

9.3 Alternative Site Analysis

This section identifies and evaluates a set of alternatives to the proposed STP site for the construction and operation of a two-unit nuclear facility (the proposed project). The analysis described here addresses alternative sites to determine if there is an “obviously superior” site in terms of environmental impacts and economic costs when compared to the proposed site.

STPNOC will operate the two proposed nuclear facilities as merchant nuclear plants, providing electrical energy to the competitive marketplace. STPNOC also intends that the proposed project be built and operated in a location that is safe, secure, and environmentally responsible. The alternative site analysis is submitted to ensure that an evaluation of the appropriateness of the proposed site, in terms of geographical and environmental restrictions, is made. Additionally, the analysis focuses on reasonable alternative sites for comparison.

This section provides a description of the site-selection process that includes selection procedures for the region of interest and candidate sites, factors considered at each level of the selection process, criteria used to screen candidate sites, and methodologies used in the alternative site comparison process. Section 9.3.1 begins with a description of the process STPNOC used to identify and evaluate alternative sites. STPNOC then describes the application of this process to select the region of interest to identify candidate areas, candidate sites, and alternative sites, and to conduct a comparison of the proposed site with the alternative sites (Section 9.3.2).

The general screening process consisted of the following steps:

- (1) The region of interest (ROI) is typically selected based on geographic boundaries or the relevant service area. Here, the ROI was selected based on the relevant market area for the proposed project. Because STPNOC proposes a merchant plant, the power generated will not serve a traditional service area. Rather, as described below, the facility will sell power to wholesale and retail customers on the open market.
- (2) Candidate areas were then selected from within the larger ROI. Candidate areas are a subset of the ROI. The candidate areas are the area remaining after unsuitable areas for siting a nuclear power plant are removed from consideration. Regulatory Guide Section 4.2 (Reference 9.3-1) further defines candidate areas as “reasonable homogeneous areas within the region of interest investigated for potential sites. Candidate areas may be made up of a single large area or several unconnected ones. The criteria governing a candidate area are the same resources and populations on which the potential plant would have an impact and similar facility costs.” This step is performed with the purpose of quickly identifying areas with the ROI that would not be suitable for the siting of a new power plant. Reasons that areas were considered unsuitable include:
 - proximity to major centers of population density
 - lack of existing infrastructure
 - lack of suitable cooling water source

- distance to transmission lines
 - unsuitable topographic features (e.g., mountains, marshes, fault lines)
 - potential to impact valuable agricultural, residential, or industrial areas
 - potential to impact dedicated land-use areas (e.g., parks, historical sites, wilderness areas, testing grounds)
 - conflicts with land-use planning programs or other restrictions established by State, county, or local governments
- (3) Potential sites are identified within the candidate area. These sites are identified using the candidate area criteria. During this step, STPNOC reviews attributes in some detail. Additionally, potential sites may be identified based on positive attributes. For example, a site is identified because it meets the need for ample water, transmission facilities and load centers, or infrastructure. The goal of this step is to identify a list of potential sites within the candidate area.
- (4) A set of candidate sites is then identified from the list of potential sites and further scrutinized to refine it to a list of alternative sites warranting further evaluation. The candidate sites selected meet the minimum seven candidate site criteria in NUREG 1555 (Reference 9.3-2):
- Consumptive use of water does not cause significant adverse effects on other users.
 - The proposed action will not jeopardize Federal, State, and affected Native American tribal listed threatened, endangered, or candidate species or result in the destruction or adverse modification of critical habitat.
 - There will not be any potential significant impacts to spawning grounds or nursery areas of populations of important aquatic species on Federal, State, and affected Native American tribal lists.
 - Discharges of effluents into waterway will be in accordance with Federal, State, regional, local and affected Native American tribal regulations and will not adversely impact efforts to meet water-quality objectives.
 - There will be no preemption of or adverse impacts on land specifically designated for environmental, recreational, or other special purposes.
 - There will not be any potential significant impact on terrestrial and aquatic ecosystems, including wetlands, which are unique to the resource area.
 - No other significant issues preclude use of the site.

- (5) Using the data gathered and analyzed for each site, the alternative sites were compared against the proposed STP site. The proposed site was originally selected in accordance with the special case in NUREG-1555 (Reference 9.3-2):

“...there will be special cases in which the proposed site was not selected on the basis of a systematic site-selection process. Examples include plants proposed to be constructed on the site of an existing nuclear power plant previously found acceptable on the basis of a NEPA review and/or demonstrated to be environmentally satisfactory on the basis of operating experience, and sites assigned or allocated to an applicant by a State government from a list of State-approved power-plant sites. For such cases, the reviewer should analyze the applicant’s site-selection process only as it applies to candidate sites other than the proposed site, and the site-comparison process may be restricted to a site-by-site comparison of these candidates with the proposed site.”

As described in section 9.3.1, sites with existing nuclear facilities were given preference in the review because co-located sites offer many environmental, construction and cost benefits. The proposed site was also compared against undeveloped or industrial sites to ensure that such sites were not environmentally preferable or obviously superior to the Proposed STP site. Preference was also given to sites to which access could be reasonably obtained.

The following factors influenced the decision to give preference to sites with existing nuclear facilities:

- Co-located sites offer existing infrastructure and have an the benefit of an established operating history.
- The environmental impacts of an existing unit are known and the impacts of a new unit should be comparable to those of the operating nuclear plant.
- Site physical criteria important in determining site suitability, primarily geologic/seismic suitability, have been characterized at existing sites.
- Transmission is available and the existing sites have nearby markets.

The alternative site comparison process used was based on the guidance outlined in NUREG 1555 (Reference 9.3-2):

“The review involves a two-part sequential test for obvious superiority. The first stage of the test determines whether there are environmentally preferred sites among the alternative sites. The second stage of the test considers economics, technology, and institutional factors among the environmentally preferred sites to see if any is obviously superior to the proposed site. If there is no environmentally preferred or obviously superior site, the proposed site prevails.”

The environmental impacts of the alternative sites are compared against the impacts for the proposed site to determine if any of the sites are environmentally preferable. Each site is compared with the proposed site. If, based on an evaluation of the reconnaissance-type

information, an alternative site does not appear to be environmentally preferable, it is not further considered.

(6) The comparison process then follows these steps, if necessary:

- Additional evaluation factors

Where the remaining alternative site impacts appear to be environmentally comparable to the proposed site (using criteria from Section 9.3 III), additional factors are applied. NUREG-1555 (Reference 9.3-2), Section 9.3 provides:

“When one or more environmentally preferable alternative sites are identified, the scope of this review should be extended, using benefit-cost techniques and other procedures to determine if any environmentally preferable site can be shown to be obviously superior to the applicant’s proposed site.”

- Apply additional evaluation criteria

Any alternative sites that appear comparable are compared against the proposed site through application of the socioeconomic criteria outlined in NUREG-1555 (Reference 9.3-2), Table 9.3.2. Using the “site-by-site” comparison analysis in NUREG-1555 (Reference 9.3-2), remaining alternative sites are compared to the proposed STP site. NUREG-1555 (Reference 9.3-2) provides:

“An ‘environmentally preferred’ alternative site is a site for which the environmental impacts are sufficiently less than for the proposed site so that environmental preference for the alternative site can be established.”

Apply “Obviously Superior” analysis

If an alternative site is deemed environmentally preferable to the proposed site, NUREG 1555 (Reference 9.3-2) explains the procedure for obvious superiority:

“When such a determination is made, the reviewer should conduct a benefit-cost balance and comparison of the estimated costs (environmental, economic and time) of completing construction of the proposed plant at the proposed site and at the environmentally preferable site or sites. The reviewer should use the results of this benefit-cost balance to determine if any environmentally preferable site can be shown to be obviously superior to the applicant’s proposed site.”

This portion of the evaluation considers factors other than the environmental impacts at the proposed and alternative sites. The factors to be considered include:

- facility costs for any sites identified as being environmentally preferable
- institutional constraints, as they affect site availability
- additional public concerns

Figure 9.3-1 shows this process applied to the sites within the region of interest.

Alternative Site Identification Process

STPNOC did not select the Proposed STP site on the basis of a systematic process. It relied on the exception in NUREG 1555 (Reference 9.3-2) that allows an applicant to select, or give preference to, an existing nuclear plant site. However, STPNOC also compared the environmental impacts of a new plant at the Proposed STP site and alternative sites in the region of interest. This section describes that comparison process. Figure 9.3-1 illustrates the process.

9.3.1.1 Region of Interest

The ROI for this application is Electric Reliability Council of Texas (ERCOT). As noted in Chapter 8, ERCOT is the regional transmission operator for most of eastern Texas. In addition to ensuring reliability of the transmission grid, ERCOT also manages the power market. ERCOT's transmission grid is unique from other regional grids: because there are limited interties to connect the grid with other systems, most of the power generated in the region must be used within ERCOT.

The size and environmental diversity of ERCOT also provide a large, manageable area from which to draw candidate areas and potential alternative sites. ERCOT supplies power to three major metropolitan areas, Houston, Dallas-Fort Worth, and Austin. These areas are characterized by densely populated urban areas, surrounded by sprawling suburbs. Once outside these cities, however, the population dwindles and becomes rural in nature; agriculture and small manufacturing are the key industries. The urban landscape gives way to rolling hills and flat grasslands.

ERCOT was also selected as the ROI because the power generated by STP 3 & 4 will be sold to customers within the region.

9.3.1.2 Candidate Areas

The three major load centers in ERCOT - Houston, Dallas-Fort Worth, and Central Texas are logical areas from which to draw candidate sites. These cities form a rough triangle of intensely urban cities that transition quickly into rural, undeveloped country. This triangle forms the “candidate area” from which STPNOC could draw potential sites for comparison with the proposed STP site. The necessary infrastructure, cooling water supply, and transmission lines are all well supported in the area. There are no reasons to consider the area unsuitable; for example seismic activity is low throughout the area, and important land resources lie along the outer boundaries of the area.

From an independent power generation standpoint, this area provides sufficient growth in demand along with adequate transmission capability to justify investment in a new nuclear power plant. Electric generation in Texas is deregulated, meaning power generation companies assess the level of demand for electricity, current and projected wholesale prices, the existing fleet of generators that supply electricity, available generation technologies, costs of fuel, and other factors in deciding whether to develop a new generation project, the technology to use, and where to site a plant or plants (ERCOT 2006, Reference 9.3-3). These decisions are not governed by a central regulatory body, but are economic decisions by the power generator. As a result, the decision to build and operate a new generation facility belongs solely with the generating company. Each decision, then, is based on market factors (e.g. demand, availability of transmission, availability of market). The candidate area provides a rapidly growing marketplace with growing demand, as well as diverse environmental and socioeconomic characteristics.

Other potential candidate areas (for example, west Texas) would include the areas outside the rough triangle formed by these three load centers (Figure 9.3-2). STPNOC considered this option, but determined that areas outside of the candidate area would be unsuitable for a the following reasons:

- Transmission outside the candidate area is relatively undeveloped, and distances from potential sites to transmission lines are significant. Larger 345 kV transmission lines do not currently serve most of the areas outside of the candidate area. New transmission lines and corridors to the load centers would need to be constructed if a new nuclear plant were constructed in most locations outside the candidate area. Even if a new plant were constructed near one of the few 345 kV lines outside of the candidate area, there are relatively long distances from the other areas (for example, west Texas) to the large load centers that form the triangle. The project would incur higher transmission costs as well as cause greater environmental impacts. Figure 9.3-2 shows transmission lines in relation to the candidate areas.
- Suitable cooling water sources such as reservoirs have not been developed outside the candidate area. These areas have relatively arid climates compared to the candidate area, and evaporation rates are high. Surface water and groundwater sources are limited to rivers and small, localized aquifers; they are mainly developed for local municipal use and irrigation. The development of such sources in this area would increase the cost and environmental impact of the project when compared to the candidate area.

9.3.1.3 Screening of Potential Sites

Potential sites are considered using attributes similar to those used to assess candidate areas. STPNOC eliminated sites that lacked suitable cooling water sources and appropriate infrastructure (such as roads and railroads). The length and extent of transmission line construction were also considered. If, for example, sites that would require new transmission to distant substations or load centers were eliminated. STPNOC did not consider factors such as seismic activity or other topographic characteristics in selecting potential sites for comparison; the candidate area is generally flat with low seismic activity.

Because the candidate area is large, STPNOC included in its review sites that deserved special consideration, such as existing commercial nuclear sites, non-nuclear industrial sites that had developed, or had plans for, power facilities, and greenfield (undeveloped) sites. The rationale for narrowing the review of potential sites in this way is presented below.

9.3.1.3.1 Potential Sites with Existing Nuclear or Non-Nuclear Power Facilities

Construction of a new power plant at an existing commercial nuclear site or at a non-nuclear power plant site, offers several benefits:

Environmental Benefits

- Environmental conditions and impacts of the existing facility are generally known from monitored data generally collected over several years for air, water, ecology, and other environmental disciplines. Based on the knowledge accumulated over years of operation, there is a reasonable basis for assumptions about the environmental impacts of a new plant. In general the environmental impacts from existing units have been shown to be small, and it is reasonable to conclude that the impacts from the new units would also be small when compared to an undeveloped site.
- Construction of new transmission corridors may be avoided if the existing transmission system (lines and corridors) can accommodate the increased power generation. This could substantially reduce environmental impacts associated with construction of the new plant.
- In general, the location for new units would be on land disturbed by the construction of existing units. The land use would be largely industrial.

Constructability and Cost Benefits

- Site physical criteria, including geologic/seismic suitability, have already been characterized.
- Transmission corridors may be available for new construction, or could be expanded with minimal impacts.
- Plant construction, operation, and maintenance costs would be reduced because of existing site infrastructure (e.g., roads, transmission lines, water source, intake/discharge system).

Other Benefits

- Infrastructure of existing sites enables ready access to nearby power markets and transmission grids.
- Existing power plants usually have broad local acceptance and support. In the case of nuclear power facilities, community support has been an important aspect of co-locating a new nuclear plant.
- Existing power plant sites have a ready source of construction experience, minimizing the impact of the large construction force necessary for a new nuclear facility.

9.3.1.3.2 Conclusions about Potential Sites with Existing Nuclear Facilities

STPNOC reviewed existing nuclear potential sites to select candidate sites. There are two operating commercial nuclear sites within the candidate area: the two-unit Comanche Peak Nuclear Plant and the two-unit STP Plant near Bay City Texas. While the Comanche Peak site is an appropriate potential site, it may not be suitable for development by STPNOC. Comanche Peak's owner, TXU, recently announced plans to enlarge its own nuclear facility at the site, thus removing it from consideration by STPNOC.

9.3.1.3.3 Potential Sites without an Existing Nuclear Facility

STPNOC's process to identify potential sites without an existing nuclear facility is similar to the process it used to identify its candidate area. Based on the criteria used for the selection of candidate areas, potential sites without an existing nuclear facility were excluded from the selection process if they were deemed unsuitable. STPNOC relied on information about existing sites without an existing nuclear facility, such as coal and natural gas generation facilities, and undeveloped greenfield and brownfield sites. Many of these types of sites were excluded because they were too close to population centers and other public services, or lacked suitable transmission or cooling water sources. After "deselecting" potential sites based on negative attributes, STPNOC then used the inverse of these attributes and focused on sites with ample land, well-developed transmission facilities, appropriate infrastructure, and suitable cooling water sources.

Of these remaining potential sites, STPNOC conducted reconnaissance reviews to identify sites that would be suitable for development of new nuclear generating capacity. Sites that had been previously considered for power plant development, including nuclear, were closely reviewed. They remain undeveloped, and are possible sites for review. Finally, STPNOC looked at a generic greenfield site, i.e. an undeveloped site that had had no previous industrial activity. This site was assumed to have favorable attributes for a potential site. For the purposes of comparison, STPNOC included a generic greenfield in its alternative site screening process.

STPNOC reviewed the remaining potential sites against candidate site criteria to screen out sites that might not be suitable candidate sites. The sites that met these criteria became the list of alternative sites for comparison with the proposed STP site. These sites are considered in Section 9.3.1.4.

9.3.1.4 Screening to Identify Alternative Sites

Each candidate site must meet certain basic criteria identified in NUREG 1555. Special consideration was given to sites with existing generation capacity, where the proposed plant could be co-located with the existing facility.

As noted in Section 9.3.1.3, sites with existing capacity generally meet the candidate site criteria. However, in some cases, STPNOC noted that additional capacity at a site may result in adverse cumulative effects. For example, locating a new nuclear plant at an existing facility may result in new transmission corridors or strain existing water resources. With these considerations in mind, STPNOC looked at candidate sites that had sufficient transmission, water availability, and land to co-locate a plant. It then chose a representative site for comparison, and carried that site forward as an alternative. This evaluation is discussed in more detail below.

9.3.1.4.1 Sites without Existing Nuclear Generating Facilities

In reviewing sites without an existing nuclear generating facility, STPNOC divided the sites into three categories: greenfield sites, brownfield sites, and sites with existing fossil generation facilities. Within each category, STPNOC screened out those sites that were undesirable for a nuclear plant (e.g., lack of available space for a new nuclear plant, high population densities in the vicinity of the plant, etc.). Among the remaining candidates within each category, STPNOC selected that site which had characteristics that made it representative of the best sites from an environmental perspective. That site was then selected as an alternative site. While other sites might have been equally suitable as alternative sites, STPNOC did not identify any candidate sites that were obviously superior to selected alternative sites.

9.3.1.4.1.1 Greenfield Sites

STPNOC evaluated both a generic greenfield site and actual greenfield sites. The results of this evaluation are discussed below.

9.3.1.4.1.1.1 Generic Greenfield Sites

As noted above, STPNOC considered a generic greenfield as a potential site. This generic greenfield site provides a bounding site from which to consider environmental impacts of the other candidate sites. A greenfield site is a location that has not previously been developed for any use. The NRC has noted that the general environmental impact of new nuclear construction on a greenfield site is generally severe (USNRC 1996, Reference 9.3-4), and greater than the impacts associated with construction and operation of a facility at an existing facility. However, for the purposes of this site analysis, STPNOC reviewed the possible general impacts of a greenfield site.

STPNOC assumed that the greenfield site would be located in an area that met the siting criteria of 10 CFR 100. As a result the characteristics of the site could be largely rural, or at least in an area with low population in the candidate area. For the purposes of this analysis, STPNOC further assumed that the site would be near a possible supply of cooling water similar to those available at the proposed STP site. For example, water could be possibly obtained from Matagorda Bay, the lower Colorado River Basin, or the Gulf of Mexico. STPNOC further assumed that the site would consist of at least 500 - 1000 ac to accommodate construction and operation needs (for comparison, construction of the STP units would disturb approximately 770 acres, with 90 acres permanently dedicated to new units and their supporting facilities). STPNOC also assumed that a supply of cooling water would be available from similar sources to the proposed STP site. Additionally, STPNOC assumed that the general environmental considerations associated with construction and operation at a greenfield site would be similar to those discussed in NUREG 1555 (Reference 9.3-2) and Chapters 4 and 5 of this ER. The generic greenfield site was not carried forward as an alternate site for several reasons, discussed below.

STPNOC assumed that the hydrology of the greenfield sites would be generally similar to the alternative sites selected, and that water use would be driven by the construction and operational water use described in Chapters 4 and 5 of this ER. However, water rights in Texas must be purchased, and distribution is governed by water districts throughout the state. As a

result, STPNOC further assumed that water rights would need to be purchased along with the available land, increasing the cost and complexity of the project.

Construction impacts would be greater at a potential greenfield site, when compared to the proposed STP site. For example, construction of STP Units 3 & 4 will use much of the existing infrastructure used at the existing facility. STPNOC assumed that similar infrastructure would not be available at the greenfield site.

Aesthetic impact would be greater than similar impacts at the proposed site. In its analysis, STPNOC predicted that the environmental impacts of construction and operation would be similar to those described in Chapters 4 and 5 of this ER, except that much of the existing infrastructure would have to be developed to access the site. Additionally, large areas of land would be cleared, graded and modified to accommodate construction and operation.

Impacts to terrestrial and aquatic resources at a generic greenfield site would likely be greater than the impact at the proposed site (USNRC 1996, Reference 9.3-4). STPNOC identified impacts to the terrestrial and aquatic resources based on the descriptions of similar impacts to resources in Chapters 4 and 5 of this ER. For example, large undeveloped forest or grassland habitats could be permanently displaced by development on a greenfield site. STPNOC further assumed that no endangered or threatened species were present at the site, and that the impacts during construction would temporarily disturb most aquatic habitats, while permanently disturbing some forest and open areas.

Impacts to land use are expected to be generally more adverse at a greenfield site when compared to the proposed site. Given the assumption that the land use in the area would be largely recreational or agricultural, changes in the land use at the site would likely be permanent. STPNOC assumed that some transmission interconnection would be required for operation of a new plant at a greenfield site. Impacts to the environment from construction of these lines are assumed to be greater than the impacts at an existing or planned power plant site (USNRC 1996, Reference 9.3-4). Construction of new corridors generally requires clearing, grubbing, and other construction, which would cause greater impact at the greenfield site than at the proposed site or other alternatives, depending on mitigation strategies and corridor location.

In summary, the environmental impacts of locating a new nuclear power plant at a generic greenfield site would be equal to or greater than the impacts of locating a new nuclear plant at STP. Therefore, generic greenfield sites were screened from further analysis.

9.3.1.4.1.2 Actual Greenfield Sites

Many of the potential greenfield sites are not owned by STPNOC or by the owners of STP. In these cases, STPNOC assumed that the land, or access to it (including any ROW easements), would have to be obtained from one or more third parties, or that would be required to enter into a joint venture with third parties. An undeveloped site would require 500 to 1,000 acres (200-400 hectares), including an exclusion area (USNRC 1996, Reference 9.3-4). Purchase of adequate water rights would also be necessary. Acquisition of these “resources” could increase the cost of construction when compared to the availability of land, water, and ROW easements at the proposed STP site.

One “greenfield” was carried forward for review: The Allen’s Creek site has not been developed, but was once considered for construction of a nuclear power plant. This site was considered an appropriate alternative because the NRC once prepared a final environmental statement on the site (USNRC 1975, Reference 9.3-5), and land use at the site has not changed significantly. Additionally, the Allen’s Creek site was determined to be representative of the best greenfield sites in terms of its environmental impacts. Therefore, the Allen’s Creek site was selected as an alternative site.

9.3.1.4.1.3 Brownfield Sites

The selection of an industrial site may mitigate the environmental impacts of a new nuclear plant when compared to a greenfield site. STPNOC assumed that the environmental impacts of additional infrastructure and land and water acquisition would be roughly equivalent to those described for a greenfield site because the necessary infrastructure for a power plant, suitable cooling water, and additional transmission facilities may need to be developed. A number of candidate sites were screened out for various reasons, such as population density in the vicinity of the plant, lack of available space for new plants, the existing uses are incompatible with a new nuclear plant (e.g., proximity to natural gas lines), and alternative plans already exist for further development of the site. However, one industrial facility an abandoned lignite mine at the Malakoff site has the available land and infrastructure to support a potential nuclear power facility. Further, environmental reviews show that impacts would be less than those at a greenfield while representative of similar sites. Finally, the Malakoff site was determined to be representative of the best brownfield sites in terms of its environmental impacts. Therefore, the Malakoff site was selected as an alternative site.

9.3.1.4.1.4 Existing Fossil Generation Sites

The selection of an existing fossil generation site may mitigate the environmental impacts of a new nuclear plant when compared to a greenfield or brownfield site. However, a number of candidate sites were screened out for various reasons, such as population density in the vicinity of the plant, lack of available space for new plants, and alternative plans already exist for further development of the site. One existing fossil generation site (at the Limestone site) has the available land and infrastructure to support a potential nuclear power facility, and environmental reviews show that impacts would be less than those at a greenfield site. Additionally, the Limestone site was determined to be representative of the best fossil generation sites in terms of its environmental impacts. Therefore, the Limestone site was selected as an alternative site.

9.3.1.5 Conclusions Regarding Candidate Sites

STPNOC chose three alternative sites from the candidate sites for the purpose of comparison with the proposed site:

- The existing 1,700 MWe Limestone Electric Generating Station is located about 140 miles northwest of Houston. The Limestone facility is an operating coal-fired power plant in east central Texas, in the middle of a rough triangle formed by the Dallas-Fort Worth, Houston, and Austin metropolitan areas.
- The Allen's Creek greenfield site is located about 40 miles west of Houston. It is a true greenfield site. It was once considered for a nuclear plant and cooling lake, but plans for the plant were abandoned. Currently, property along the proposed reservoir is still owned by a STPNOC partner; the planned 9,500 acre reservoir and accompanying water rights are now owned by the City of Houston and the Brazos River Authority (BRA). The reservoir has not yet been built.
- The Malakoff Brownfield site is located in Henderson County, about 60 miles southeast of Dallas. This site was originally planned for a coal-fired plant, and was once a lignite mine. While it is considered a brownfield for the purposes of continuing review, it is more closely described as a former industrial non-nuclear site.

These alternative sites represent the best available alternative sites in terms of their environmental impacts as well as the diverse geographic and environmental areas in which they are located.

9.3.2 Alternative Site Review

The proposed site is reviewed at length in this environmental report. However, it is also reviewed here for comparison against the three alternative sites. This section reviews other alternative sites based on the selection criteria and review topics suggested in NUREG-1555 (Reference 9.3-2). The object of the analysis is to consider whether any of the alternative sites are "obviously superior" to STP. STPNOC generally reviewed these alternative sites with the following topics in mind:

- hydrology, water quality, and water availability

- aquatic biological resources, including wetlands, wetland buffers, essential fish habitat, and endangered species
- terrestrial resources, including endangered species, and areas requiring special consideration
- land uses and transmission corridors
- socioeconomic factors, including aesthetics, archaeological and historic preservation, and environmental justice
- population distribution and density
- air quality

Other categories of review, such as radiological health and postulated accident scenarios would likely not vary from site to site. Table 9.3-3 shows the results of the comparison.

9.3.2.1 Limestone Electric Generating Station Site

The Limestone Electric Generating Station (Limestone) is a two unit lignite-and-coal-fired electric generating facility with a combined capacity of 1,700-MWe (NRG 2006, Reference 9.3-6). The site is located in eastern Limestone County, at its junction with Freestone and Leon Counties, about 2.5 miles southeast of Farrar and 8 miles north of Jewett (ENSR 2004, Reference 9.3-7). The city of Waco, TX is on the edge of the 50 mile radius.

9.3.2.1.1 Land Use Including Site and Transmission Line Rights-of-Way

The Limestone plant encompasses about 4,346 acres. The two generating units are centrally located in the main plant area. The main plant is divided into northern and southern portions by railroad spurs along the south side of the bottom ash cooling impoundment. The solid waste disposal area (SWDA) occupies the eastern half of the property. A 28-acre switchyard is also located at the plant site. The rest of the site is primarily occupied by undeveloped land (ENSR 2004, Reference 9.3-7).

The region surrounding the Limestone plant site is a rural area that consists primarily of undeveloped agricultural property with surface lignite mining operations to the south and east (ENSR 2004, Reference 9.3-7). In 2002 approximately 85 percent total land acreage was devoted to farming within the 6 mile radius (USDA 2004, Reference 9.3-8).

Based on preliminary transmission analysis performed by Siemens, two new 345-kilovolt transmission lines would be required to connect the proposed project to ERCOT transmission system (Siemens 2007, Reference 9.3-9). The new lines would likely be installed within, or mostly within, the existing 345-kilovolt transmission line ROWs (ERCOT 2007, Reference 9.3-10).

Therefore, the land use impacts of construction of a new nuclear plant at Limestone would be similar to those at STP. However, if new corridors are required, expected impacts to land use could be greater during construction than those at the propose STP site.

9.3.2.1.2 Air Quality

The Limestone site is located in Austin-Waco Intrastate Air Quality Control Region (40 CFR 81.134 Subpart B, Reference 9.3-11), which is designated as unclassifiable/attainment with respect to the National Air Quality Standards (NAAQS) (40 CFR 81.344, Reference 9.3-11). The nearest non-attainment area is Ellis County, which is designated as a non-attainment area with respect to the 8-hour ozone standard (40 CFR 81.344, Reference 9.3-11). Ellis County is located about 50 miles northwest of the Limestone site. Any required permits (e.g., preconstruction air permits) would be obtained from the Texas Commission on Environmental Quality (TCEQ).

Before project construction activities could begin, the project would be required to obtain a preconstruction air permit from the TCEQ (TCAA 2007, Reference 9.3-12). The air permit would ensure both construction and operation emissions would conform to the Texas State Implementation Plan and would not challenge state efforts to achieve or maintain compliance with the NAAQS (TAC 2007, Reference 9.3-13).

Air quality impacts from construction and operation of the proposed project at Limestone would be similar to those at the proposed STP site.

9.3.2.1.3 Hydrology, Water Use, and Water Quality

Boiler water and potable water for the lignite-fired Limestone Generating Facility is primarily obtained from three on-site wells (ENSR 2004, Reference 9.3-7) that tap into the prolific Carrizo-Wilcox Aquifer. The Carrizo-Wilcox Aquifer now has more than 251,852 acre-feet of availability in the eastern region, with significant potential for further development (TWDB 2006, Reference 9.3-14).

Circulation water for the existing facility is purchased through diversion rights with the Brazos River Authority (TWDB 2006, Reference 9.3-14). It is routed via underground pipes from Lake Limestone, located about 5 miles southwest of the facility (ENSR 2004, Reference 9.3-7). Lake Limestone is directly fed by the Navasota River. It has an authorized storage capacity of 204,524 acre-feet and an authorized diversion of 65,450 acre-feet (TWDB 2006, Reference 9.3-14). Circulation water usage for the existing Limestone generating facility is about 22,400 acre-feet per year (TWDB 2003, Reference 9.3-15).

For the purpose of analysis, STPNOC conservatively assumed that water for the proposed nuclear generating units would also come from the Lake Limestone and the Carrizo-Wilcox Aquifer. The additional need for water at the Limestone Site would be minimized by using dry cooling technology. Because the reactor would be air-cooled, the primary need for surface water would be for support infrastructure, and therefore the demand for surface water resources would be relatively small.

Impacts to hydrology, water use and water quality at the Limestone site would be similar to those at the proposed STP site.

9.3.2.1.4 Terrestrial Resources Including Protected Species

The plant site is located east of the Austin-Waco metropolitan area. The Limestone site encompasses approximately 4,346 acres (ENSR 2004, Reference 9.3-7). The terrain is generally flat. Most of the undeveloped portion of the site is land managed for agriculture and livestock although some of the proposed plant site is existing industrial land, the Limestone Generating Station. The area surrounding this proposed site consists of open cropland and pasture habitats interspersed with wooded bottomlands and forested patches, multiple limestone mining sites, lignite mining sites, and Lake Limestone to the south. Animal species that occur on the Limestone Site are those typically found in similar habitats in the Post Oak Savannah region of Texas.

STPNOC assumed that the proposed plant would use mostly existing transmission circuits and corridors to distribute power to the grid.. Any expansion of the transmission lines would require clearing and grubbing along the ROW.

Impacts to terrestrial resources at the Limestone site would be similar to those at the proposed STP site.

9.3.2.1.5 Aquatic Resources Including Protected Species

There are no known threatened or endangered species at the site or within the vicinity. Additionally, there are no known spawning grounds or critical habitat located within the vicinity of the site. (Future Gen 2006, Reference 9.3-16). However, state and federal agencies have expressed concern over fish species down stream from the dam. (TWDB2006, Reference 9.3-14). Water for closed loop cooling would likely come from Lake Limestone, a 12,553 acre impoundment reservoir located on the Navasota River. Short term impacts to aquatic resources in the lake would likely occur from construction of intake structures. Construction and operation of discharge and intake structures would also have an impact on lake and river aquatic resources.

Impacts to aquatic resources at the Limestone site would be similar to or greater than those at the proposed STP site.

9.3.2.1.6 Socioeconomics

The predicted socioeconomic impacts of construction at the Limestone site is summarized below:

- The population distribution near the site is low with typical rural characteristics. Some population increase with the construction and operation of the plant is possible, but it is likely that much of the work force will come from within the region. Impacts of increased population will be similar to those at the proposed STP site.
- Physical impacts as a result of construction and operation would be similar to those at the proposed STP site.
- Economic impacts of construction and operation would be similar to those described in Chapters 4 and 5. Wages and increased taxes will likely have a beneficial impact, and be similar to those at the proposed STP site.
- Impacts to transportation will be similar to those at the proposed STP site.
- Impacts on aesthetics and recreation will be similar to those at the proposed STP site. Construction of cooling towers may increase the aesthetic impact of the plant.
- Impacts on housing from the construction labor force are expected to be similar to those at the proposed STP site.
- Impacts to public services and educational systems is expected to be similar to those at the proposed STP site. Some local school districts may experience some pressure as a result of increased student population during plant construction and operation.

9.3.2.1.7 Historic and Cultural Resources

The site at Limestone is on undeveloped, but previously disturbed land. STPNOC conducted historical and archaeological records searches in and near the coal-fired unit at Limestone. A review of the National Register of Historical Places records revealed no registered places within 10 miles of the Limestone site. (Reference 9.3-17) Although there are some historic sites in the region, they would not be adversely affected by construction or operation at the site.

Impacts to historical and cultural resources at the Limestone site would be similar to those at the proposed STP site.

9.3.2.1.8 Environmental Justice

The 2000 Census block groups were used for ascertaining minority and low-income populations in the area. There are 195 block groups within a 50 mile radius of Limestone. The Census Bureau data for Texas characterizes 11.53 percent of the population as Black races; 0.57 percent American Indian or Alaskan Native; 2.7 percent Asian; 0.07 percent Native Hawaiian or other Pacific Islander; 11.69 percent all other races; 2.47 percent multi-racial; 29.03 percent aggregate of minority races; and 31.99 percent Hispanic ethnicity. If any block group minority percentage exceeded 50 percent, then the block group was identified as containing a minority population. If any block group percentage exceeded its corresponding state percentage by more than 20 percent, then the block group was identified as having minority population. One hundred sixteen minority populations exist in 195 block groups. The locations of the minority populations within the 50-mile radius of the Limestone site are shown in Figure 9.3-2.

The Census Bureau data characterize 13.98 percent of Texas households as low-income. Based on the “more than 20 percent” criterion, 18 block groups contain a low-income population. Both groups are unlikely to be disproportionately affected; most minority and low income population groups are located near the larger towns and urban areas.

Impacts on low-income and minority populations would be similar to those at the proposed STP site.

9.3.2.1.9 Conclusions

Impacts from the construction of a new nuclear plant at the Limestone Site would be similar to those at the proposed STP site. As a result, Limestone was not considered environmentally preferable to the proposed STP site. This site is an active industrial area, with infrastructure and transmission corridors available for construction or potential expansion. Terrestrial and aquatic impacts would be similar to or greater than those at the proposed STP site, while socioeconomic impacts would be similar.

9.3.2.2 Evaluation of the Allen’s Creek Site

The 11,000-acre Allen’s Creek site is owned by NRG Energy. The site is located in southwestern Austin County, just west of the Brazos River and about 45 miles west of Houston, about four miles northwest of Wallis, and seven miles south-southeast of Sealy, between State Highway 36 and the Brazos River floodplain. The terrain rolls gently with elevations that range from 98 to 146 feet above mean sea level (NRC 1973, Reference 9.3-18). The site is primarily agricultural, with approximately 87.5 percent of the 6 mile vicinity dedicated to farming.

Originally, the site had been set aside for a cooling lake and nuclear plant to be operated by Reliant Energy. The plant was cancelled. The City of Houston - within the Brazos River Authority - later acquired the land for the reservoir and proposed a water supply reservoir for the property. Currently the parties plan to build the reservoir between 2018 and 2030 to meet water needs for the Houston metropolitan area. Any surface water rights required for an operating plant would be purchased from the city and the Brazos River Authority.

9.3.2.2.1 Land Use Including Site and Transmission Line Rights-of-Way

In 1973, the majority of the Allen's Creek site was cleared of the native hardwood vegetation, and an extensive system of drainage ditches were constructed which allowed much of the area to be used to farm row crops. Major crops grown include corn, cotton, sorghum, hay, and improved pasture. Uncleared and partially cleared land was used to graze cattle (NRC 1973, Reference 9.3-18). Currently, the land is a greenfield site primarily in agricultural use.

Construction of the power plant and transmission lines would alter land use at the site from vacant to industrial use. After the sale of the reservoir site, NRG retained the area first planned for construction of the cancelled plant, as well as significant holdings around the proposed reservoir.

Based on preliminary transmission analysis performed by Siemens, two new 345-kilovolt transmission lines would be required. (Siemens 2007, Reference 9.3-9). New corridors would be required to connect these lines to ERCOT's system. As of April 2007 there were no existing 345-kilovolt transmission lines between the Allen's Creek Site. Although there could be some short-term loss of use during construction of the new corridors, it is expected that those impacts will not adversely affect land use in the area.

Therefore, the land use impacts of construction of a new nuclear plant at Allen's Creek would be greater than those at the proposed STP site.

9.3.2.2.2 Air Quality

The Allen's Creek site is located in the Metropolitan Houston-Galveston Intrastate Air Quality Control Region (AQCR) (40 CFR 81.38, Reference 9.3-11). Although the site is generally rural, much of the Houston metropolitan area lies within the 50 mile region. Before project construction activities could begin, the project would be required to obtain a preconstruction air permit from the TCEQ (TCAA 2007, Reference 9.3-12). The air permit would ensure both construction and operation emissions would conform to the Texas State Implementation Plan and would not challenge state efforts to achieve or maintain compliance with the NAAQS (TAC 2007, Reference 9.3-13).

It is anticipated that construction and operation impacts on air quality will be similar to those at the proposed STP site.

9.3.2.2.3 Hydrology, Water Use, and Water Quality

STPNOC assumes that the cooling water requirements would be similar to those described in Chapter 3 of this report.

The Allen's Creek site is located in Texas atop the Gulf Coast Aquifer in the southern portion of Austin County. The Gulf Coast Aquifer is a major aquifer that parallels the Gulf of Mexico coastline from the Louisiana border to the Mexican border. This aquifer covers 54 counties and consists of several aquifers, including the Jasper, Evangeline, and Chicot aquifers, which are composed of discontinuous sand, silt, clay, and gravel beds. The area of the aquifer is about 41,879 square miles (TWDB 2007, Reference 9.3-19). The predicted availability of the Carrizo-Wilcox Aquifer for year 2010 is about 1.8 million acre-feet per year, compared to a reported water use of about 1.1 million acre-feet per year (TWDB 2007, Reference 9.3-19).

Water for the proposed nuclear generating units would be provided by future development of the Allen's Creek Reservoir, described more thoroughly below. Based on current plans, reservoir construction would begin in year 2018 and be completed in year 2030. Construction of the Allen's Creek Reservoir is part of the comprehensive TWDB water strategy for the region, as outlined in their 2007 Water Report (TWDB 2007, Reference 9.3-19). Most of the water (70%) in the reservoir has been appropriated by the City of Houston. The Brazos River authority owns the remaining water, and rights to the necessary cooling water source could be acquired from either entity. If the plant was built before the reservoir was complete, ground water would be required. However, ground water models - as well as existing state laws - make ground water an uncertain source.

Impacts to hydrology, water use and water quality are expected to be similar to those at the proposed STP site.

9.3.2.2.4 Terrestrial Resources Including Protected Species

The Allen's Creek site is located approximately 45 miles west of the center of Houston, Texas, immediately west of the Brazos River. The proposed Houston/BRA reservoir will inundate about 9,500 acres. Much of the site is open cropland and pasture, but hardwood riparian areas and bluff forests exist along the Brazos River and Allen's Creek (Lovelace et al. 1995, Reference 9.3-20). Although much the Allen's Creek site has been disturbed for agriculture, the coastal prairie around the site exhibits wide expanses of open grassland fringed by stands of oak and elm. Animal species that occur near the Allen's Creek Site are those typically found in similar habitats in the Post Oak Savannah region of Texas. A small amount of forested land would be cleared for construction, resulting in the permanent loss of some habitat.

STPNOC is not aware of any known occurrences of federally listed threatened or endangered species on the Allen's Creek site (NRC 1978, Reference 9.3-21, Lovelace et al. 1995, Reference 9.3-20). Additionally, there are no known spawning areas or designated critical habitat on the site. There are some bald eagle nests in the vicinity, but they will not be adversely affected by construction of the plant.

As noted above, STPNOC assumed that two 345-kilovolt transmission lines would connect the proposed project to the ERCOT transmission system. Construction of transmission corridors may affect relict populations of some federally listed species, depending on the routes chosen for the new lines.

Impacts to terrestrial resources at the Allen's Creek site would be similar to or greater than those at the proposed STP site.

9.3.2.2.5 Aquatic Resources Including Endangered Species

In order to assess the impacts to aquatic resources, STPNOC assumed that the reservoir would be complete by the time construction on a new plant started. Generally, construction and operation of a nuclear power plant at the shore of Allen's Creek Reservoir is not expected to adversely affect aquatic species in the lake. The necessary intake and discharge structures could cause short-term adverse effects to the lake's aquatic environment. There are no known endangered species in this area of the Brazos/Allen's Creek watershed.

Impacts to aquatic resources at the Allen's Creek site would be similar to those at the proposed STP site.

9.3.2.2.6 Socioeconomics

STPNOC noted the following social and economic impacts as a result of constructing and operating the proposed project at the Allen's Creek site:

- The population distribution near the site is low with typical rural characteristics. Some population increase with the construction and operation of the plant is possible, but it is likely that much of the work force will come from the Houston area. Impacts of increased population will be similar to those at the proposed STP site.
- Physical impacts as a result of construction and operation would be similar to those at the proposed STP site.
- Economic impacts of construction and operation would be similar to those described in Chapters 4 and 5. Wages and increased taxes will likely have a beneficial impact, and be similar to those at the proposed STP site.
- Impacts to transportation will be similar to those at the proposed STP site.
- Impacts on aesthetics and recreation will be similar to or greater than those at the proposed STP site. Construction of cooling towers may increase the aesthetic impact of the plant, given that the area around the reservoir would be largely rural and recreational.

- Impacts on housing from the construction labor force are expected to be similar to those at the proposed STP site.
- Impacts to public services and educational systems is expected to be similar to those at the proposed STP site. Some local school districts may experience some pressure as a result of increased student population during plant construction and operation.

9.3.2.2.7 Historic and Cultural Resources

STPNOC is not aware of any historic or cultural resources at the Allen's Creek site. STPNOC conducted historical and archaeological records searches on the National Park Service's National Register Information System (NRHP) and reviewed information in the Allen's Creek Safety Analysis Report prepared in 1973. A search of the NRHP identified 54 sites in the 50 mile region surrounding the Allen's creek site. There are 7 sites in Austin County (4-42 miles from the site), which encompasses the Allen's Creek site. Two of these properties, the Allen's Creek Assuary Site and the Church of the Guardian Angel are in Willis, approximately 4 miles northwest of the Allen's Creek site. There are 5 sites in Colorado County (27 miles from the site), 31 sites in Wharton County (25 miles from the site), 5 sites in Fort Bend County (17-22 miles from the site), and 6 sites in Waller County (28 miles from the site). None have been located within the 6 mile vicinity. (Reference 9.3-17)

Impacts to historic and cultural resources at the Allen's Creek site would be similar to those at the proposed STP site.

9.3.2.2.8 Environmental Justice

The 2000 Census block groups were used for ascertaining minority and low-income populations in the area. There are 1,257 block groups within a 50 mile radius of Allen's Creek. The Census Bureau data for Texas characterizes 11.53 percent of the population as Black races; 0.57 percent American Indian or Alaskan Native; 2.7 percent Asian; 0.07 percent Native Hawaiian or other Pacific Islander; 11.69 percent all other races; 2.47 percent multi-racial; 29.03 percent aggregate of minority races; and 31.99 percent Hispanic ethnicity. If any block group minority percentage exceeded 50 percent, then the block group was identified as containing a minority population. If any block group percentage exceeded its corresponding state percentage by more than 20 percent, then the block group was identified as having minority population. One thousand two hundred fifteen minority populations exist in 1,257 block groups.

STPNOC evaluated whether the health or welfare of minority and low-income populations could be disproportionately affected by construction activities. STPNOC identified the most likely pathways by which adverse environmental impacts associated with construction could affect human populations. These pathways are land use, water use, ecological resources, physical impacts, socioeconomic resources, radiological releases, and meteorological effects from operation of cooling towers. However, most minority and low income populations are well outside potential site boundaries, and would not be disproportionately affected by a facility at Allen's Creek.

Impacts on low-income and minority populations would be similar to those at the proposed STP site, and would not disproportionately affect these populations.

9.3.2.2.9 Conclusions

Impacts from the construction of a new nuclear plant at the Allen's Creek site would be similar to or greater than those at the proposed STP site. As a result, Allen's Creek was not considered environmentally preferable to the proposed STP site. This site is an undeveloped site that is largely agricultural. Land use will change significantly. The site will be on the shores of a new reservoir that has been appropriated for drinking water by the city of Houston and the BRA. Terrestrial and aquatic impacts would be similar to or greater than those at the proposed STP site. STPNOC anticipates that the new plant will adversely affect the aesthetics of the largely rural area, given the fact that the agricultural area will be permanently changed to an industrial site.

9.3.2.3 Evaluation of the Malakoff Site

The 3,400 Malakoff site is located on western side of Henderson County near of the town of Malakoff. The Dallas-Fort Worth Metropolitan area is approximately fifty (50) miles to the Northwest. State Highway 31 spans an east-west path about a half mile north of the Malakoff site; Cedar Creek defines the western boundary of the site; and the rest of the site is bordered by the former Trinity Lignite Mine site. Vegetation in the region includes mixed hardwoods, a dense undergrowth of scrubs and vines, and grasses. Farms occupy about 56 percent of the land near the site.

9.3.2.3.1 Land Use Including Site and Transmission Line Rights-of-Way

In the early 1980s, HL&P began construction of a coal-fired generation plant at the Malakoff Site; however, the project was cancelled construction activities were discontinued. Today, based on GoogleEarth™ aerial photography, about half the site is wooded and half is cleared for agricultural use. No on-site structures are evident from the GoogleEarth™ aerial photographs (GoogleEarth 2007, Reference 9.3-22).

Construction of the 2,700 MWe nuclear generation plant would require between 650 and 2,700 acres of land for permanent structures and plant operations (NUREG 1437, Reference 9.3-4). Based on the size of the site, no additional land acquisitions would be necessary to construct the nuclear generation facility. However, a pipeline would be necessary to supply cooling water to the site from any one of several reservoirs in the region. Although the pipeline corridor may be installed underground, it is assumed that a 100 foot wide pipeline ROW could be built. Based on GoogleEarth™ aerial photography, effectively all the land along the potential corridors is currently farmland or woodlands (GoogleEarth 2007, Reference 9.3-22).

New transmission lines may be necessary. There are, however, existing 345-kilovolt transmission lines in the area; it is possible that these ROW may be expanded for some or all of the new transmission lines.

The land use impacts of construction of a new nuclear plant at the Malakoff site would be greater than those at the proposed STP site.

9.3.2.3.2 Air Quality

The Malakoff site is located in a designated attainment area for the purpose of Texas air regulations. Air quality impacts from construction and operation of the proposed project at Malakoff Site would be similar to those at the proposed STP site.

9.3.2.3.3 Hydrology, Water Use, and Water Quality

The Malakoff site is located atop the Carrizo-Wilcox Aquifer, a major aquifer supplying most of eastern Texas groundwater. Sixty-three percent (63%) of the aquifer, including groundwater under the Malakoff site is governed by a groundwater control district. (TWDB 2007, Reference 9.3-19) Across the entire Carrizo-Wilcox aquifer, the predicted availability of the Carrizo-Wilcox Aquifer for year 2010 is about one million acre-feet per year, compared to a reported water use of 450,000 acre-feet per year (TWDB 2007, Reference 9.3-19). The Aquifer has more than 251,852 acre-feet of availability in the eastern region, with significant potential for further development (TWDB 2006, Reference 9.3-14).

Surface water for the plant could be drawn from any number of reservoirs within a fifty (50) mile radius. For example, Lake Palestine is the second largest reservoir in the Neches Basin and is fed by the Neches River. However, the lake is more than 32 miles from the site. Cedar Lake is about 5 miles from the site. Although ample surface water may be available, construction of the nuclear generation units at the Malakoff Site would require modifications to the existing long-range water management plans for the region. Pipelines would also be required to provide cooling water to the plant.

Impacts to hydrology, water use and water quality at the Malakoff site would be similar to those at the proposed STP site.

9.3.2.3.4 Terrestrial Resources Including Protected Species

The plant site is located approximately fifty (50) miles southeast of Dallas, Texas, immediately east of the Trinity River, and is situated in southwestern Henderson County. The terrain at the site is relatively flat. Much of the site is open cropland and pasture, but some hardwood riparian areas exist along the Trinity River and Cedar Creek. The vegetation in the area surrounding this proposed site consists of mixed pine and hardwoods, including oak, elm, hackberry, and pecan. Along the Trinity River, the western border of the county, lie the bottomlands of the flood plain, where the vegetation features mixed hardwoods and a dense undergrowth of scrubs and vines typical of the East Texas mixed forests (HOT 2007, Reference 9.3-23). A large variety of wildlife and game animals inhabits these areas. Animal species that occur on the Malakoff Site are those typically found in similar habitats in the Post Oak Savannah region of Texas. Since some of the Malakoff Site is bottomland hardwoods, a small amount of forested land may be cleared for the construction of site facilities. Also, a make-up water intake line from the site to water sources would have to be constructed.

STPNOC is not aware of any known occurrences of federally listed threatened or endangered species on the Malakoff Site, although the site has not been surveyed specifically for these species. No known spawning grounds or critical habitat has been designated in the county. Table 9.3-5 indicates federally-listed plant and animal species recorded in neighboring counties. Bald eagles are not known to nest in Henderson County, but do “winter” there and in adjacent counties (TPWD 2007a, Reference 9.3-24).

Two 345-kilovolt transmission lines would be needed to connect the proposed project to the ERCOT transmission system. Land clearing associated with construction of plant facilities and transmission lines would be conducted according to Federal and state regulations, permit conditions, existing STP procedures, good construction practices, and established Best Management Practices (e.g., directed drainage ditches, silt fencing). While construction would cause some short term displacement of terrestrial species, it is expected that operation of a facility at this site will not adversely affect endangered species or habitat.

Impacts to terrestrial resources at the Malakoff site would be similar to or greater than those at the proposed STP site.

9.3.2.3.5 Aquatic Resources Including Endangered Species

The Malakoff site would be located near the city of Malakoff in Henderson County. Withdrawal water for the proposed plant a number of reservoirs or rivers adjacent to the site. No known threatened or endangered species have been noted at any of these sites.

Discharge from the facility would likely be to Walnut Creek. This creek is part of the Trinity River watershed. No known Federal or State Threatened or Endangered aquatic species occur in Henderson County (TPWD 2007c, Reference 9.3-25). The necessary intake and discharge structures could cause short-term adverse effects to the lake's aquatic environment.

Impacts to aquatic resources at the Malakoff site would be similar to those at the proposed STP site.

9.3.2.3.6 Socioeconomics

The social and economic impacts to the surrounding region as a result of constructing and operating the proposed project at the Malakoff site are summarized as follows.

- The population distribution near the site is low with typical rural characteristics. Some population increase with the construction and operation of the plant is possible, but it is likely that much of the work force will come from the Dallas-Fort Worth area. Impacts of increased population will be similar to those at the proposed STP site.
- Physical impacts as a result of construction and operation would be similar to those at the proposed STP site.
- Economic impacts of construction and operation would be similar to those described in Chapters 4 and 5. Wages and increased taxes will likely have a beneficial impact, and be similar to those at the proposed STP site.
- Impacts to transportation will be similar to those at the proposed STP site.
- Impacts on aesthetics and recreation will be similar to or greater than those at the proposed STP site. Construction of cooling towers may increase the aesthetic impact of the plant.
- Impacts on housing from the construction labor force are expected to be similar to those at the proposed STP site.
- Impacts to public services and educational systems is expected to be similar to those at the proposed STP site. Some local school districts may experience some pressure as a result of increased student population during plant construction and operation.

It is expected that socioeconomic impacts would be similar to those at the proposed STP site.

9.3.2.3.7 Historic and Cultural Resources

STPNOC conducted historical and archaeological records searches on the National Park Service's National Register Information System (NRHP) and reviewed information on historic and archaeological sites provided in documents associated with the canceled Malakoff coal-fired unit.

Several archaeological sites were identified at the Malakoff site during cultural resources surveys to support the cancelled coal-fired unit. The sites were evaluated for listing in the National Register, but none were eligible.

Impacts to historic and cultural resources at the Malakoff site would be similar to those at the proposed STP site.

9.3.2.3.8 Environmental Justice

The 2000 Census block groups were used for ascertaining minority and low-income populations in the area. There are 310 block groups within a 50 mile radius of Malakoff. The Census Bureau data for Texas characterizes 11.53 percent of the population as Black races; 0.57 percent American Indian or Alaskan Native; 2.7 percent Asian; 0.07 percent Native Hawaiian or other Pacific Islander; 11.69 percent all other races; 2.47 percent multi-racial; 29.03 percent aggregate of minority races; and 31.99 percent Hispanic ethnicity. If any block group minority percentage exceeded 50 percent, then the block group was identified as containing a minority population. If any block group percentage exceeded its corresponding state percentage by more than 20 percent, then the block group was identified as having minority population. One hundred twenty minority populations exist in 310 block groups.

Although some minority and low income populations occur in the vicinity of the Malakoff site, any adverse environmental effects from the plant will not disproportionately affect minority or low income populations.

Impacts to low-income and minority populations at the Malakoff site would be similar to those at the proposed STP site.

9.3.2.3.9 Conclusions

Impacts from the construction of a new nuclear plant at the Limestone Site would be similar to those at the proposed STP site. As a result, the Malakoff site was not considered environmentally preferable to the proposed STP site. This site was set aside for a planned power plant, and land was disturbed earlier by this development. Terrestrial and aquatic impacts would be similar to or greater than those at the proposed STP site.

9.3.2.4 STP: The Preferred Location

The proposed STP site is reviewed at length in this ER. This section summarizes the information for the purposes of comparison.

9.3.2.4.1 Land Use Including Site and Transmission Line Rights-of-Way

Land use in the area surrounding the proposed STP site is predominantly agricultural and rangeland. Industrial land use within the vicinity is limited to STP, the OXEA Corporation facility, and the Port of Bay City. There is also commercial fishing in the lower Colorado River, East and West Matagorda Bays, Intracoastal Waterway and the Gulf of Mexico. There are no federal, state, regional or county land-use plans for this area. Since there is no zoning in Matagorda County, no rezoning would be required for this project. There would be no new offsite transmission lines or corridors required to support the new units. All temporary and new permanent facilities associated with the construction of the proposed project will be located within the existing STP property boundary on land areas previously disturbed by construction.

9.3.2.4.2 Air Quality

Matagorda and Brazoria Counties are in attainment with all National Ambient Air Quality Standards except for ozone under the 8-hour standard. The region was classified as being in “moderate” non-attainment. Temporary and minor impacts to local ambient air quality could occur as a result of normal construction activities. Specific mitigation measures to control fugitive dust would be identified in the Construction Environmental Controls Plan, which implements TCEQ requirements and would be prepared before project construction. The Construction Environmental Controls Plan would also contain environmental management controls strategy to minimize emissions from construction activities and equipment.

9.3.2.4.3 Hydrology, Water Use, and Water Quality

Five active onsite wells currently provide makeup water, process water, potable water and supply for the fire protection system for STP 1 & 2. The wells extend into the Chicot Aquifer, range in depth from 600 to 700 feet, and have design yields of 200 to 500 gpm. These wells would provide potable water for the construction project as well. Daily groundwater usage during peak construction activities, including usage by STP 1 & 2 could push total annual groundwater usage above the current permitted limit. To mitigate this shortage of capacity, STPNOC would implement water conservation strategies for construction activities. In conjunction with surface water from the Colorado River, the wells would provide water for operation of STP 3 & 4 as well.

9.3.2.4.4 Terrestrial Ecology and Sensitive Species

Construction activities should not reduce local biodiversity or impact threatened and endangered species. Three listed species (bald eagle, brown pelican, and alligator) have been observed within the proposed STP site. The Texas Prairie Wetland Project is located several hundred yards from the proposed site, but given the distance from the construction site and the limited duration of the construction activities, the long-term presence of waterbirds on the site should not be impacted by construction. An active bald eagle nest is located on the proposed STP site near its eastern boundary. Although recently delisted under the Endangered Species Act, the bald eagle remains protected under the Bald and Golden Eagle Protection Act. National management guidelines for bald eagles recommend a protection zone to extend out 660 feet from each eagle nest. No activities related to construction will occur within one mile of the eagle nest. Approximately 800 acres of the construction-impacted areas will be available as

wildlife habitat when construction is complete, and relatively similar open habitats will remain on site and are present off-site.

9.3.2.4.5 Aquatic Ecology and Sensitive Species

The aquatic species that occur on site are ubiquitous, common, and easily located in nearby waters. No threatened, endangered or federally listed species are expected to be affected by the proposed construction. Most of the common fish species tend to be tolerant of salinity and temperature fluctuations and are ubiquitous in coastal wetlands along the Gulf Coast. The particular wetlands that would be impacted on site are not substantively distinguishable from other wetland acreage in the vicinity and potential impacts were considered acceptable because the species readily colonize available surface waters and would not be lost to the area.

Best management practices and good construction engineering practices will be used to avoid or minimize sedimentation. Some dredging will be required to prepare the existing barge slip for vessels transporting large components to the site but impacts would occur over a relatively brief period (one spawning season) and would not produce long-term or lasting impacts. The season of the year in which construction occurs would determine which specific resources may be affected. Because the area to be disturbed is small and in a protected near shore area that is already dedicated to intake functions, the overall impact on aquatic species is expected to be minimal and temporary.

9.3.2.4.6 Socioeconomics

The socioeconomic impacts of the proposed STP site are summarized as follows:

- The population distribution near the site is low with typical rural characteristics. Any population increases as a result of the plant construction or operation will have a minimal impact on the area.
- Physical impacts as a result of construction and operation would be minimal, since the site is part of an operating nuclear plant.
- Economic impacts of construction and operation are described in Chapters 4 and 5. These impacts are predicted to be beneficial due to an increase in taxed property, jobs, and housing construction.
- Impacts to transportation are described in Chapter 4 and 5, and are expected to be minimal.
- Impacts on aesthetics and recreation are described in Chapters 4 and 5. Any adverse impacts are expected to be minimal.
- Impacts on housing from the construction labor force and operations are described in Chapters 4 and 5. Any adverse impacts are expected to be minimal.
- Impacts to public services and educational systems are described in Chapters 4 and 5. It is expected that any adverse impacts to public services will be minimal.

9.3.2.4.7 Historic, Cultural, and Archaeological Resources

One historical property is located 8.9 miles from the project site, other significant cultural resources are between 6.0 and 9.2 miles away, and 35 archaeological sites are between 4.1 and 10 miles away. Construction activities would be conducted immediately adjacent to the current STP plant on ground that was evaluated for cultural resources in 1975. No changes to offsite corridors are anticipated and there would be no impacts due to construction on the transmission corridors. Therefore, it is unlikely that any historical properties or other significant cultural resources are within the area that would be impacted by construction. A letter dated January 19, 2007 was received from the Texas Historical Commission stating that no historic properties will be affected by the proposed construction and operation of STP 3 & 4.

9.3.2.4.8 Environmental Justice

Nineteen census block groups within the 50-mile radius have significant Black or African American populations. One block group has a significant Asian minority population and six block groups have significant "some other race" populations. Thirty census block groups within the 50-mile radius have significant Hispanic ethnicity populations. The closes of these groups is approximately 10 miles from the site. Except for increased rental housing rates during construction-related activities, no adverse impacts in Matagorda County would disproportionately affect minority or low-income populations.

9.3.3 Summary and Conclusions

Tables 9.3-1 shows the alternative sites and the STP 3 & 4 site compared against the candidate site criteria. In addition, other cost associated criteria were also used (see Table 9.3-2) to fully compare the environmental impacts of the sites.

Table 9.3-2 assesses impact predictions based on the detailed discussions in section 9.3.2. In determining the ultimate environmental impact of the proposed STP site when compared to the alternate sites, STPNOC used the impact categories outlined in NUREG 1437:

- **SMALL** Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
- **MODERATE** Environmental effects are sufficient to alter noticeably, but not to destabilize, any important attribute of the resource.
- **LARGE** Environmental effects are clearly noticeable and are sufficient to destabilize any important attributes of the resource

In summary, none of the alternative sites is “environmentally preferable” to the proposed site. STPNOC notes that the environmental impacts of the proposed plant on the alternative sites are greater than or equal to the impacts associated with construction and operation of the ABWR at the proposed STP site. Consequently, none of the alternative sites is obviously superior to the STP site.

9.3.4 References

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Table 9.3-1 Comparison of Alternative Sites Using General Candidate Criteria

Site	Consumptive Use of Water	No Further Species Endangerment	Effects on Spawning Grounds	Effluent Discharge/ Water Quality	No Preemption or Adverse Impacts to Land Use	Potential Effects on		Population Characteristics
						Aquatic and Terrestrial Ecology	Aquatic and Terrestrial Ecology	
Limestone	Minor consumptive use of ground and surface water	Occur in vicinity but not at the site	No record of spawning grounds at the site	Discharges anticipated to be within current regulatory limits	No preemption or additional land use	Effects to terrestrial resources expected to be similar to STP impacts; aquatic habitat may be affected	Effects to terrestrial resources expected to be similar to STP impacts; aquatic habitat may be affected	Meets 10 CFR 100
Allen's Creek	Minor consumptive use of groundwater; surface water requirements dependent on construction of Allen's Creek Reservoir	Occur in vicinity but not at the site	No record of spawning grounds at the site	Discharges anticipated to be within current regulatory limits	Construction would alter land from vacant to industrial	Construction of reservoir will affect aquatic habitat	Construction of reservoir will affect aquatic habitat	Meets 10 CFR 100
Malakoff	Surface water requirements would require modification to the existing long-range water management plans for the region	Occur in vicinity and counties that would contain new transmission lines, but not at the site	No record of spawning grounds at the site	Discharges anticipated to be within current regulatory limits	Construction would alter land from farmland and woodlands to industrial	Length of transmission corridors may impact terrestrial habitats	Length of transmission corridors may impact terrestrial habitats	Meets 10 CFR 100
STP	Impacts to groundwater during peak construction activities would warrant mitigation	Construction and operation would not adversely impact protected species.	No record of spawning grounds at the site	Discharges anticipated to be within current regulatory limits	No preemption or additional land use	Effects expected to be similar to STP impacts	Effects expected to be similar to STP impacts	Meets 10 CFR 100

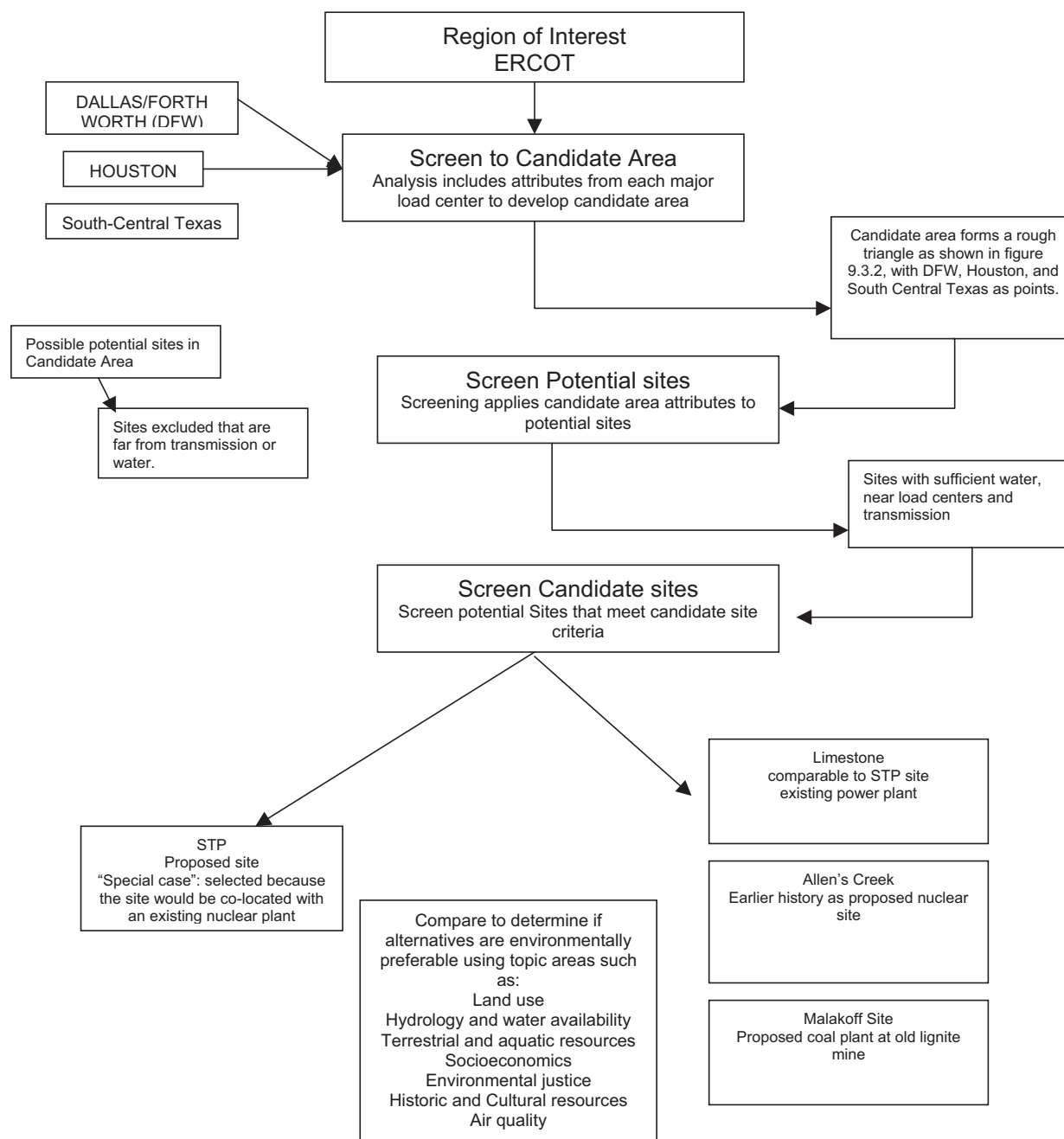
Table 9.3-2 Comparison of Candidate and Proposed Sites

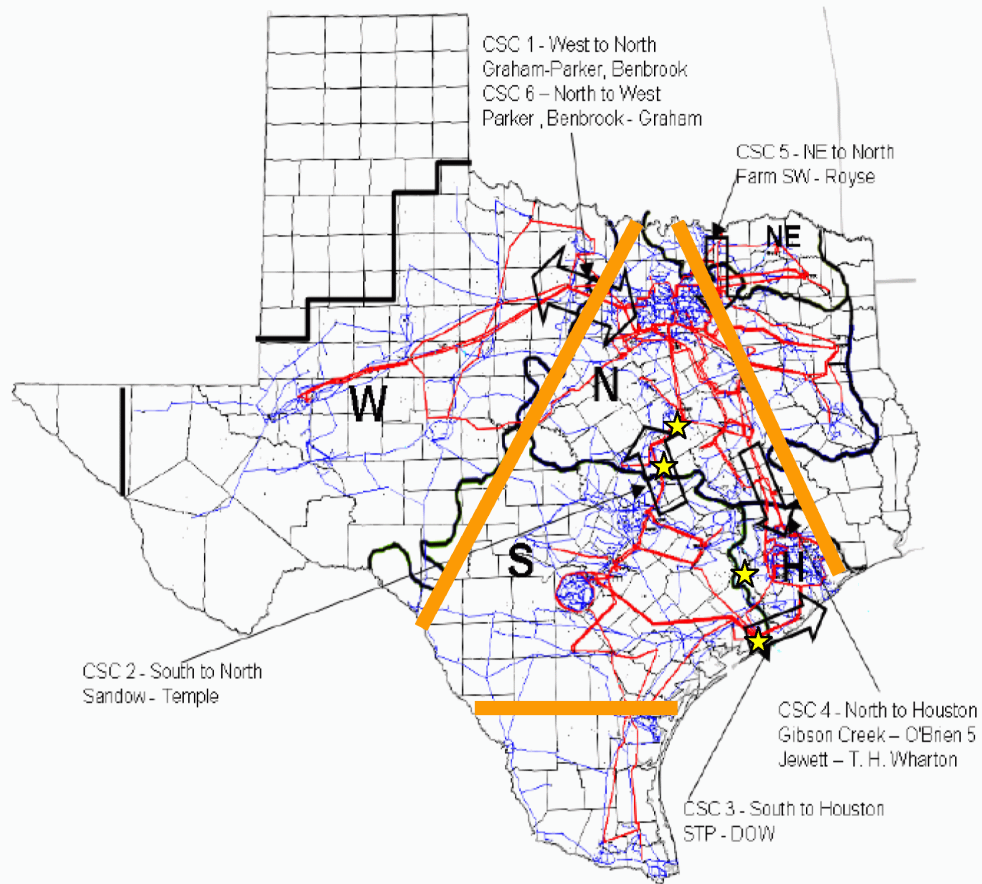
Topic Areas for Evaluation	STP	Limestone	Allen's Creek	Malakoff
Land use	SMALL Land use will not change	SMALL Land use will not change	SMALL TO MODERATE Land use will change from agricultural to industrial	SMALL Former industrial site; some loss of agricultural use, but expected to be minimal
Air Quality	SMALL Any construction and operation impacts will be mitigated	SMALL Any construction and operation impacts will be mitigated	SMALL Any construction and operation impacts will be mitigated	SMALL Any construction and operation impacts will be mitigated
Water	SMALL Any shortage during peak construction will be mitigated	SMALL Need for water will be minimized by using dry cooling technology	SMALL TO MODERATE Ground water an uncertain source - cooling water will be provided by future reservoir	SMALL Will require modifications to the region's existing long-range water management plan
Terrestrial Ecology	SMALL Listed and/or protected species present at site should not be impacted due to distance from construction site and limited duration of construction activities	SMALL Use of mostly existing transmission corridors will limit impact on sensitive species	SMALL Brevity of transmission corridor and low number sensitive species will limit impact on sensitive species.	SMALL No endangered species or habitat were identified or likely in the new transmission corridors.
Aquatic Ecology	SMALL No listed, threatened or endangered species expected to be affected. Area to be disturbed is small and in a protected near shore area already dedicated to intake functions.	SMALL TO MODERATE Water consumption for operation may affect the aquatic environment	SMALL Necessary intake and discharge structures may affect sensitive species	SMALL Necessary intake and discharge structures may affect sensitive species
Socioeconomics	SMALL TO MODERATE Impacts of construction workforce and increase in K-12 student population could have MODERATE adverse impacts in Matagorda County. However, increased taxes and jobs in the county may have a MODERATE beneficial impact.	SMALL Population increases from workforce not likely to result in adverse socioeconomic effects. Increased taxes may result in MODERATE beneficial impact..	SMALL TO MODERATE Impacts of construction workforce could have MODERATE impacts in Austin County. However, increased taxes and jobs in the county may have a MODERATE beneficial impact.	SMALL TO MODERATE Construction and operation on undeveloped site will likely result in complaints regarding diminution in enjoyment of physical environment. However, increased taxes and jobs in the county may have a MODERATE beneficial impact.
Historic, Cultural, and Archeological Resources	SMALL No historic or cultural resources at site.	SMALL No historic or cultural resources at site.	SMALL No historic or cultural resources at site.	SMALL Archaeological sites identified at site, but none eligible for federal listing.

Table 9.3-2 Comparison of Candidate and Proposed Sites (Continued)

Topic Areas for Evaluation	STP	Limestone	Allen's Creek	Malakoff
Environmental Justice	SMALL No adverse impacts will disproportionately affect minority populations	SMALL No adverse impacts will disproportionately affect minority populations	SMALL No adverse impacts will disproportionately affect minority populations	SMALL No adverse impacts will disproportionately affect minority populations
Transmission Corridors	SMALL No new offsite transmission lines required	SMALL TO MODERATE Requires two new transmission lines. Both can likely be installed within the existing 345 kilovolt transmission line ROWs. If new corridors are required, expected adverse impacts will be LARGE during construction, and SMALL during operation.	SMALL TO LARGE Estimated to require approximately 60 miles of corridor and a 200-foot ROW to connect to ERCOT grid-not expected to permanently affect agricultural areas or residents (due to low population density) Short term impacts of the new construction could be MODERATE to LARGE, depending on the location of the new corridors.	SMALL TO MODERATE New transmission could be built in the existing ROW, but the ROW may be need to be expanded for some or all new transmission lines If expansion is required the short term adverse effects may be MODERATE due to clearing and grubbing.
Transportation	SMALL TO MODERATE Impacts during peak construction could be SMALL to MODERATE because of congestion. Impacts during operation would be SMALL.	SMALL TO MODERATE Impacts during peak construction could be SMALL to MODERATE because of congestion. Impacts during operation would be SMALL.	SMALL TO MODERATE Impacts during peak construction could be SMALL to MODERATE because of congestion. Impacts during operation would be SMALL.	SMALL TO MODERATE Impacts during peak construction could be SMALL to MODERATE because of congestion. Impacts during operation would be SMALL.
Is the Site Environmentally Preferable?	Proposed site	Impacts are greater than or equal to proposed site	Impacts are greater than or equal to proposed site	Impacts are greater than or equal to proposed site

Figure 9.3-1 Alternative Site Process





Source: ERCOT congestion survey (2006)

Figure 9.3-2 Candidate Area with Alternative Sites