8b	Upgrades Required for Transmission Interconnection	7	5	35	Required upgrades approximately $13 million.	S&L thermal overload modeling	5	35	Required upgrades approximately $13 million.	S&L thermal overload modeling	5	35	Required upgrades approximately $8 million.	S&L thermal overload modeling	5	35	Required upgrades approximately $8 million.	S&L thermal overload modeling	5	35	Required upgrades approximately $13 million.	S&L thermal overload modeling
8c	Transmission System Stability	7	1	7	High stability risk due to only one 500 kV transmission line in site area.	S&L stability assessment.	1	7	High stability risk due to concentration of existing generation in site area.	S&L stability assessment.	1	7	High stability risk due to concentration of existing generation in site area.	S&L stability assessment.	1	7	High stability risk due to concentration of existing generation in site area.	S&L stability assessment.	1	7	High stability risk due to concentration of existing generation in site area.	S&L stability assessment.
9a	Distance from Barge Access	10	1	10	No barge access.	Topographic Map	4	40	Less than 5 miles to Delaware River.	GIS site layout tabulations	3	30	Approximately 10 miles to Delaware River.	GIS site layout tabulations	4	40	Approximately 1.5 miles to Delaware River.	GIS site layout tabulations	5	50	Delaware River barge access adjacent to site.	GIS site layout tabulations
9b	Distance from Railroad Access	7	3	21	8.5 miles of new railway.	GIS site layout tabulations	3	21	6.5 miles of new railway.	GIS site layout tabulations	3	21	5.4 miles of new railway.	GIS site layout tabulations	2	14	10.6 miles of new railway.	GIS site layout tabulations	2	14	12.5 miles of new railway.	GIS site layout tabulations
9c	Distance from Highway Access	5	4	20	3.5 miles of relocated and improved roadway.	GIS site layout tabulations	4	20	3.3 miles of new and relocated roadway.	GIS site layout tabulations	4	20	1.6 miles of new and relocated roadway.	GIS site layout tabulations	4	20	3.7 miles of new roadway.	GIS site layout tabulations	3	15	5.3 miles of improved roadway.	GIS site layout tabulations
10a	Distance from Adequate Source of Cooling Water	8	3	24	6.4 mile makeup water pipeline to Delaware River.	GIS site layout tabulations	4	32	4.8 mile makeup water pipeline to Delaware River.	GIS site layout tabulations	2	16	12.9 mile makeup water pipeline to Delaware River.	GIS site layout tabulations	5	40	0.7 mile makeup water pipeline to Delaware River.	GIS site layout tabulations	5	40	Delaware River adjacent to site.	GIS site layout tabulations
10b	Adequacy of Cooling Water Source	10	1	10	Make-up requirement (62,470 gpm) is 13% of 7Q10 flow (483,840 gpm).	USGS surface water flow data	2	20	Make-up requirement (62,470 gpm) is 8% of 7Q10 flow (770,560 gpm).	USGS surface water flow data	2	20	Make-up requirement (62,470 gpm) is 8% of 7Q10 flow (770,560 gpm).	USGS surface water flow data	2	20	Make-up requirement (62,470 gpm) is 8% of 7Q10 flow (770,560 gpm).	USGS surface water flow data	2	20	Make-up requirement (62,470 gpm) is 8% of 7Q10 flow (770,560 gpm).	USGS surface water flow data
10c	Cooling Water Static Head	5	1	5	400 feet.	Topographic Map	5	25	40 feet.	Topographic Map	3	15	140 feet.	Topographic Map	5	25	20 feet.	Topographic Map	5	25	10 feet.	Topographic Map
10d	Potential to Degrade Water Quality	7	1	7	Wastewater would be discharged to segment of Delaware River classified as Special Protection Waters. Wastewater and makeup water pipelines would pass through groundwater protection area for public drinking water wells.	NJ water quality regulations, GIS data on protected groundwater resources	5	35	No special water quality issues identified.	NJ water quality regulations, GIS data on protected groundwater resources	3	21	Groundwater protection area for public drinking water wells less than 2 miles from site.	NJ water quality regulations, GIS data on protected groundwater resources	3	21	Rail spur would pass through groundwater protection area for public drinking water wells.	NJ water quality regulations, GIS data on protected groundwater resources	5	35	No special water quality issues identified.	NJ water quality regulations, GIS data on protected groundwater resources
	Unweighted Rating		108				120				120				124				138			
	Weighted Rating			772				875				886				904				1014		

Last page of Section 8.

9. SELECTION OF PREFERRED SITE

As described in the previous sections of this report, a standardized process was used to identify Candidate Areas, Potential Sites, and Candidate Sites. A systematic numerical scoring system was developed to provide an objective evaluation of the relative favorability of the Candidate Sites, using consistent criteria. The results of these evaluations indicate that all of the Candidate Sites are potentially licensable nuclear power plant sites, and that Site 7-4 is the most favorable Candidate Site with regard to the issues considered. The final step in the process was for PSEG to incorporate business considerations and any other relevant additional factors into the site evaluations and the selection of a Preferred Site.

In evaluating the five Candidate Sites, PSEG considered not only the Environmental Acceptability, Nuclear Licensing, and Engineering/Cost issues discussed above, but the additional technical and business considerations described below. In some cases, these considerations correlate to lower construction or operation costs. In addition, PSEG considered the synergies of co-locating a new nuclear facility with the existing nuclear units at Site 7-4. These synergies are significant from environmental, financial, and operational perspectives, and they include the following factors:

- Abundant existing site data, information and regulatory knowledge; familiarity with the site and environs. This includes pre-existing knowledge and data on the following:
  - Terrestrial and aquatic ecology
  - Site characteristics including geology and seismic data; known foundation conditions and foundation design
  - Over 30 years of on-site meteorological data
  - Regional socioeconomic conditions
- Significant community and key stakeholder support in Lower Alloways Creek Township and Salem County, New Jersey.
- Emergency management infrastructure and support agreements with the states of New Jersey and Delaware, and with Salem and Cumberland counties in New Jersey and New Castle County in Delaware. Existing emergency plans can be used as necessary and a consistent Emergency Planning Zone can be maintained.
- Economic and operational synergies with existing operations:
  - Common operations support facilities and training infrastructure, including off-site visitor center and emergency response facilities, eliminating the need to construct new facilities.

  - Common operations support organization, including PSEG Corporate Nuclear Headquarters and support staffing. This provides a significant benefit and flexibility in retention of staff and ability to deploy shared resources to support the needs of either the new or operating plants.
  - Regional nuclear presence provides potential recruiting base for staffing and retention.
- Security considerations:
  - Opportunity for an integrated security strategy and protected area
  - Pre-existing mutual aid, support, and response agreements
- Four existing 500 kV transmission circuits allow for the output of the new plant to be more readily integrated into the regional power grid, reducing the potential need for additional transmission circuits.

In addition, development of a new nuclear facility at Site 7-4 would have the following advantages:

- Jobs creation in areas of New Jersey currently challenged by low per-capita income and high unemployment.
- Limited risk of substantial population growth in the Low Population Zone due to surrounding land use and land cover conditions.
- Minimal community and regional disruptions associated with the new transmission lines, new pipelines, and new road and rail systems that would be necessary to develop a greenfield site. These disruptions include the following:
  - Increased costs of greenfield development due to physical and support infrastructure requirements
  - Larger environmental footprints (i.e., larger site necessary) for greenfield development

In summary, PSEG considered business and other qualitative factors in addition to the numerical evaluations in making the final site selection. Site 7-4 was selected as the Preferred Site because it was the highest-ranked site using objective numerical criteria and it has significant additional benefits in community support, emergency response, existing infrastructure, and operational synergies. The other four Candidate Sites are considered to be Alternative Sites.

Last page of Section 9.

Appendix A

Basis of Candidate Area Exclusionary Criteria

APPENDIX A
BASIS OF EXCLUSIONARY CRITERIA

The purpose of exclusionary criteria is to eliminate parts of the Region of Interest (ROI) that have undesirable characteristics, allowing the study to focus on Candidate Areas that have the greatest probability of containing desirable sites. This is done primarily by eliminating areas that are farther than a maximum acceptable distance from desired infrastructure (transmission, water, railroads, and highways) and eliminating areas that conflict with desired environmental conditions. For nuclear power plant siting, one of the most important environmental considerations is to avoid areas with high population density. For siting any type of power plant, another important environmental consideration is to avoid encroachment on designated public lands. This Appendix explains the technical and regulatory bases of the exclusionary criteria used for the PSEG Alternative Site Evaluation Study.

1. Criteria Related to Distance from Required Infrastructure

The maximum acceptable distance for any particular infrastructure component is a matter of judgement, and can vary depending on the size of the initial ROI, the economics of the project, the significance of existing environmental issues, etc. The goal is to use exclusionary distances that are based on reasonable judgements and are effective in reducing the ROI to manageable Candidate Areas. The distances can be adjusted if the initial screening is found to be overly restrictive or not restrictive enough. After Candidate Areas are identified using the exclusionary criteria, specific Potential Sites are identified within the siting areas, and the identification of Potential Sites typically focuses on being as close as possible to the desired infrastructure components.

For the PSEG Alternative Site Evaluation Study, the general approach was to establish exclusion areas such that the cost of connecting to each desired infrastructure component would be no more than approximately 1% of the total project cost. Using an assumed cost of $5 billion for a new nuclear power plant, the cost of connecting to each infrastructure component therefore should be limited to approximately $50 million. Although the actual cost of a new nuclear power plant may be more than $5 billion by the time a site is proposed as a result of this study, $5 billion was used as a conservative, low-end estimate in order to keep the allowable cost of infrastructure components within reasonable limits. In addition, minimizing the distance to required infrastructure connections also tends to minimize the environmental impacts associated with the construction of new transmission lines, roads, and other facilities.

The following paragraphs discuss the bases of the exclusionary distances that were used.

A. Suitable Transmission Line or Substation

The cost of a transmission line depends on the voltage. For this study, a 500 kV line was considered to be the minimum interconnection requirement, in order to provide maximum thermal margin. The installed cost of a 500 kV line varies

considerably depending on terrain and other local conditions, but typically ranges between approximately $2.5 million and $5 million per mile. Thus, limiting the transmission line cost to $50 million would mean excluding any areas that are more than about 10 to 20 miles from an existing 500 kV transmission line or substation. Considering the ROI used in this study, the high-end of this range was considered most appropriate for exclusionary screening, so as to avoid eliminating areas that might be acceptable under certain circumstances. Therefore, an exclusionary distance of 20 miles was used for transmission screening.

B. Suitable Water Source

The cost of a make-up water pipeline depends on the diameter and material. For this study, the minimum make-up water flow requirement (based on the peak make-up required for one generating unit with a wet cooling tower system) was estimated to be approximately 35,000 gpm, which typically would require a pipe 48 inches in diameter. Depending on the material and other conditions, the installed cost of a 48-inch make-up water pipeline typically is about $2 million to $2.5 million per mile (assuming that the pipeline is not safety related). Thus, limiting the pipeline cost to $50 million would mean excluding any areas that are more than about 20 to 25 miles from a suitable water source.

In addition to the installation costs, longer pipelines incur higher pumping costs during plant operation. Also, if it is not possible to recycle all cooling tower blowdown within the power plant, or discharge the blowdown to a nearby drainage way, a blowdown pipeline back to the make-up water source may be required. The cost of a blowdown pipeline typically is about one-half to two-thirds the cost of the makeup pipeline. Given these additional considerations, the low-end of the distance range was considered most appropriate for exclusionary screening of water sources. Therefore, an exclusionary distance of 20 miles was used for water screening

C. Suitable Railroad

The installed cost of a railroad spur suitable for delivery of large components typically is about $2.5 million per mile. Thus, limiting the rail spur cost to $50 million would mean excluding any areas that are more than about 20 miles from a suitable railroad. This was considered an appropriate exclusionary distance for screening of railroads.

D. Primary or Interstate Highway

The installed cost of a typical power plant access road (24 feet wide, asphalt paved) typically is about $2 million per mile. Thus, limiting the access road cost to $50 million would mean excluding any areas that are more than about 25 miles from a primary or Interstate highway.

However, considering the ROI used in this study, access to primary or Interstate highways was not expected to be a limiting issue. That is, any areas within a reasonable distance of transmission, water, and railroads would be expected to also have access to a primary or Interstate highway. For this reason and for the sake of consistency with the exclusionary distances used for transmission, water, and railroads, an exclusionary distance of 20 miles was used for highways.

2. Criteria Related to Environmental Issues

Although many environmental issues need to be considered in an alternative site evaluation study, exclusionary screening should consider only those issues that are feasible to evaluate for a large ROI on the basis of readily available mapping data. Other environmental issues are considered later in the study, when more detailed site-specific information is developed. The following paragraphs discuss the bases of the exclusionary criteria that were used in this study to screen the ROI for environmental issues.

A. Population Density

U.S. Nuclear Regulatory Commission regulatory guidance strongly discourages siting a nuclear power plant in an area where the Low Population Zone (LPZ) would have a population density greater than 500 people per square mile. The size of the LPZ normally is determined on the basis of site-specific and technology-specific radioactive dose calculations, and it is not feasible to perform such calculations for an alternative site evaluation study. However, a review of recent regulatory submittals indicates that a 3-mile radius centered on the reactor containment building would bound the LPZ distance for virtually all site conditions and reactor designs. Therefore, a 3-mile radius was used as a conservative approximation of the LPZ distance for this study. For the exclusionary screening, any areas with a population density greater than 500 people per square mile, and buffer zones within 3 miles of those areas, were eliminated. This ensured that any power plant site and LPZ located in the remaining areas would not exceed the 500 people per square mile population density guideline.

B. Designated Parks, Preserves, and Recreation Areas

Publicly held lands designated for nature preservation or recreational use include parks, nature preserves, wildlife management areas, outdoor recreation areas, etc. Such lands typically cannot be purchased for private development. Even if the land could be purchased, a proposal to develop such land for a power plant typically would generate intense public opposition. Therefore, publicly held designated lands were eliminated during the exclusionary screening.

C. Active Military Bases

Active military bases typically cannot be purchased for private development. Even if the land could be purchased, the available acreage and prior or existing uses of such land are frequently not compatible with a nuclear power plant. Therefore, active military bases were eliminated during the exclusionary screening.

Appendix B

Site Evaluation Criteria

Item No.	Description of Characteristic	Musts	Wants	Numerical Weighting Factor - Importance (10 is High, 1 is Low)	Evaluation Criteria	Numerical Rating Factor (5 is Best, 1 is Worst)
1. Demography and Emergency Planning Issues						
a	Proximity to Population Centers	A population center (community with population more than 25,000) must not be less than 4 miles from the reactor containment location.	The nearest population center should be more than 20 miles from the reactor containment location.	10	Nearest population center more than 20 miles	5
					Nearest population center 15 to 20 miles	4
					Nearest population center 10 to 15 miles	3
					Nearest population center 6 to 10 miles	2
					Nearest population center 4 to 6 miles	1
b	Low Population Zone Feasibility	The population density within 3 miles of the reactor containment location must not be greater than 500/square mile. A hospital, prison, or other population with special emergency needs must not be within 3 miles of the reactor location.	The population density within 3 miles of the reactor containment location should be as low as possible.	8	Population density less than 100/square mile	5
					Population density 100 to 200/square mile	4
					Population density 200 to 300/square mile	3
					Population density 300 to 400/square mile	2
					Population density 400 to 500/square mile	1
c	Exclusion Area Feasibility	None	The maximum Exclusion Area Boundary (EAB) distance (5,000 feet from the reactor containment location) should be entirely within the site property line and should not be crossed by any public roads, railroads, or waterways.	7	The site property line is greater than or equal to the EAB distance in all directions, and no public roads, railroads, or waterways cross the EAB.	5
					The site property line is greater than or equal to the EAB distance in all directions, except where the EAB extends over water. No public roads or railroads cross the EAB.	4
					The site property line is greater than or equal to the EAB distance in all directions, but a public road or railroad crosses the EAB.	3
					Part of the EAB extends into land beyond the site property line, but no public roads, railroads, or residences are within the EAB.	2
					Part of the EAB extends into land beyond the site property line, and a public road, railroad, or residence is within the EAB.	1

Item No.	Description of Characteristic	Musts	Wants	Numerical Weighting Factor - Importance (10 is High, 1 is Low)	Evaluation Criteria	Numerical Rating Factor (5 is Best, 1 is Worst)
d	Emergency Planning Zone (EPZ) Feasibility	There must not be more than one population center within 10 miles of the reactor containment location.	There should be no population centers within 50 miles of the reactor containment location. If a population center is within 50 miles, it should not be downwind of the site (based on prevailing wind direction)	5	Nearest population center more than 50 miles	5
					Nearest population center 10 to 50 miles and not downwind	4
					Nearest population center 10 to 50 miles and downwind	3
					Nearest population center less than 10 miles and not downwind	2
					Nearest population center less than 10 miles and downwind	1
2. Seismic Issues						
a	Proximity to Capable Faults	There must be no capable faults within 5 miles of the site.	There should be no capable faults within 200 miles of the site. Capable faults nearer to the site should be as short as possible.	10	Nearest capable fault more than 200 miles	5
					Nearest capable fault 150 miles to 200 miles (only faults more than 40 miles in length need be considered)	4
					Nearest capable fault 100 miles to 150 miles (only faults more than 20 miles in length need be considered)	3.5
					Nearest capable fault 50 miles to 100 miles (only faults more than 10 miles in length need be considered)	3
					Nearest capable fault 20 miles to 50 miles (only faults more than 5 miles in length need be considered)	2
					Nearest capable fault 5 miles to 20 miles (only faults more than 1 mile in length need be considered)	1
b	Safe Shutdown Earthquake (SSE) Maximum Acceleration	SSE acceleration must not be more than 0.3g.	SSE maximum acceleration should be 0.2g or lower.	10	SSE maximum acceleration 0.2g or lower	5
					SSE maximum acceleration greater than 0.2g but less or equal to 0.25g	3
					SSE maximum acceleration greater than 0.25g but less or equal to 0.3g	1

Item No.	Description of Characteristic	Musts	Wants	Numerical Weighting Factor - Importance (10 Is High, 1 Is Low)	Evaluation Criteria	Numerical Rating Factor (5 Is Best, 1 Is Worst)
c	Liquefaction Potential	Liquefiable soil must not extend below the maximum foundation depth (to be evaluated after a reactor design has been selected and soil borings are available).	Site should be a rock site or cohesive soil site without liquefaction potential. Although cohesive soils do not have liquefaction potential, they may have long term settlement problems.	8	Rock site (rock strata at depths 0 to 20 feet below the surface)	5
					Cohesive soil site (clay or fine silt at depths 0 to 20 feet below the surface)	4
					Site has fluvial-alluvial deposits or sand/silt below groundwater level	3
					Site has beach sands below ground water level	2
					Site has uncompacted hydraulic fills below groundwater level	1
3. Site Security Issues						
a	Proximity to Hazardous Land Uses	None	There should be no identifiable hazardous land uses (military bases, gas or oil wells or pipelines, refineries, etc.) within 5 miles of safety-related equipment	6	No identified hazardous land uses within 5 miles	5
					One hazardous land use 1 to 5 miles away	4
					More than one hazardous land use 1 to 5 miles away	3
					One hazardous land use less than 1 mile away	2
					More than one hazardous land use less than 1 mile away	1
b	Protection Against Malevolent Watercraft or Vehicles	None	No navigable waterway or public roads should be within 1 mile of safety-related equipment.	8	Nearest waterway or public road more than 1 mile from safety-related equipment	5
					Nearest waterway or public road 1/2 mile to 1 mile from safety-related equipment	4
					Nearest waterway or public road 1,000 ft to 1/2 mile from safety-related equipment	3
					Nearest waterway or public road 500 to 1,000 ft from safety-related equipment	2
					Nearest waterway or public road less than 500 ft from safety-related equipment	1

Item No.	Description of Characteristic	Musts	Wants	Numerical Weighting Factor - Importance (10 is High, 1 is Low)	Evaluation Criteria	Numerical Rating Factor (5 is Best, 1 is Worst)
c	Suitable Terrain for Protected Area (PA) Fence and Owner Controlled Area (OCA) Surveillance	The site can be made flat and clear of obstructions to allow a suitable continuous PA fence.	The site should be flat and clear of obstructions for an area of at least 1000 feet on all sides of PA fence.	7	Site is flat and clear of obstructions for an area of at least 1000' on all sides of PA fence.	5
					Site is flat and clear of obstructions for a area of at least 500' on all sides of PA fence.	4
					Site can be made flat and clear of obstructions for a area of at least 1000' on all sides of PA fence.	3
					Site can be made flat and clear of obstructions for a area of at least 500' on all sides of PA fence.	2
					Site is or can be made flat and clear of obstructions to allow a continuous PA fence.	1
d	Response Time for Local Law Enforcement Agency (LLEA)	None	Response time for LLEA to reach the site should be as short as possible.	5	Estimated LLEA driving time less than 10 minutes	5
					Estimated LLEA driving time 10 to 20 minutes	4
					Estimated LLEA driving time 20 to 30 minutes	3
					Estimated LLEA driving time 30 to 40 minutes	2
					Estimated LLEA driving time more than 40 minutes	1
4. Ecology Issues						
a	Wetlands Impact Potential	None	Minimize the acreage of jurisdictional wetlands potentially affected by site development (within the site boundaries).	10	Less than 5 acres of wetlands on-site	5
					5 to 10 acres of wetlands on-site	4
					10 to 30 acres of wetlands on-site	3
					30 to 50 acres of wetlands on-site	2
					More than 50 acres of wetlands on-site	1

Item No.	Description of Characteristic	Musts	Wants	Numerical Weighting Factor - Importance (10 is High, 1 is Low)	Evaluation Criteria	Numerical Rating Factor (5 is Best, 1 is Worst)
b	Other Natural Habitats Impact Potential	None	Minimize potential impact on natural habitats other than wetlands (within the site boundaries).	5	No natural habitats on-site	5
					Less than 25 percent natural habitats	4
					25 to 50 percent natural habitats	3
					50 to 75 percent natural habitats	2
					75 to 100 percent natural habitats	1
c	Documented Occurrence of Threatened and Endangered Species	No designated Critical Habitat of a federal threatened or endangered species on-site.	Locate site as far as possible from documented occurrences of federal or state threatened and endangered species.	7	Nearest documented occurrence more than 1/2 mile from site	5
					Nearest documented occurrence 1/4 to 1/2 mile from site	4
					Nearest documented occurrence within 1/4 mile from site	3
					Nearest documented occurrence potentially on-site	2
					Nearest documented occurrence definitely on-site	1
d	Proximity to Designated Natural Areas	The site must not impinge on a federal, state, or local designated park or preserve.	Locate site as far as possible from federal, state, and local designated parks and preserves.	7	Nearest designated area more than 10 miles from site	5
					Nearest designated area 5 to 10 miles from site	4
					Nearest designated area 3 to 5 miles from site	3
					Nearest designated area 1 to 3 miles from site	2
					Nearest designated area less than 1 mile from site	1
5. Land Use Issues						
a	Existing Land Use on the Site	The site must not be occupied by extensive recreational or residential developments or other extensive incompatible land uses.	Locate site where existing predominant on-site land use is compatible with power plant development.	10	Highly compatible (e.g., existing nuclear power plant or unused "brownfield" land)	5
					Moderately compatible (e.g., mineral extraction)	4
					Slightly compatible (e.g., existing fossil-fueled power plant, agriculture, or forestry)	3
					Somewhat incompatible (e.g., active industrial/commercial development)	2
					Highly incompatible (e.g., recreational, institutional or residential)	1
b	Existing Land Use within 1 Mile of the Site	None	Locate site where existing predominant land use (other than industrial/commercial development) within one mile is compatible with power plant.	8	Highly compatible (e.g., existing power plant, "brownfield", or mineral extraction)	5
					Somewhat compatible (e.g., agriculture, forestry, or industrial/commercial)	3
					Incompatible (e.g., recreational, institutional or residential development)	1

Item No.	Description of Characteristic	Musts	Wants	Numerical Weighting Factor - Importance (10 is High, 1 is Low)	Evaluation Criteria	Numerical Rating Factor (5 is Best, 1 is Worst)
c	Zoning / Land Use Planning	None	Locate site in area of compatible zoning / land use planning.	8	Highly compatible planning / zoning (e.g., heavy industry)	5
					Moderately compatible planning / zoning (e.g., light industry / commercial)	4
					Slightly compatible planning / zoning (e.g., agricultural / forestry)	2
					Incompatible planning / zoning (e.g., residential / recreational)	1
d	Prime Farmland	None	Site should occupy minimum prime farmland.	5	No prime farmland occupies site	5
					Prime farmland occupies 1 to 25 percent of site	4
					Prime farmland occupies 26 to 50 percent of site	3
					Prime farmland occupies 51 to 75 percent of site	2
					Prime farmland occupies 76 to 100 percent of site	1
e	Proximity to Public Airports	None	Locate site as far as possible from airports registered for public use with the Federal Aviation Administration or Department of Transportation.	8	Nearest registered airport more than 40,000 feet from site	5
					Nearest registered airport 20,000 to 40,000 feet from site	4
					Nearest registered airport 10,000 to 20,000 feet from site	3
					Nearest registered airport 3,500 to 10,000 feet from site	2
					Nearest registered airport less than 3,500 feet from site	1
f	Proximity to Federal (Victor) Airways	None	Locate site more than 2 miles from the centerline of a Federal (Victor) Airway shown on a Federal Aviation Administration sectional chart.	5	Nearest airway more than 2 miles from site	5
					Nearest airway less than 2 miles from site	1
6. Social Issues						
a	Potential for Hazardous Material Contamination	The site must not be a designated Superfund property.	Locate site in an area free of potential hazardous material contamination (known contaminated properties, potential sources of contamination, etc.).	8	Low contamination potential	5
					Moderate contamination potential	3
					High contamination potential	1
b	Community Acceptance	None	Locate site in area with optimal conditions for local acceptance of the project.	8	Local conditions very favorable	5
					Local conditions somewhat favorable	4
					Local conditions neutral	3
					Local conditions somewhat unfavorable	2
					Local conditions very unfavorable	1

Item No.	Description of Characteristic	Musts	Wants	Numerical Weighting Factor - Importance (10 is High, 1 is Low)	Evaluation Criteria	Numerical Rating Factor (5 is Best, 1 is Worst)
c	Cultural Resources (Archaeological and Historical)	None	Locate site so as to avoid potential historical or archeological resources.	7	Site extensively surveyed, no cultural resources found	5
					Site partially surveyed, no cultural resources found	4
					Site not surveyed for cultural resources	3
					Minor cultural resources known to be present	2
					Significant cultural resources known to be present	1
d	Aesthetic and Noise Impacts	None	Minimize potential impacts on sensitive receptors (homes, parks, churches, schools, etc.).	7	No sensitive receptors within 1/2 mile of existing facility	5
					No sensitive receptors within 1/2 mile of greenfield site	4
					Less than 10 sensitive receptors within 1/2 mile of existing facility	3
					Less than 10 sensitive receptors within 1/2 mile of greenfield site	2
					More than 10 sensitive receptors within 1/2 mile of any site	1
e	Social / Economic Impact Potential	None	Locate site in area where the potential social and economic impacts are likely to be highly positive, based on unemployment rates and environmental justice issues.	5	Highly positive socioeconomic impact	5
					Moderately positive socioeconomic impact	3
					Minimally positive socioeconomic impact	1
7. Site Development Issues						
a	Plant Site Topography	The site must be suitable for plant arrangement. Ground slope across the site must not be more than 5% or so flat as to prevent proper drainage.	Minimize average ground slope (consistent with drainage) and fill requirements in order to minimize costs for earthwork, erosion control, etc.	8	Less than 1.0 percent slope and less than 500,000 cy fill required	5
					1.0 to 2.0 percent slope or 500,000 to 1,000,000 cy fill required	4
					2.0 to 3.0 percent slope or 1,000,000 to 1,500,000 cy fill required	3
					3.0 to 4.0 percent slope or 1,500,000 to 2,000,000 cy fill required	2
					4.0 to 5.0 percent slope or more than 2,000,000 cy fill required	1
b	Foundation, Earthwork and Pipe Installation Conditions	There must be no sinkhole or mine subsidence activity. There must be no deep deposits of loose, soft or highly expansive material. .	For foundations, it is desirable to have dense granular soils or rock 5 to 10 feet below the surface. Less desirable, based on strength, settlement and construction costs are permeable soils. Silt is even less desirable because of low strength and erodibility	5	Mostly granular soil	5
					Mixed, mostly granular soils	4
					Mostly clay soils	3
					Silty soils, shallow rocks, or soft clays	2
					Very loose soils or soft silt	1

Item No.	Description of Characteristic	Musts	Wants	Numerical Weighting Factor - Importance (10 Is High, 1 Is Low)	Evaluation Criteria	Numerical Rating Factor (5 Is Best, 1 Is Worst)
c	Flood Potential	The power block must be above the 100 year flood level or must be feasible to protect from the 100 year flood.	Entire site should be above the 100 year flood level.	5	Entire site above 100 year flood level	5
					Only power block above 100 year flood level	3
					Entire site below 100 year flood level	1
d	Constructibility	None	Locate where constructibility factors (deliverability of large components, terrain, laydown area availability, etc.) are favorable.	7	Good Constructibility	5
					Average Constructibility	3
					Poor Constructibility	1
8. Transmission Issues						
a	Distance from Transmission	The site must be within 20 miles of a suitable transmission line or substation (500 kV or above).	Minimize the distance to the transmission interconnection point, in order to lower operation and construction costs and minimize public opposition.	10	Site less than 1 mile from transmission access	5
					Site 1 to 5 miles from transmission access	4
					Site 5 to 10 miles from transmission access	3
					Site 10 to 15 miles from transmission access	2
					Site 15 to 20 miles from transmission access	1
b	Upgrades Required for Transmission Interconnection	None	Minimize cost of upgrades required for interconnection.	7	Cost less than $20 million	5
					Cost $20 million to $40 million	3
					Cost more than $40 million	1
c	Transmission System Stability	None	Minimize risk of transmission system stability problems.	7	Low stability risk	5
					Medium stability risk	3
					High stability risk	1

Item No.	Description of Characteristic	Musts	Wants	Numerical Weighting Factor - Importance (10 is High, 1 is Low)	Evaluation Criteria	Numerical Rating Factor (5 is Best, 1 is Worst)
9. Transportation Issues						
a	Distance from Barge Access	The site must be within 20 miles of a body of water suitable for barge delivery of large components (unless suitable rail access is available).	Minimize the distance to the barge access point, in order to lower construction costs and minimize public opposition.	10	Nearest barge access less than 1 mile	5
					Nearest barge access 1 to 5 miles	4
					Nearest barge access 5 to 10 miles	3
					Nearest barge access 10 to 15 miles	2
					Nearest barge access 15 to 20 miles (or no barge access)	1
b	Distance from Railroad Access	The site must be within 20 miles of an existing railroad line suitable for delivery of equipment and materials (unless suitable barge access is available)	Minimize the distance to the railroad access point, in order to lower maintenance and construction costs and minimize public opposition.	7	Nearest railroad access less than 1 mile	5
					Nearest railroad access 1 to 5 miles	4
					Nearest railroad access 5 to 10 miles	3
					Nearest railroad access 10 to 15 miles	2
					Nearest railroad access 15 to 20 miles (or no rail access)	1
c	Distance from Highway Access	The site must be within 20 miles of primary or interstate highway.	Minimize the length of new or improved access road required to reach the highway access point, in order to lower maintenance and construction costs and minimize public opposition.	5	New or improved road less than 1 mile	5
					New or improved road 1 to 5 miles	4
					New or improved road 5 to 10 miles	3
					New or improved road 10 to 15 miles	2
					New or improved road 15 to 20 miles	1

Item No.	Description of Characteristic	Musts	Wants	Numerical Weighting Factor - Importance (10 is High, 1 is Low)	Evaluation Criteria	Numerical Rating Factor (5 is Best, 1 is Worst)
10. Water Supply Issues						
a	Distance from Adequate Source of Cooling Water	The site must be within 20 miles of an adequate cooling water source.	Minimize the distance between the water source and the plant, in order to lower operational and construction costs.	8	Site less than 1 mile from water source	5
					Site 1 to 5 miles from water source	4
					Site 5 to 10 miles from water source	3
					Site 10 to 15 miles from water source	2
					Site 15 to 20 miles from water source	1
b	Adequacy of Cooling Water Source	Water source must be capable of supplying at least 35,000 gpm (conservative single unit make-up requirement) under drought conditions. No make-up storage reservoir required.	Minimize the percentage of the 7 day, 10 year low flow (7Q10) withdrawn for dual unit operation (62,470 gpm make-up requirement).	10	62,470 gpm is less than 1 percent of 7Q10	5
					62,470 gpm is 1 to 2 percent of 7Q10	4
					62,470 gpm is 2 to 5 percent of 7Q10	3
					62,470 gpm is 5 to 10 percent of 7Q10	2
					62,470 gpm is more than 10 percent of 7Q10	1
c	Cooling Water Static Head	None	Minimize the cooling water pumping head, in order to reduce operating costs.	5	Static head less than 50 feet	5
					Static head 50 to 100 feet	4
					Static head 100 to 150 feet	3
					Static head 150 to 200 feet	2
					Static head more than 200 feet	1
d	Potential to Impact Water Quality	None	Site should minimize potential to degrade existing surface water or ground water quality (based on water quality classifications, ground water protection areas, etc.).	7	Low potential impact	5
					Moderate potential impact	3
					High potential impact	1

Appendix C

Regulatory Basis of Nuclear Licensing Evaluation Criteria

APPENDIX C
REGULATORY BASIS OF NUCLEAR LICENSING EVALUATION CRITERIA

This Appendix explains the regulatory basis of the numerical criteria developed for evaluating issues related to nuclear licensing at the Candidate Sites. The nuclear licensing issues are grouped into the following categories:

- Demography and Emergency Planning Issues
- Seismic Issues
- Site Security Issues

For all of these issues, the discussions in the following paragraphs refer to the site evaluation criteria shown in Appendix B of this report. The site evaluation criteria for other types of issues shown in Appendix B (Ecology, Land Use, etc.) are not discussed here because those non-nuclear licensing criteria typically are not dictated by regulations. The criteria for non-nuclear licensing issues typically are based on common sense considerations, and the descriptions in Appendix B are self-explanatory.

1. Demography and Emergency Planning Issues

The key demography and emergency planning issues identified for evaluation are the feasibility of establishing a Low Population Zone (including proximity to Population Centers), an Exclusion Area, and Emergency Planning Zones (10 miles and 50 miles). The numerical site evaluation criteria developed for these issues are summarized in Section 1 of Appendix B of this report.

Low Population Zone (LPZ) Feasibility

10 CFR 50 [Reference 1] states that:

> *"Low population zone means the area immediately surrounding the exclusion area which contains residents, the total number and density of which are such that there is a reasonable probability that appropriate protective measures could be taken in their behalf in the event of a serious accident. These guides do not specify a permissible population density or total population within this zone because the situation may vary from case to case. Whether a specific number of people can, for example, be evacuated from a specific area, or instructed to take shelter, on a timely basis will depend on many factors such as location, number and size of highways, scope and extent of advance planning, and actual distribution of residents within the area."*

10 CFR 100.3 [Reference 2] states that

> *"Low population zone means the area immediately surrounding the exclusion area which contains residents, the total number and density of which are such that there is a reasonable probability*

that appropriate protective measures could be taken in their behalf in the event of a serious accident. These guides do not specify a permissible population density or total population within this zone because the situation may vary from case to case. Whether a specific number of people can, for example, be evacuated from a specific area, or instructed to take shelter, on a timely basis will depend on many factors such as location, number and size of highways, scope and extent of advance planning, and actual distribution of residents within the area.

Population center distance means the distance from the reactor to the nearest boundary of a densely populated center containing more than about 25,000 residents."

10 CFR 100.21 [Reference 2] states that

"Applications for site approval for commercial power reactors shall demonstrate that the proposed site meets the following criteria:

(a) Every site must have an exclusion area and a low population zone, as defined in § 100.3;

(b) The population center distance, as defined in § 100.3, must be at least one and one-third times the distance from the reactor to the outer boundary of the low population zone. In applying this guide, the boundary of the population center shall be determined upon consideration of population distribution. Political boundaries are not controlling in the application of this guide..."

Regulatory Guide 4.7 Section C.3 [Reference 3] states that

"... Preferably a reactor would be located so that, at the time of initial site approval and within about 5 years thereafter, the population density, including weighted transient population, averaged over any radial distance out to 20 miles (cumulative population at a distance divided by the circular area at that distance), does not exceed 500 persons per square mile. A reactor should not be located at a site whose population density is well in excess of the above value. ..."

Page I-12 of NUREG-0396 [Reference 4] states that the LPZ must be of such a size that an individual located at any point on its outer boundary that is exposed to the radioactive cloud during its entire period of passage would not receive a total radiation dose to the whole body of 25 rem or 300 rem thyroid. The dose at the outer LPZ boundary is a function of the site-specific short-term atmospheric dispersion factors (χ/Q). Since site-specific atmospheric dispersion factors are not normally available during an alternative site evaluation study, a typical distance to the LPZ boundary was established based on the information in early site permit (ESP) applications, combined construction and operating license (COL) applications, safety evaluation reports, and environmental impact

statements for several recent projects [see References 5 through 16]. The information derived from these sources is summarized in Table 1.

Table 1 summarizes data for nine projects (three of the projects listed in Table 1 had both an ESP application and a COL application; therefore, there are only nine projects although there are more data entries in Table 1). The maximum LPZ distance for any of these projects was 6 miles. However, none of the other projects had an LPZ distance of more than 3 miles, and the minimum distance was 2 miles. The 6-mile LPZ distance was considered an aberration based on very unusual site-specific conditions, and using 6 miles as the typical LPZ distance was considered unreasonably conservative for this study. An LPZ distance of 3 miles would bound eight out of the nine projects in Table 1. Therefore, the typical LPZ distance for this study was set at 3 miles.

As explained in the regulatory guidance quoted above, there are actually two separate considerations related to the LPZ. One consideration is that the distance to the nearest population center (an area with a population of at least 25,000 and a population density of at least 500 people per square mile) must be at least one and one-third times the distance from the reactor to the outer boundary of the LPZ. Considering the typical LPZ distance of 3 miles, this means that the nearest population center should be no closer than 4 miles from the proposed reactor containment location (one and one-third times the distance to the outer boundary of the LPZ). In addition, greater distances to the nearest population center are preferred. The site evaluation criteria based on these considerations are summarized in Item 1a of Appendix B.

The other consideration is that the population density within the LPZ generally should not be more than 500 people per square mile. In addition, lower population densities within the LPZ are preferred. The site evaluation criteria based on these considerations are summarized in Item 1b of Appendix B.

Exclusion Area Feasibility

10 CFR 100.3 [Reference 2] states that

> *"Exclusion area means that area surrounding the reactor, in which the reactor licensee has the authority to determine all activities including exclusion or removal of personnel and property from the area. This area may be traversed by a highway, railroad, or waterway, provided these are not so close to the facility as to interfere with normal operations of the facility and provided appropriate and effective arrangements are made to control traffic on the highway, railroad, or waterway, in case of emergency, to protect the public health and safety. Residence within the exclusion area shall normally be prohibited. In any event, residents shall be subject to ready removal in case of necessity. Activities unrelated to operation of the reactor may be permitted in an exclusion area under appropriate limitations, provided that no significant hazards to the public health and safety will result."*

NUREG-0396, Page I-12 [Reference 4] states that the exclusion area must be of such a size that an individual located at any point on its boundary for two hours immediately following the onset of a postulated design basis accident fission product release from the reactor plant would not receive a total radiation dose to the whole body of 25 rem or 300 rem to the thyroid from radioactive plume exposures. As with the LPZ, the dose is a function of the site-specific short-term atmospheric dispersion factors. Table 1 shows that that the maximum Exclusion Area Boundary (EAB) distance for the projects considered is 7,381 feet (1.4 miles), and the minimum distance is 2,640 feet (0.5 miles). To be conservative, 5,000 feet was established as the typical EAB distance for this study. The EAB distances of more than 5,000 feet reported in the COL applications appear to be based on the location of existing site boundaries and not on dose considerations. The typical 5,000 foot EAB distance bounds the EAB distances listed in Table 1 where only a single EAB distance is listed (no minimum / maximum distances provided). Thus, a 5,000-foot EAB should be acceptable for dose evaluations when site-specific short-term atmospheric dispersion factors are known.

NUREG-0396, Page I-12 goes on to state that the licensee must have authority over all activities within the EAB. Normally, such authority requires ownership of the area, but there may be some situations where authority can be achieved without ownership. If the area is not owned, the presence of a public road, railroad, or residences is a significant complicating factor. The site evaluation criteria based on these factors are summarized in Item 1c of Appendix B.

Emergency Planning Zones Feasibility

10 CFR 50.33 [Reference 1] states that

> *"Generally, the plume exposure pathway EPZ* [emergency planning zone] *for nuclear power reactors shall consist of an area about 10 miles (16 km) in radius and the ingestion pathway EPZ shall consist of an area about 50 miles (80 km) in radius. The exact size and configuration of the EPZs surrounding a particular nuclear power reactor shall be determined in relation to the local emergency response needs and capabilities as they are affected by such conditions as demography, topography, land characteristics, access routes, and jurisdictional boundaries."*

10 CFR 50.47 makes a similar statement that

> *"2) Generally, the plume exposure pathway EPZ for nuclear power plants shall consist of an area about 10 miles (16 km) in radius and the ingestion pathway EPZ shall consist of an area about 50 miles (80 km) in radius. The exact size and configuration of the EPZs surrounding a particular nuclear power reactor shall be determined in relation to local emergency response needs and capabilities as they are affected by such conditions as demography, topography, land characteristics, access routes, and jurisdictional boundaries."*

10 CFR 50.33 states that Emergency Planning Zones are discussed in NUREG-0396, EPA 520/1-78-016 [Reference 4]. Page I-6 of NUREG-0396 states that a 50 mile distance is justified as a maximum emergency planning distance because significant wind shifts within this distance would be likely to restrict the spread of radioactive material beyond this radius. Page I-52 of NUREG-0396 states that for areas beyond 10 miles away from the site, there is little apparent distinction between the effectiveness of evacuation and sheltering strategies in terms of projected early fatalities or injuries. Therefore, although protective actions may be required for individuals located in areas further than 10 miles from the site for an "atmospheric" release, the actual measures used and how rapidly or efficiently they are implemented will not strongly influence the number of projected early health effects.

Based on the regulatory guidance quoted above, sites with the least constrained evacuation planning issues (low population, good access from site to major traffic networks, and no terrain or climate limitations) within 50 miles and 10 miles should be considered the most suitable for emergency planning. The site evaluation criteria based on these factors are summarized in Item 1d of Appendix B.

References

1. 10 CFR PART 50 - Domestic Licensing of Production and Utilization Facilities

2. 10 CFR PART 100 - Reactor Site Criteria

3. Regulatory Guide 4.7, General Site Suitability Criteria for Nuclear Power Stations, (Draft issued as DG-4004), Revision 2, April 1998.

4. NUREG-0396, EPA 520/1-78-016, "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants," December 1978.

5. NUREG-1844, "Safety Evaluation Report for an Early Site Permit (ESP) at the Exelon Generation Company, LLC (EGC) ESP Site," May 2006

6. NUREG-1840, "Safety Evaluation Report for an Early Site Permit (ESP) at the Grand Gulf Site," Date Published: April 2006

7. NUREG-1811, Supplement 1, "Draft Environmental Impact Statement for an Early Site Permit (ESP) at the North Anna ESP Site Draft Report for Comment," Date Published: July 2006

8. "Southern Nuclear Operating Company Vogtle Early Site Permit Application," Revision 0, AUGUST 2006

9. Tennessee Valley Authority, "Bellefonte Nuclear Plant Units 3 & 4 COL Application Part 2, FSAR," Revision 0

10. UniStar Nuclear Energy, "Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 COL Application Part 2 FSAR," Revision 0

11. Entergy Operations, Inc. "Grand Gulf Nuclear Station (GGNS) Unit 3 COL Application Part 2, FSAR," Revision 0

12. Dominion Nuclear, "North Anna Power Station Unit 3, Combined License Application, Part 2 Final Safety Analysis Report," Revision 0

13. Progress Energy, "Shearon Harris Nuclear Power Plant Units 2 and 3, COL Application Part 2, Final Safety Analysis Report," Revision 0

14. STP Nuclear Operating Company (STPNOC), "South Texas Project (STP) Units 3 and 4, COLA Final Safety Analysis Report," Revision 01

15. Southern Nuclear Operating Company, "Vogtle Electric Generating Plant Units 3 and 4, COL Application Part 2 – FSAR," Revision 0

16. Duke Energy, "William States Lee III Nuclear Station Units 1 and 2, CLO Application Part 2 FSAR," Revision 0

Table 1 – EAB and LPZ Distances Reported for Current Nuclear Projects

	EAB Envelope Distance	LPZ Circular Radius	Calculated Minimum Allowable Distance to a Population Center of 25,000 Residents (1 1/3 times the LPZ Distance)	Reactor Types Reviewed[1]
	Feet	Feet	Feet	
Early Site Permit Applications				
Clinton [Reference 5]	3,362 (0.64 miles)	13,182 (2.5 miles)	17,576 (3.3 miles)	2 - ACR-700 1 - ABWR 2 - AP1000 1 - ESBWR 3 - IRIS 4 - GT-MHR 8 - PBMR
Grand Gulf [Reference 6] [2]	3,362 (0.64 miles)	11,088 (2.1 miles)	14,784 (2.8 miles)	2 - ACR-700 1 - ABWR 1 - AP1000 1 - ESBWR 3 - IRIS 4 - GT-MHR 8 – PBMR
North Anna [Reference 7]	5,000 0.95 miles {2,854.9 minimum lateral distance (0.54 miles)}	31,680 (6 miles)	42,240 (8 miles)	1 - AP1000 2 - ACR-700 1 - ABWR 1 - ESBWR 3 - IRIS 4 - GT-MHR 8 - PBMR
Vogtle [Reference 8]	3,415 (0.65 miles)	10,560 (2 miles)	14,080 (2.67 miles)	2 - AP1000

Table 1 – EAB and LPZ Distances Reported for Current Nuclear Projects

	EAB Envelope Distance	LPZ Circular Radius	Calculated Minimum Allowable Distance to a Population Center of 25,000 Residents (1 1/3 times the LPZ Distance)	Reactor Types Reviewed[1]
	Feet	Feet	Feet	
Combined License Applications				
Bellefonte Nuclear Plant Units 3 & 4 [Reference 9]	3,330 (0.68 miles) minimum lateral distance 6,330 (1.2 miles) maximum lateral distance	10,560 (2 miles)	14,080 (2.7 miles)	2 – AP1000
Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 [Reference 10]	2,640 (0.5 miles)	7,920 (1.5 miles)	10,560 (2.0 miles)	1 – US EPR
Grand Gulf Nuclear Station Unit 3 [Reference 11]	3,390 (0.64 miles)	11,190 (2.1 miles)	14,920 (2.8 miles)	1 - ESBWR
North Anna Unit 3 [Reference 12]	4,650 (0.88 miles)	31,680 (6 miles)	42,240 (8 miles)	1 - ESBWR

Table 1 – EAB and LPZ Distances Reported for Current Nuclear Projects

	EAB Envelope Distance	LPZ Circular Radius	Calculated Minimum Allowable Distance to a Population Center of 25,000 Residents (1 1/3 times the LPZ Distance)	Reactor Types Reviewed[1]
	Feet	Feet	Feet	
Shearon Harris Nuclear Power Plant Units 2 & 3 [Reference 13]	4,085 (0.77 miles) minimum 4,572 (0.87 miles) maximum	15,840 (3 miles)	21,120 (4 miles)	2 – AP1000
South Texas Project Units 3 & 4 [Reference 14]	3,050 (0.58 mile) minimum 7,381 (1.4 miles) maximum	15,840 (3 miles)	21,120 (4 miles)	2 - ABWR
Vogtle Electric Generating Plant Units 3 & 4 [Reference 15]	Same as ESPA above 3,415 (0.65 miles)	Same as ESPA 10,560 (2 miles)	Same as ESPA above 14,080 (2.67 miles)	2 - AP1000
William States Lee III Units 1 & 2 [Reference 16]	2,663 (0.50 miles) minimum 5,961 (1.13 miles) maximum	10,560 (2 miles)	14,080 (2.67 miles)	2 – AP1000
Minimum	2,640 (0.5 miles)	7,920 (1.5 miles)	10,560 (2.0 miles)	
Maximums	7,381 (1.4 miles)	31,680 (6 miles)	42,240 (8 miles)	

Table 1 Notes:

1. ACR-700 -Advanced Canada Deuterium Uranium Reactor
   ABWR - Advanced Boiling Water Reactor
   AP1000 - Advanced Pressurized Water Reactor
   ESBWR - Economic Simplified Boiling Water Reactor
   IRIS - International Reactor Innovative and Secure
   GT-MHR - Gas Turbine Modular Helium Reactor
   PBMR - Pebble Bed Modular Reactor

2. NUREG 1840, Section 2.3.4 Short-Term Diffusion Estimates, Subsection 2.3.4.1 Technical Information in the Application state at the minimum distance to the EAB from any individual new reactor sited within the 630-foot radius circle would be 0.52 miles (841 meters) and the minimum distance to the LPZ from any individual new reactor sited within the 630-foot (radius) circle would be 2 miles (3219 meters). There are 5,280 feet in a mile, so a 630 foot is 0.119 miles. Thus, the EAB is 0.64 miles (0.52 + 0.119 = 0.639 miles) and the LPZ is 2.1 miles (2 + 0.119 = 2.119 miles).

2. Seismic Issues

The key seismic issues identified for evaluation are Proximity to Capable Faults, Safe Shutdown Earthquake Maximum Acceleration, and Liquefaction Potential. The numerical site evaluation criteria developed for these issues are summarized in Section 2 of Appendix B of this report.

Proximity to Capable Faults

To determine the potential ground motion at a site, 10 CFR 100.23(c) [Reference 1], Appendix A of 10 CFR 100 [Reference 2], and Regulatory Guide 1.165 [Reference 3] require the identification and characterization of seismic sources. The most important source for an earthquake is a capable fault, which is defined in Appendix A of 10 CFR 100 as follows:

> (g) A *capable fault* is a fault which has exhibited one or more of the following characteristics:
>
> (1) Movement at or near the ground surface at least once within the past 35,000 years or movement of a recurring nature within the past 500,000 years.
> (2) Macro-seismicity instrumentally determined with records of sufficient precision to demonstrate a direct relationship with the fault.
> (3) A structural relationship to a capable fault according to characteristics (1) or (2) of this paragraph such that movement on one could be reasonably expected to be accompanied by movement on the other.
>
> In some cases, the geologic evidence of past activity at or near the ground surface along a particular fault may be obscured at a particular site. This might occur, for example, at a site having a deep overburden. For these cases, evidence may exist elsewhere along the fault from which an evaluation of its characteristics in the vicinity of the site can be reasonably based. Such evidence shall be used in determining whether the fault is a capable fault within this definition.
>
> Notwithstanding the foregoing paragraphs (1), (2), and (3), structural association of a fault with geologic structural features which are geologically old (at least pre-Quaternary) such as many of those found in the Eastern region of the United States shall, in the absence of conflicting evidence, demonstrate that the fault is not a capable fault within this definition.

The larger the fault and closer it is to the site, the more critical it is in establishing the SSE acceleration for the site. Appendix A of 10 CFR 100 requires that the site must be investigated for capable faults any part of which is within 200 miles of the site. Appendix A also provides a table with guidelines that capable faults of lesser length and at a certain

distance from the site need not be considered in determining the SSE. Appendix A of 10 CFR 100 and Regulatory Guide 1.165 also require that a capable fault, any part of which is within 5 miles of the site, needs more stringent requirements for determining the SSE and suitability of the site.

The site evaluation criteria based on these factors are shown in Item of Appendix B.

Safe Shutdown Earthquake (SSE) Maximum Acceleration

The limit of 0.3g peak SSE ground acceleration is based on the design basis 0.3g acceleration for the new standardized nuclear plants (such as, the AP1000). Regulatory Guide 1.165 requires the use of probability seismic hazard analysis (PHSA) procedures for determining the SSE acceleration and the response spectra. Since an alternative site evaluation must be based on a preliminary type of investigation, a higher numerical rating factor was assigned to sites for which smaller SSE accelerations were obtained.

The site evaluation criteria based on these factors are shown in Item 2b of Appendix B.

Liquefaction Potential

10 CFR 100.23 (d) (4) discusses several siting factors that must be evaluated and requires that the potential for soil liquefaction be evaluated in addition to several other geologic and seismic factors. During an earthquake, soils may undergo either transient or permanent reduction in undrained shear resistance, which depending on the extent and severity may cause ground failure and could make the site economically unsuitable for building a plant. If a site is prone to liquefaction, it will require improving the soil, and this may be costly. Following is a listing of various means available for soil improvement.

1. Over-excavation and replacement with compacted non-liquefiable soil (has been used on many nuclear power plants).
2. In-situ densification such as vibroflotation or dynamic consolidation (suitable for improving soil up to 20 – 30 feet below grade).
3. Vibratory replacement techniques such as stone columns.
4. Various grouting techniques such as jet grouting, compaction grouting and chemical grouting.

Regulatory Guide 1.198 [Reference 4] provides procedures and criteria for assessing seismic liquefaction at nuclear power plant site. Regulatory Guide 1.198 also provides screening techniques for evaluating liquefaction potential. The liquefaction hazard evaluation should address three basic questions: (1) Are potential liquefiable soil present? (2) If so, are they saturated (below groundwater table)? (3) If so, are they of sufficient thickness or lateral extent to pose a risk to the construction of a power plant facilities? The foundation (base mat) depth of the safety related structures for the standardized nuclear plant designs range from about 30 feet below grade (for the AP1000) to about 80 feet below grade (for the ESBWR). Hence, evaluation of the third question would

require information on whether liquefiable soils extend below 30 feet to 80 feet depth. This type of information depends on the availability of soil borings, which are not normally available during an alternative site evaluation study. Therefore, the numerical site evaluation criteria were based on screening the soil type for soils that have more or less potential for liquefaction during earthquakes.

The site evaluation criteria based on these factors are shown in Item 2c of Appendix B.

References

1. 10 CFR 100 - Reactor Site Criteria

2. Appendix A of 10 CFR 100 - Seismic and Geologic Siting Criteria for Nuclear Power Plants

3. Regulatory Guide 1.165, Identification and characterization of seismic sources and determination of safe shutdown earthquake ground motion, March 1997.

4. Regulatory Guide 1.198, Procedures and criteria for assessing seismic soil liquefaction at nuclear power plant sites, November 2003.

3. Site Security Issues

The key site security issues identified for evaluation are Proximity to Hazardous Land Uses, Protection Against Malevolent Watercraft or Vehicles, Suitable Terrain for Protected Area and Owner Controlled Area, and Response Time for Local Law Enforcement Agency. The numerical site evaluation criteria developed for these issues are summarized in Section 3 of Appendix B of this report.

Proximity to Hazardous Land Uses

10 CFR 100.21(e) [Reference 1] requires that "Potential hazards associated with nearby transportation routes, industrial and military facilities must be evaluated and site parameters established such that potential hazards from such routes and facilities will pose no undue risk to the type of facility proposed to be located at the site".

Regulatory Guide 4.7 [Reference 2] specifies that potentially hazardous industrial, military, and transportation facilities must be identified within 5 miles of a proposed site, and major airports must be identified within 10 miles of a proposed site. Potential accidents at the identified facilities must then be evaluated to determine whether they could cause hazards that would exceed design basis events.

Evaluating the consequences of accidents at nearby facilities would require site-specific and technology-specific design information, and this type of evaluation is not within the scope of an alternative site evaluation study. However, proximity to potentially hazardous facilities can be used to evaluate the potential impact of nearby facilities on the suitability of candidate sites. In particular, the distance from the possible location of safety related plant components to the nearest facility that can be identified as potentially hazardous based on publicly available information (oil and gas wells, pipelines, refineries, military bases, etc.) is relevant in the evaluation of candidate sites. Greater distances and smaller numbers of facilities within those distances are preferred.

The site evaluation criteria based on these considerations are summarized in Item 3a of Appendix B.

Protection Against Malevolent Watercraft or Vehicles

10 CFR 73.1 [Reference 3] requires sites to install barriers to protect against watercraft or vehicles coming within the safe standoff distance determined for numerous plant structures or components for the design basis threat (DBT). Sites are free to locate these barriers on their property, except that they cannot block or obstruct a public waterway or road. To avoid additional evaluations or reinforcement of the structures or components that are required to be protected for the DBT, the barriers need to be installed as far away from these structures as possible. The proximity of a public waterway or road could limit the ability of the site to achieve the required standoff distances, which could result in costly reinforcements to the structures or components.

Increased distances provide better margins against a future increased DBT and a better chance that reinforcement of the components or structures will not be required. The site evaluation criteria based on these considerations are summarized in Item 3b of Appendix B.

Suitable Terrain for Protected Area Fence and Owner Controlled Area Surveillance

The proposed shape of the Protected Area (PA) for the dual-unit AP1000 is rectangular and the size is approximately 1000' x 1750'. It is expected that the protected area shapes for any other new plant design would be rectangular and the sizes would be similar or smaller, if the design is a single unit plant.

At the time of COLA submittal, the location of the PA fence, as defined in 10 CFR 73.2 and 10 CFR 73.55 [Reference 3], on the site would be finalized, and the security strategy would be developed for each typical plant design (e.g. AP1000). Alterations to the PA fence because of terrain would require a separate security strategy for the unique condition and may require additional security posts during operation. For this reason, there needs to be sufficient space to install the PA fence at the location given by the plant vendor.

In addition to the terrain requirements for the PA fence, it is preferred to have flat terrain in the area just outside the PA fence to facilitate surveillance of the Owner Controlled Area (OCA) for early detection. Areas that can be flattened by clear cutting or moving soil are acceptable, but would require additional cost to perform those activities, and thus are penalized in the numerical scoring.

The site evaluation criteria based on these factors are summarized in Item 3c of Appendix B.

Response Time for Local Law Enforcement Agency

During an actual security emergency, the plant would call for help from the Local Law Enforcement Agency (LLEA). Faster response times from the LLEA result in less time for adversaries to attack the plant security forces by themselves. Arrival of the LLEA greatly increases the chance of defeating adversaries, and thus shorter LLEA response times may result in a smaller number of security posts being required.

There is no minimum requirement for LLEA response time. The security strategy is designed for whatever response time is available. Because shorter response times give the site security a better chance of winning force-on-force drills and/or could result in a reduction of security posts, shorter LLEA response times are favored in the numerical scoring.

The site evaluation criteria based on these factors are summarized in Item 3d of Appendix B.

References

1. 10 CFR 100 - Reactor Site Criteria

2. Regulatory Guide 4.7 - General Site Suitability Criteria for Nuclear Power Stations, (Draft issued as DG-4004), Revision 2, April 1998

3. 10 CFR 73 – Physical Protection of Plants and Materials