U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

NUREG-1437
Supplement 48

Generic Environmental Impact Statement for License Renewal of Nuclear Plants

Supplement 48

Regarding South Texas Project, Units 1 and 2

Draft Report for Comment

Office of Nuclear Reactor Regulation

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Any interested party may submit comments on this report for consideration by the NRC staff. Comments may be accompanied by additional relevant information or supporting data. Please specify the report number NUREG-1437, Supplement 48, in your comments, and send them by the end of the comment period specified in the *Federal Register* notice announcing the availability of this report.

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For any questions about the material in this report, please contact Tam Tran, NRC Environmental Project Manager, at 1-800-368-5642, extension 3617, or by e-mail at tam.tran@nrc.gov

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ABSTRACT

This supplemental environmental impact statement has been prepared in response to an application submitted by STP Nuclear Operating Company (STPNOC) to renew the operating licenses for South Texas Project (STP), Units 1 and 2, for an additional 20 years.

This supplemental environmental impact statement (SEIS) includes the preliminary analysis that evaluates the environmental impacts of the proposed action and alternatives to the proposed action. Alternatives considered include: new nuclear generation, natural gas-fired combined-cycle generation, supercritical coal-fired generation, combination alternative, purchased power, and not renewing the license (the no-action alternative).

The U.S. Nuclear Regulatory Commission's (NRC's) preliminary recommendation is that the adverse environmental impacts of license renewal for STP are not great enough to deny the option of license renewal for energy planning decisionmakers. This recommendation is based on the following:

- the analysis and findings in NUREG-1437, Volumes 1 and 2, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*;
- the Environmental Report submitted by STPNOC;
- consultation with Federal, state, local, and tribal government agencies;
- the NRC's environmental review; and
- consideration of public comments received during the scoping process.

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EXECUTIVE SUMMARY

BACKGROUND

By letter dated October 25, 2010, STP Nuclear Operating Company (STPNOC) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to issue renewed operating licenses for South Texas Project (STP), Units 1 and 2, for an additional 20-year period.

Pursuant to Title 10, Part 51.20(b)(2) of the *Code of Federal Regulations* (10 CFR 51.20(b)(2)), the renewal of a power reactor operating license requires preparation of an environmental impact statement (EIS) or a supplement to an existing EIS. In addition, 10 CFR 51.95(c) states that the NRC shall prepare an EIS, which is a supplement to the Commission's NUREG-1437, *Generic Environmental Impact Statement (GEIS) for License Renewal of Nuclear Plants* (GEIS).

Upon acceptance of STPNOC's application, the NRC staff began the environmental review process described in 10 CFR Part 51 by publishing a notice of intent to prepare a supplemental EIS (SEIS) and conduct scoping. In preparation of this SEIS for STP, the NRC staff performed the following:

- conducted public scoping meetings on March 2, 2011, in Bay City, Texas;
- conducted a site audit at the plant in July 2011;
- reviewed STPNOC's Environmental Report (ER) and compared it to the GEIS;
- consulted with other agencies;
- conducted a review of the issues following the guidance set forth in NUREG-1555, *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal*; and
- considered public comments received during the scoping process.

PROPOSED ACTION

STPNOC initiated the proposed Federal action—issuing renewed power reactor operating licenses—by submitting an application for license renewal of STP, for which the existing licenses (NPF-76 and NPF-80) for STP, Units 1 and 2, will expire on August 20, 2027, and December 15, 2028, respectively. The NRC's Federal action is the decision whether or not to renew the licenses for an additional 20 years.

PURPOSE AND NEED FOR ACTION

The purpose and need for the proposed action (issuance of a renewed license) is to provide an option that allows for power generation capability beyond the term of the current nuclear power plant operating license to meet future system generating needs. Such needs may be determined by other energy-planning decisionmakers, such as State, utility, and—where authorized—Federal (other than NRC). This definition of purpose and need reflects the NRC's recognition that, unless there are findings in the safety review required by the Atomic Energy Act or findings in the National Environmental Policy Act (NEPA) environmental analysis that would lead the NRC to reject a license renewal application, the NRC does not have a role in the energy-planning decisions of whether a particular nuclear power plant should continue to operate.

If the renewed license is issued, the appropriate energy-planning decisionmakers, along with STPNOC, will ultimately decide if the reactor units will continue to operate based on factors such as the need for power. If the operating licenses are not renewed, then the facility must be shut down on or before the expiration dates of the current operating licenses—August 20, 2027, and December 15, 2028.

ENVIRONMENTAL IMPACTS OF LICENSE RENEWAL

The SEIS evaluates the potential environmental impacts of the proposed action. The environmental impacts from the proposed action are designated as SMALL, MODERATE, or LARGE. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

- The environmental impacts associated with the issue is determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.
- A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts, except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal.
- Mitigation of adverse impacts associated with the issue is considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

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, important attributes of the resource.

LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

For Category 1 issues, no additional site-specific analysis is required in this SEIS unless new and significant information is identified. Chapter 4 of this report presents the process for identifying new and significant information. Site-specific issues (Category 2) are those that do not meet one or more of the criterion for Category 1 issues; therefore, an additional site-specific review for these non-generic issues is required, and the results are documented in the SEIS. The NRC staff has reviewed STPNOC's established process for identifying and evaluating the significance of any new and significant information on the environmental impacts of license renewal of STP. Neither STPNOC nor NRC identified information that is both new and significant related to Category 1 issues that would call into question the conclusions in the GEIS. This conclusion is supported by NRC's review of the applicant's ER, other documentation relevant to the applicant's activities, the public scoping process and substantive comments raised, and the findings from the environmental site audit conducted by the NRC staff. Further, the NRC staff did not identify any new issues applicable to STP that have a significant environmental impact. The NRC staff, therefore, relies upon the conclusions of the GEIS for all Category 1 issues applicable to STP.

Table ES–1 summarizes the Category 2 issues applicable to STP, if any, as well as the NRC staff's findings related to those issues. If the NRC staff determined that there were no Category 2 issues applicable for a particular resource area, the findings of the GEIS, as documented in Appendix B to Subpart A of 10 CFR Part 51, stand.

Table ES–1. NRC Conclusions Relating to Site-Specific Impacts of License Renewal

Resource Area	Relevant Category 2 Issues	Adverse Impacts
Land Use	None	SMALL
Air Quality	None	SMALL
Surface Water Resources	Surface water use conflicts	SMALL
Groundwater Resources	Groundwater use conflicts	SMALL
Aquatic Resources	Entrainment & impingement of fish & shellfish	SMALL
	Heat shock	SMALL
Terrestrial Resources	None	SMALL
Protected Species	Threatened or endangered species	SMALL
Human Health Issues	Electromagnetic fields—acute effects (electric shock vs. chronic effects)	SMALL to MODERATE
	Microbiological organisms	SMALL
Socioeconomics	Housing Impacts	SMALL
	Public services (public utilities)	SMALL
	Offsite land use	SMALL
	Public services (public transportation)	SMALL
	Historic & archaeological resources	SMALL

With respect to environmental justice, the NRC staff has determined that there would be no disproportionately high and adverse impacts to these populations from the continued operation of STP during the license renewal period. Additionally, the NRC staff has determined that no disproportionately high and adverse human health impacts would be expected in special pathway receptor populations in the region as a result of subsistence consumption of water, local food, fish, and wildlife.

SEVERE ACCIDENT MITIGATION ALTERNATIVES

Since STPNOC had not previously considered alternatives to reduce the likelihood or potential consequences of a variety of highly uncommon, but potentially serious, accidents at STP, 10 CFR 51.53(c)(3)(ii)(L) requires that STPNOC evaluate severe accident mitigation alternatives (SAMAs) in the course of the license renewal review. SAMAs are potential ways to reduce the risk or potential impacts of uncommon, but potentially severe accidents, and they may include changes to plant components, systems, procedures, and training.

The NRC staff reviewed the ER's evaluation of potential SAMAs. Based on the staff's review, the NRC staff concluded that none of the potentially cost beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of the license renewal, pursuant to 10 CFR Part 54.

ALTERNATIVES

The NRC staff considered the environmental impacts associated with alternatives to license renewal. These alternatives include other methods of power generation and not renewing the

STP operating licenses (the no-action alternative). Replacement power options considered were as follows:

- new nuclear generation,
- natural gas-fired combined-cycle generation,
- supercritical coal-fired generation,
- combination alternative, and
- purchased power.

The NRC staff initially considered many additional alternatives for analysis as alternatives to license renewal of STP; these were later dismissed due to technical, resource availability, or commercial limitations that currently exist and that the NRC staff believes are likely to continue to exist when the existing STP licenses expire. The no-action alternative by the NRC staff, and the effects it would have, were also considered. Where possible, the NRC staff evaluated potential environmental impacts for these alternatives located both at the STP site and at some other unspecified alternate location. Alternatives considered, but dismissed, were as follows:

- offsite nuclear-, gas-, and coal-fired capacity,
- energy conservation and energy efficiency,
- wind power,
- solar power,
- hydroelectric power,
- wave and ocean energy,
- geothermal power,
- municipal solid waste,
- biomass,
- biofuels,
- oil-fired power,
- fuel cells, and
- delayed retirement.

The NRC staff evaluated each alternative using the same impact areas that were used in evaluating impacts from license renewal.

RECOMMENDATION

The NRC's preliminary recommendation is that the adverse environmental impacts of license renewal for STP are not great enough to deny the option of license renewal for energy-planning decisionmakers. This recommendation is based on the following:

- analysis and findings in the GEIS,
- ER submitted by STPNOC,
- consultation with Federal, state, local, and tribal government agencies,

- the NRC staff’s own independent review, and
- consideration of public comments received during the scoping process.

ABBREVIATIONS AND ACRONYMS

AADT	average annual daily traffic
ABWR	advanced boiling-water reactor
ac	acre
ac-ft	acre-foot
ACHP	Advisory Council on Historic Preservation
ADAMS	Agencywide Documents Access and Management System
AEA	Atomic Energy Act of 1954
AEO	Annual Energy Outlook
AFW	auxiliary feedwater
ALARA	as low as is reasonably achievable
AMP	aging management program
AOC	averted offsite property damage costs
AOSC	averted onsite costs
APE	area of potential effect
AQCR	air quality control region
ASME	American Society of Mechanical Engineers
ATWS	anticipated transient without scram
BACT	best available control technology
BEG	Bureau of Economic Geology
BGS	below ground surface
BMP	best management practice
Bq/l	becquerels per liter
BTU	British thermal unit
C	Celsius
CAA	Clean Air Act
CAES	compressed air energy storage
CAPS	Missouri Census Data Center Circular Area Profiling System
CCW	component cooling water
CDF	core damage frequency
CDM	control drive mechanism

C_{eq}	carbon equivalent
CET	containment event tree
CFR	*U.S. Code of Federal Regulations*
cfs	cubic feet per second
CLB	current licensing basis
cm	centimeter
CO_2	carbon dioxide
COE	cost of enhancement
COL	combined license
Corps	U.S. Army Corps of Engineers
CPGCD	Coastal Plains Groundwater Conservation District
CWA	Clean Water Act
CWIS	cooling water intake structure
DBA	design-basis accident
dBA	decibel A-weighting
DG	diesel generator
DMR	discharge monitoring report
DOE	U.S. Department of Energy
DSEIS	draft supplemental environmental impact statement
DSHS	Department of State Health Services
DWS	drinking water standard
ECP	essential cooling pond
ECW	essential cooling water
ECWIS	essential cooling water intake structure
EFH	essential fish habitat
EIA	Energy Information Administration
EIS	environmental impact statement
ELF	extremely low frequency
EMF	electromagnetic field
EO	Executive Order
EOE	Encyclopedia of Earth
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act

EPRI	Electric Power Research Institute
EPZ	emergency planning zone
ER	Environmental Report
ERCOT	Electric Reliability Council of Texas
ESA	Endangered Species Act
ESRP	environmental standard review plan
F	Fahrenheit
F&O	facts and observations
FES	final environmental statement
FIP	Federal Implementation Plan
FM	Farm-to-Market
FR	*Federal Register*
FRN	*Federal Register* Notice
FSAR	final safety analysis report
FSEIS	final supplemental environmental impact statement
ft	foot
ft^3	cubic foot
ft/s	feet per second
FWS	U.S. Fish and Wildlife Service
g	gram
gal	gallon
GCBO	Gulf Coast Bird Observatory
GCC	global climate change
GE	General Electric
GEA	Geothermal Energy Association
GEIS	generic environmental impact statement
GHG	greenhouse gas
GIWW	Gulf Intercoastal Waterway
GL	generic letter
GMFMC	Gulf of Mexico Fishery Management Council
gpd	gallons per day
gpm	gallons per minute
GWMS	gaseous waste management system

ha	hectare
HAP	hazardous air pollutant
HARC	Houston Advanced Research Center
hr	hour
HVAC	heating, ventilation, and air conditioning
Hz	hertz
IAEA	International Atomic Energy Agency
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IES	Institute of Educational Sciences
IGCC	integrated gasification combined cycle
in.	inch
IPA	integrated plant assessment
IPCC	Intergovernmental Panel on Climate Change
IPE	individual plant examination
IPEEE	individual plant examination of external events
ISD	independent school district
ISEPA	Iowa Stored Energy Plant Agency
ISLOCA	interfacing system loss-of-coolant accident
kg	kilogram
km	kilometer
km^2	square kilometer
kV	kilovolt
kWh	kilowatt hour
L/min	liters per minute
lb	pound
LCRA	Lower Colorado River Authority
LCRWPG	Lower Colorado River Water Planning Group
LERF	large early release frequency
LLNL	Lawrence Livermore National Laboratory
LLW	low-level waste
LOCA	loss-of-coolant accident

LOOP	loss of offsite power
LRA	license renewal application
LWPS	liquid waste processing system
m	meter
m^3	cubic meter
m^3/s	cubic meters per second
mA	milliampere
MAAP	Modular Accident Analysis Program
MACCS2	MELCOR Accident Consequence Code System 2
MACR	maximum averted cost-risk
MBTA	Migratory Bird Treaty Act
MCR	main cooling reservoir
MDC	main drainage channel
mg/l	milligrams per liter
mgd	millions of gallons per day
mGy	milligray
mi	mile
min	minute
MIT	Massachusetts Institute of Technology
mm	millimeter
MMI	Modified Mercalli Intensity
MMS	U.S. Minerals Management Service
mo	month
mrad	millirad
mrem	millirem
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSL	mean sea level
mSv	millisievert
MT	metric ton
MW	megawatt
MWd	megawatt day
MWe	megawatt electric
MWt	megawatt thermal

NAAQS	National Ambient Air Quality Standards
NASS	National Agriculture Statistics Service
NCES	National Center for Education Statistics
NEA	Nuclear Energy Agency
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act
NESC	National Electrical Safety Code
NETL	National Energy Technology Laboratory
NGCC	natural gas-fired combined-cycle
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NMFS	National Marine Fisheries Service
NPCC	Northwest Power and Conservation Council
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NRCS	Natural Resources Conservation Service
NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NRR	Office of Nuclear Reactor Regulation
NWS	National Weather Service
OECD	Organization for Economic Co-operation and Development
OMB	Office of Management and Budget
OPSB	Ohio Power and Siting Board
PACR	potential averted cost-risk
pCi/L	picocuries per liter
PDP	positive displacement pump
PGA	peak ground acceleration
PM_{10}	particulate matter, ≤10 μm
$PM_{2.5}$	particulate matter, ≤2.5 μm
PNNL	Pacific Northwest National Laboratory
POST	Parliamentary Office of Science and Technology
PRA	probabilistic risk assessment
PSD	prevention of significant deterioration

PWR	pressurized-water reactor
RAI	request for additional information
RCB	reactor containment building
RCP	reactor coolant pump
RCRA	Resources Conservation and Recovery Act
RCS	reactor coolant system
rem	roentgen equivalent man
REMP	Radiological Environmental Monitoring Program
RG	regulatory guide
RMPF	reservoir makeup pumping facility
RMTS	risk managed technical specification
ROI	region of influence
ROW	right-of-way
RPC	replacement power costs
RRW	risk reduction worth
RTC	Report to Congress
SAMA	severe accident mitigation alternative
SAR	safety analysis report
SAWS	San Antonio Water System
SBDG	standby diesel generator
SCR	selective catalytic reduction
SEIS	supplemental environmental impact statement
SER	safety evaluation report
SG	steam generator
SGTR	steam generator tube rupture
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SNL	Sandia National Laboratory
SOARCA	State-of-the-Art Reactor Consequence Analysis
SPDES	State Pollutant Discharge Elimination System
SSC	system, structure, and component
SSE	safe shutdown earthquake
STP	South Texas Project

STPNOC	South Texas Project Nuclear Operating Company
Sv	sievert
SWPS	solid waste processing system
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TCPA	Texas Comptroller of Public Accounts
TDS	total dissolved solids
THC	Texas Historical Commission
TMMSN	Texas Marine Mammal Stranding Network
TPDES	Texas Pollutant Discharge Elimination System
TPWD	Texas Parks and Wildlife Department
tpy	tons per year
TS	technical specification
TSC	Technical Support Center
TSECO	Texas State Energy Conservation Office
TSHA	Texas State Historical Association
TSP	total suspended particles
TSWGW	Texas Saltwater and Fishing Guides Web
TWDB	Texas Water Development Board
USCB	U.S. Census Bureau
USGS	U.S. Geological Survey
VOC	volatile organic compound
WEG	Wild Earth Guardians
WMA	Wildlife Management Area
WOE	weight-of-evidence
WSEC	White Stallion Energy Center
yr	year

1.0 PURPOSE AND NEED FOR ACTION

Under the U.S. Nuclear Regulatory Commission's (NRC's) environmental protection regulations in Title 10, Part 51, of the *Code of Federal Regulations* (10 CFR 51)—which implement the National Environmental Policy Act (NEPA)—issuance of a new nuclear power plant operating license requires the preparation of an environmental impact statement (EIS).

The Atomic Energy Act of 1954 (AEA) specifies that licenses for commercial power reactors can be granted for up to 40 years. NRC regulations (10 CFR 54.31) allow for an option to renew a license for up to an additional 20 years. The initial 40-year licensing period was based on economic and antitrust considerations rather than on technical limitations of the nuclear facility.

The decision to seek a license renewal rests entirely with nuclear power facility owners and, typically, is based on the facility's economic viability and the investment necessary to continue to meet NRC safety and environmental requirements. The NRC makes the decision to grant or deny license renewal based on whether the applicant has demonstrated that the environmental and safety requirements in the agency's regulations can be met during the period of extended operation.

1.1 Proposed Federal Action

STP Nuclear Operating Company (STPNOC) initiated the proposed Federal action by submitting an application for license renewal of South Texas Project (STP), Units 1 and 2, for which the existing licenses (NPF-76 and NPF-80) expire on August 20, 2027, and December 15, 2028, respectively. The NRC's Federal proposed action is the decision whether to renew the licenses for an additional 20 years.

1.2 Purpose and Need for the Proposed Federal Action

The purpose and need for the proposed action (issuance of a renewed license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by other energy-planning decisionmakers. This definition of purpose and need reflects the NRC's recognition that, unless there are findings in the safety review required by the AEA or findings in the NEPA environmental analysis that would lead the NRC to reject a license renewal application (LRA), the NRC does not have a role in the energy-planning decisions of State regulators and utility officials as to whether a particular nuclear power plant should continue to operate.

If the renewed license is issued, State regulatory agencies and STPNOC will ultimately decide whether the plant will continue to operate based on factors such as the need for power or other matters within the State's jurisdiction or the purview of the owners. If the operating license is not renewed, then the facility must be shut down on or before the expiration dates of the current operating licenses—August 20, 2027, and December 15, 2028, respectively.

1.3 Major Environmental Review Milestones

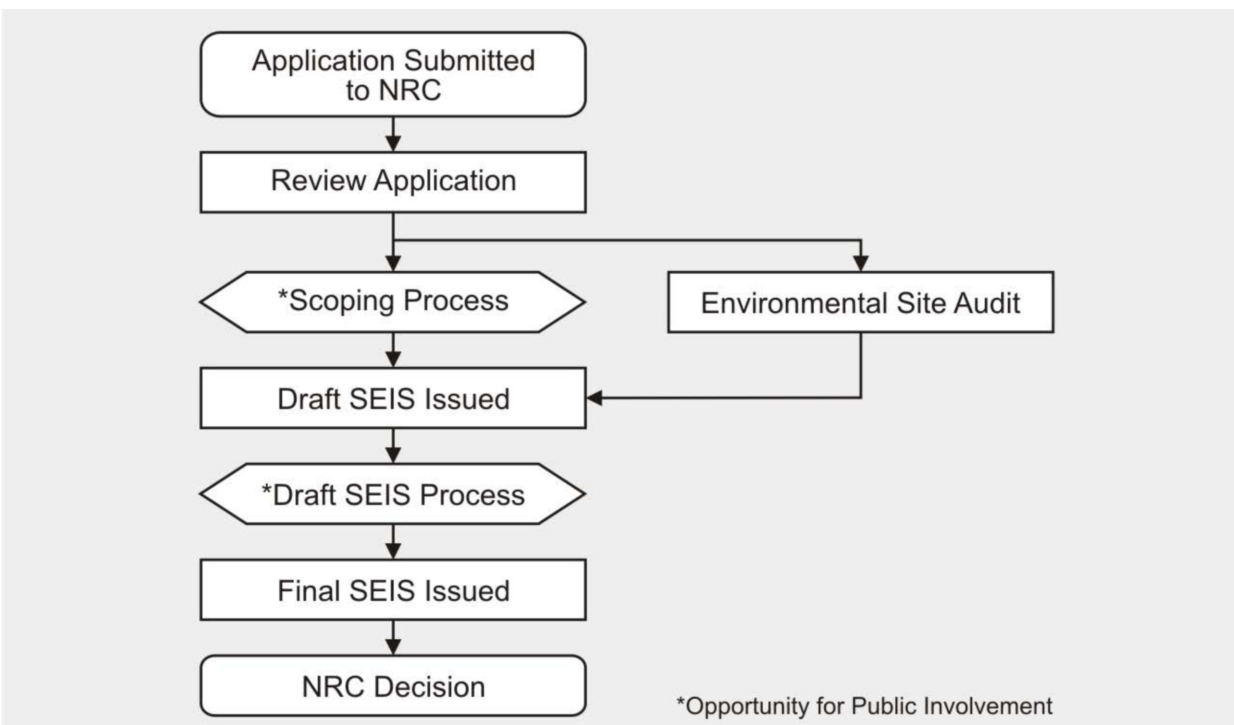
STPNOC submitted an Environmental Report (ER) (STPNOC 2010b) as part of its LRA (STPNOC 2010a) in October 2010. After reviewing the LRA and ER for sufficiency, the NRC staff published a *Federal Register* Notice of Acceptability and Opportunity for Hearing (76 FRN 2426) on January 13, 2011. Then, on January 31, 2011, the NRC published another notice in the *Federal Register* (76 FR 5410) on the intent to conduct scoping, thereby beginning the 60-day scoping period.

The NRC staff held two public scoping meetings on March 2, 2011, in Bay City, Texas. The comments received during the scoping process are presented in their entirety in “Environmental Impact Statement Scoping Process, Summary Report, South Texas Project, Units 1 and 2, Bay City,” published in 2012 (NRC 2012). The staff presents comments considered to be within the scope of the environmental license renewal review and the NRC responses in Appendix A of this supplemental environmental impact statement (SEIS).

In order to independently verify information provided in the ER, the NRC staff conducted a site audit at STP, Units 1 and 2, in July 2011. During the site audit, the staff met with plant personnel, reviewed specific documentation, toured the facility, and met with interested Federal, State, and local agencies. A summary of that site audit and the attendees is contained in the Audit Summary Report, published in August 2011 (NRC 2011).

Upon completion of the scoping period and site audit, the NRC staff compiled its findings in this draft SEIS (Figure 1–1). This document is made available for public comment for 45 days. During this time, the staff will host public meetings and collect public comments. Based on the information gathered, it will amend the draft SEIS findings, as necessary, and publish the final SEIS for license renewal.

Figure 1–1. Environmental Review Process



The NRC has established a license renewal review process that can be completed in a reasonable period with clear requirements to assure safe plant operation for up to an additional 20 years of plant life. The NRC staff conducts the safety review simultaneously with the environmental review. The staff documents the findings of the safety review in a safety evaluation report (SER). The findings in the SEIS and the SER are both factors in the NRC’s decision to either grant or deny the issuance of a renewed license.

1.4 Generic Environmental Impact Statement

The NRC staff performed a generic assessment of the environmental impacts associated with license renewal to improve the efficiency of its license renewal review. The *Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants* (GEIS), NUREG-1437 (NRC 1996, 1999), documented the results of the staff's systematic approach to evaluate the environmental consequences of renewing the licenses of individual nuclear power plants and operating them for an additional 20 years. The staff analyzed in detail and resolved those environmental issues that could be resolved generically in the GEIS.

The GEIS establishes 92 separate issues for the NRC staff to independently verify. Of these issues, the NRC staff determined that 69 are generic to all plants (Category 1) while 21 issues do not lend themselves to generic consideration (Category 2). Two other issues remain uncategorized (environmental justice and chronic effects of electromagnetic fields). The staff evaluated these issues on a site-specific basis (along with the Category 2 issues). Appendix B provides the list of all 92 issues.

For each potential environmental issue, in the GEIS, the NRC staff performs the following:

- describes the activity that affects the environment,
- identifies the population or resource that is affected,
- assesses the nature and magnitude of the impact on the affected population or resource,
- characterizes the significance of the effect for both beneficial and adverse effects,
- determines whether the results of the analysis apply to all plants, and
- considers whether additional mitigation measures would be warranted for impacts that would have the same significance level for all plants.

The NRC's standard of significance for impacts was established using the Council on Environmental Quality (CEQ) terminology for "significant." The NRC established three levels of significance for potential impacts—SMALL, MODERATE, and LARGE, as defined below.

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, important attributes of the resource.

LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

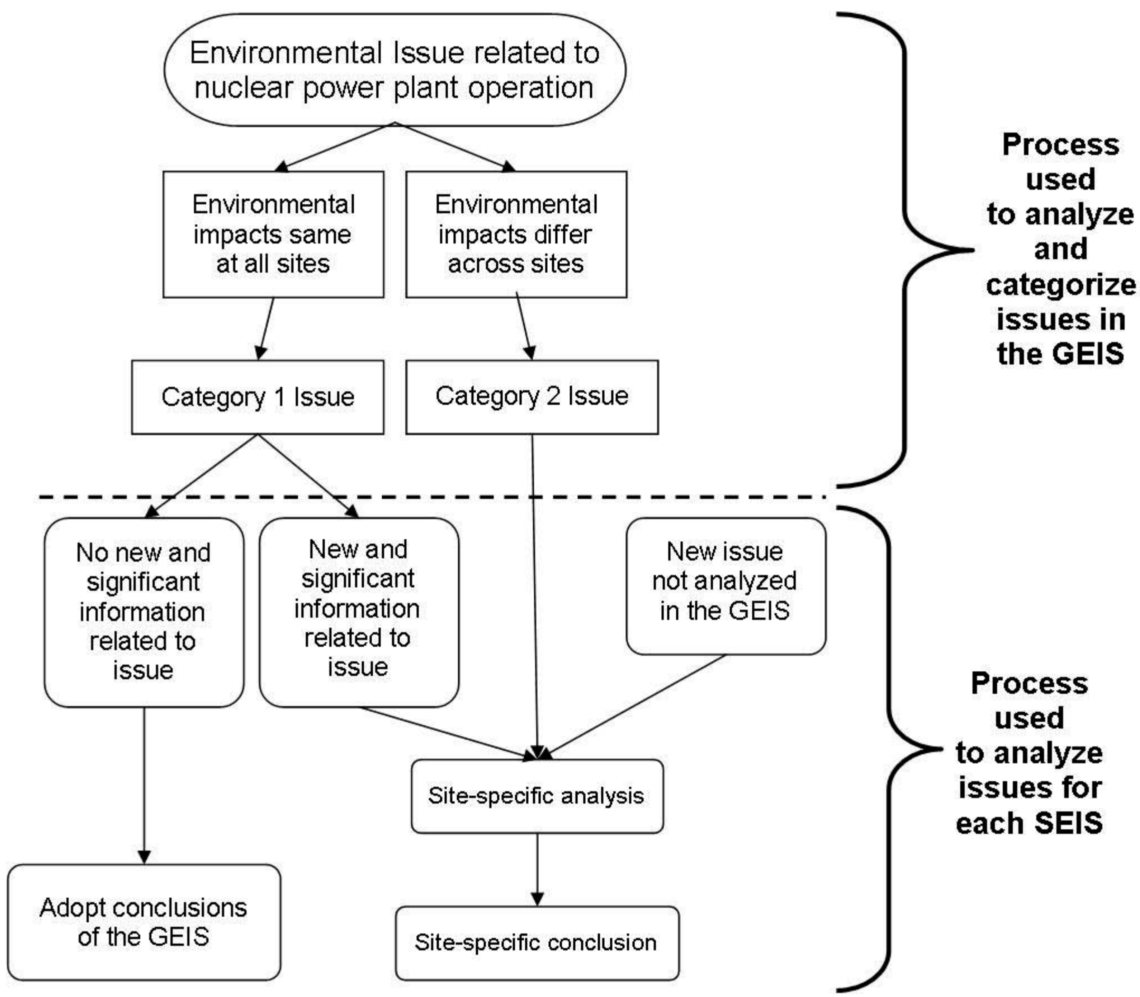
> **Significance** indicates the importance of likely environmental impacts and is determined by considering two variables: **context** and **intensity**.
>
> **Context** is the geographic, biophysical, and social context in which the effects will occur.
>
> **Intensity** refers to the severity of the impact, in whatever context it occurs.

The GEIS includes a determination of whether the analysis of the environmental issue could be applied to all plants and whether additional mitigation measures would be warranted (Figure 1–2). Issues are assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet the following criteria:

- The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.
- A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).
- Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

Figure 1–2. Environmental Issues Evaluated For License Renewal

In the GEIS, 92 issues were evaluated.
A site-specific analysis is required for 23 of those 92 issues



For generic issues (Category 1), no additional site-specific analysis is required in this SEIS unless new and significant information is identified. The process for identifying new and significant information is presented in Chapter 4. Site-specific issues (Category 2) are those that do not meet one or more of the criteria of Category 1 issues; therefore, additional site-specific review for these issues is required. The results of that site-specific review are documented in the SEIS.

In summary, the NRC staff evaluated 92 issues in the GEIS. Based on the findings of the GEIS, a site-specific analysis is required for 23 of those 92 issues and is addressed in the SEIS.

1.5 Supplemental Environmental Impact Statement

The SEIS presents an analysis that considers the environmental effects of the continued operation of STP, Units 1 and 2, alternatives to license renewal, and mitigation measures for minimizing adverse environmental impacts. Chapter 8 contains analysis and comparison of the potential environmental impacts from alternatives while Chapter 9 presents the preliminary recommendation to the NRC (the Commission) on whether or not the environmental impacts of license renewal are so great that preserving the option of license renewal would be unreasonable. The final recommendation will be made after consideration of comments received on this draft SEIS during the public comment period.

In the preparation of this SEIS for STP, Units 1 and 2, the NRC staff carried out the following activities:

- reviewed the information provided in the STPNOC's ER;
- consulted with other Federal, State, local agencies, and Tribal nations;
- conducted an independent review of the issues during site audit; and
- considered the public comments received for the review (during the scoping process and, subsequently, on this draft SEIS).

New information can be identified from many sources, including the applicant, the NRC, other agencies, or public comments. If a new issue is revealed, it is first analyzed to determine whether it is within the scope of the license renewal environmental evaluation. If the new issue is not addressed in the GEIS, the NRC staff would determine the significance of the issue and document the analysis in the SEIS.

> **New and significant information** either identifies a significant environmental issue that was not covered in the GEIS or was not considered in the analysis in the GEIS and leads to an impact finding that is different from the finding presented in the GEIS.

1.6 Cooperating Agencies

During the scoping process, no Federal, State, or local agencies were identified as cooperating agencies in the preparation of this SEIS.

1.7 Consultations

The Endangered Species Act of 1973, as amended; the Magnuson–Stevens Fisheries Management Act of 1996, as amended; and the National Historic Preservation Act of 1966 require that Federal agencies consult with applicable State and Federal agencies and groups prior to taking action that may affect endangered species, fisheries, or historic and archaeological resources, respectively. The NRC consulted with the following agencies and groups (Appendix D to this SEIS includes copies of consultation documents):

- Advisory Council on Historic Preservation (ACHP),
- National Marine Fisheries Service (NMFS),

- State Historic Preservation Office (SHPO),
- U.S. Fish and Wildlife Service (USFWS),
- Ysleta del Sur Pueblo,
- Alabama-Coushatta Tribe,
- Kiowa Tribe of Oklahoma,
- Comanche Nation,
- Tonkawa Tribe of Oklahoma,
- Apalachicola Creek,
- Lipan Apache Tribe of Texas,
- Lipan Apache Band of Texas,
- Tap Pulam-Coahuiltecan Nation,
- Kickapoo Traditional Council,
- Pamaque Clan of Coahuila Y Tejas, and
- Apalachicola Band of Creek Indians.

1.8 Correspondence

During the course of the environmental review, the NRC staff contacted Federal, State, regional, local, and Tribal agencies listed in Section 1.7. Appendix E contains a chronological list of all documents sent and received during the environmental review.

In addition, Chapter 11 provides a list of persons who requested and received a copy of this SEIS.

1.9 Status of Compliance

STPNOC is responsible for complying with all NRC regulations and other applicable Federal, State, and local requirements. Appendix H of the GEIS describes some of the major applicable Federal statutes.

There are numerous permits and licenses issued by Federal, State, and local authorities for activities at STP, Units 1 and 2. Appendix C contains further discussion by the staff about status of compliance. Regarding Coastal Zone Management Act (CZMA) compliance status, pursuant to Section 506.11(13) of Texas Administrative Code, STPNOC has obtained and maintained satisfactorily a consistency certification in accordance with the CZMA (Section 2.3 contains further discussion about CZMA compliance status for STP license renewal).

1.10 References

10 CFR 51. *Code of Federal Regulations*, Title 10, *Energy*, Part 51, “Environmental protection regulations for domestic licensing and related regulatory functions.”

10 CFR 54. *Code of Federal Regulations*, Title 10, *Energy*, Part 54, “Requirements for renewal of operating licenses for nuclear power plants.”

76 FR 2426. U.S. Nuclear Regulatory Commission. "Notice of Acceptance for Docketing of the Application and Notice of Opportunity for Hearing Regarding Renewal of Facility Operating License Numbers NPF–76 and NPF–80 for an Additional 20-Year Period, STP Nuclear Operating Company, South Texas Project, Units 1 and 2." *Federal Register*. Volume 76(9): 2426–2428. January 13, 2011.

76 FRN 5410. U.S. Nuclear Regulatory Commission. "STP Nuclear Operating Company; Notice of Intent To Prepare an Environmental Impact Statement and Conduct the Scoping Process for South Texas Project, Units 1 and 2." *Federal Register*. Volume 76(20): 5410–5411. January 31, 2011.

[AEA] Atomic Energy Act of 1954, as amended. 42 U.S.C. §2011, et seq.

Endangered Species Act of 1973, as amended. 16 U.S.C. §1531, et seq.

Magnuson–Stevens Fishery Conservation and Management Act, as amended. 16 U.S.C. §1801 et seq.

[NEPA] National Environmental Policy Act of 1969, as amended. 42 U.S.C. §4321, et seq.

National Historic Preservation Act of 1966. 16 U.S.C. §470, et seq.

[NRC] U.S. Nuclear Regulatory Commission. 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. Washington, DC: NRC. NUREG-1437. May 1996. ADAMS Nos. ML040690705 and ML040690738.

[NRC] U.S. Nuclear Regulatory Commission. 1999. Section 6.3, Transportation, Table 9.1, Summary of findings on NEPA issues for license renewal of nuclear power plants. In: *Generic Environmental Impact Statement for License Renewal of Nuclear Plants.* Washington, DC: NRC. NUREG-1437, Volume 1, Addendum 1. August 1999. ADAMS No. ML040690720.

[NRC] U.S. Nuclear Regulatory Commission. 2011. Summary of site audit related to the review of the license renewal application for South Texas Project, Units 1 and 2. August 4, 2011. ADAMS No. ML11196A005.

[NRC] U.S. Nuclear Regulatory Commission. 2012. Environmental Impact Statement Scoping Process, Summary Report, South Texas Project, Units 1 and 2, Bay City, TX. Washington, DC: NRC. 2012. ADAMS No. ML11153A082.

[STPNOC] South Texas Plant Nuclear Operating Company. 2010a. "South Texas Project, Units 1 and 2, Docket Nos. STN 50–498, STN 50–499, License Renewal Application." October 25, 2010. ADAMS No. ML103010257.

[STPNOC] South Texas Plant Nuclear Operating Company. 2010b. "South Texas Project, Applicant's Environmental Report—Operating License Renewal Stage, South Texas Project Units 1 & 2." September 2010. ADAMS No. ML103010263.

2.0 AFFECTED ENVIRONMENT

South Texas Project (STP) is located in Matagorda County, Texas, approximately 70 mi (110 km) south-southwest of Houston. The plant consists of two reactor units. Each nuclear reactor is a pressurized-water reactor (PWR) with steam generators producing steam that turns turbines to generate electricity. For purposes of the evaluation in this report, the “affected environment” is the environment that currently exists at and around STP. Because existing conditions are at least partially the result of past construction and operation at the plant, the impacts of these past and ongoing actions and how they have shaped the environment are presented here. The facility and its operation are described in Section 2.1, and the affected environment is presented in Section 2.2.

2.1 Facility Description

STP is a two-unit, nuclear-powered steam electric generating facility that began commercial operation in August 1988 (Unit 1) and June 1989 (Unit 2). The nuclear reactor for each unit is a Westinghouse PWR, producing a reactor core rated thermal power of 3,853 megawatts-thermal (MWt). The nominal net electrical capacity is 1,250 megawatts-electric (MWe). In this supplemental environmental impact statement (SEIS), the use of “STP” is referring to the site where the existing “STP, Units 1 and 2” are located. The use of “STPNOC” is referring to the applicant (STP Nuclear Operating Company) who submitted the license renewal application (LRA). The use of “STP, Units 1 and 2” is referring to the distinction between the existing reactor units and the proposed new reactor units, “STP, Units 3 and 4.”

2.1.1 Reactor and Containment Systems

The nuclear steam supply system at STP is a four-loop Westinghouse PWR. The reactor core heats water, which is pumped to four steam generators where the heat boils the water on the shell-side into steam that is routed to the turbines. The steam turns the turbines, which are connected to the electrical generator. The Units 1 and 2 steam generators were replaced in 2008 and 2009, respectively, with new Westinghouse steam generators.

The nuclear fuel is low-enriched uranium dioxide with enrichments less than 5 percent by weight uranium-235 and fuel burnup levels with a batch average of approximately 45,000 megawattdays (MWd) per metric ton uranium at discharge. Maximum burnup would not exceed 60,000 MWd per metric ton uranium. STP operates on an 18-month refueling cycle.

The reactor, steam generators, and related systems are enclosed in a containment building. The containment building is a post-tensioned, reinforced concrete cylinder with a slab base and a hemispherical dome. A welded steel liner is attached to the inside face of the concrete shell to ensure a high degree of leak tightness. In addition, the 4-ft (1.2-m)–thick concrete walls serve as a radiation shield.

2.1.2 Radioactive Waste Management

> By design, the operation of nuclear power plants is expected to result in small releases of radiological effluents (gaseous, liquid, and solid) through controlled processes. However, releases must meet stringent NRC and EPA regulatory limits.

STP uses liquid, gaseous, and solid waste processing systems to collect and treat, as needed, radioactive materials that are produced as by-products of plant operations. These materials are produced in the form of

(a) activation products resulting from irradiation of reactor water and impurities, principally metallic corrosive products, therein and (b) fission products resulting from their migration through the fuel cladding. Radioactive materials in liquid and gaseous effluents (controlled releases from STP) are reduced to levels that ensure compliance with NRC radiation protection regulations in Title 10, Part 20, of the *U.S. Code of Federal Regulations* (10 CFR Part 20), and they are as low as is reasonably achievable (ALARA), in accordance with Appendix I to 10 CFR Part 50.

Reactor fuel assemblies that have exhausted some of their fissile uranium content (related to the ability to sustain nuclear criticality chain reaction) are referred to as spent fuel (or used fuel). Spent fuel assemblies are removed from the reactor core and replaced by new fuel assemblies during routine refueling outages, typically every 18 months. The spent fuel assemblies are then stored in the spent fuel pool.

Systems used at STP to process radioactive liquid, gaseous, and solid wastes are described in the following sections.

2.1.2.1 Radioactive Gaseous Waste System

The objectives of the gaseous waste management system (GWMS) are to process and control the release of radioactive gaseous effluents into the environment to be within the requirements of 10 CFR Part 20 and to be consistent with the ALARA guidelines set forth in Appendix I to 10 CFR Part 50. The GWMS also removes fission product gases from the reactor coolant system and from equipment and piping (i.e., reduces the amount of radioactivity from the gases before they are released into the environment). The GWMS is designed so that radiation exposure to plant workers is within NRC dose limits in 10 CFR 20.1201 and ALARA.

The GWMS processes the waste gas to control and limit the amount of radioactive noble gas and iodine released into the environment. An inlet header water removal system removes water vapor and heat from the gas stream prior to processing the gas through charcoal beds. The charcoal beds are designed to delay the passage of the gases, which allows for radioactive decay of the noble gases and adsorption of radioiodine as the gas stream moves through the charcoal beds. At the end of the charcoal bed, the gas is filtered by high efficiency filters to remove charcoal dust. There is also a radiation monitor that measures the radioactivity in the waste gas and can automatically terminate the release in the event radioactivity exceeds predetermined levels.

The primary sources of radioactive gas in the plant are as follows:

- the turbine generator building process vents,
- the auxiliary feedwater pump turbine exhaust, which is vented directly to the atmosphere through the isolation valve cubicle process vent,
- the reactor containment building ventilation system,
- the mechanical auxiliary building,
- the fuel handling building ventilation system, and
- the reactor coolant gases.

2.1.2.2 Radioactive Liquid Waste System

The function of STPNOC's liquid waste processing system (LWPS) is to collect and process radioactive liquid wastes to reduce radioactivity and chemical concentrations to levels acceptable for discharge to the environment or to recycle the liquids for use in plant systems.

The principal objectives of the LWPS are to collect liquid wastes that may contain radioactive material and to maintain sufficient processing capability so that liquid waste may be discharged to the environment below the regulatory limits of 10 CFR Part 20 and consistent with the ALARA guidelines in Appendix I to 10 CFR Part 50.

Sources of liquid waste sent to the LWPS include floor drains, equipment drains, laundry and hot shower drains, and contaminated wastes from plant systems and components. Processing of the liquid waste is performed using several different methods including filtration, demineralization, evaporation, or a combination of the three methods.

Liquid releases from the plant are made in accordance with NRC radiation protection standards in 10 CFR Part 20 and the ALARA guidelines set forth in Appendix I to 10 CFR Part 50. The waste is routed through a monitor that measures the radioactivity and can automatically terminate the release in the event radioactivity exceeds predetermined levels. The liquid waste is discharged into the main cooling reservoir (MCR). The entire MCR is within the STP site boundary, and the public is prohibited from access to the MCR.

2.1.2.3 Radioactive Solid Waste Processing Systems

The solid waste processing system (SWPS) is designed to process, package, and store the solid radioactive wastes generated by plant operations until they are shipped off site to a vendor for further processing or for permanent disposal at a licensed burial facility or both. The SWPS is designed to meet the following objectives:

- to collect process, package, temporary store, and prepare the waste for shipment;
- to maintain radiation exposes to plant personnel within the dose limits of 10 CFR Part 20.1201 and ALARA;
- to package and transport the waste in compliance with NRC regulations 10 CFR Parts 61 and 71 and the U.S. Department of Transportation regulations 49 CFR Parts 170 through 179; and
- to stabilize wet waste using either an onsite or offsite system from a qualified vendor.

The permanently installed portion of the SWPS is located within the mechanical-electrical auxiliary building. Identical systems containing the following major subsystems are used for STP, Units 1 and 2:

- Concentrate storage tank and transfer subsystem—This subsystem includes a 5,000-gallon storage tank equipped with a mixer, heat tracing, and level controls to prevent overflows. The applicant states that this system is currently not in use.
- Spent resin transfer subsystem—This system is used to transfer spent resin filter media to a vendor-supplied processing system.
- Expended cartridge filter transfer subsystem—This system handles filter cartridges used to process radioactive liquid wastes. The system uses shielding and long-handled tools to safely handle the filters for insertion into a shielded cask that will be transported to a disposal facility.
- Overhead crane subsystem—This is a remotely operated 7 ½-ton overhead bridge crane with automatic grapples to move loaded containers from the

storage areas to the truck loading area and to stabilize wet waste using either an onsite or offsite system from a qualified vendor.

- Dry active waste area—This area is used to sort and package dry active waste. The waste is typically sent to an offsite vendor for volume reduction prior to disposal.
- Chemical addition subsystem—This subsystem provides chemical adjustment of liquids to maintain pH control for efficient processing.
- Vendor-supplied onsite subsystem—This subsystem consists of control panels used to control dewatering pumps, fill and dewatering heads, level controls, and monitoring instruments.

Radioactive waste is stored within plant buildings until it is shipped off site for further processing by a vendor or disposal or both. The storage areas have restricted access and shielding to reduce radiation rates to plant workers. The radioactive waste is divided into high activity and low activity storage areas. Separation of the high activity storage area from the building exterior by the low activity area provides for a reduction in radiation levels to plant workers in the truck loading area.

The Texas Low-Level Radioactive Waste Disposal Compact Facility, located in Andrews County, Texas, opened on November 10, 2011. The facility is licensed by the State of Texas to dispose of Class A, B, and C low-level waste (LLW). This LLW disposal facility is available to STP for the disposal of its LLW. With the availability of this disposal facility, the current LLW handling and storage facilities are expected to be adequate to handle LLW waste generated during the license renewal term.

In the event of an interruption in LLW disposal capability, STP has the ability to store its waste on site. STP has an onsite staging facility, located west of STP Unit 2. This facility can provide a staging area for the waste for up to 5 years of operation of both reactor units.

2.1.3 Nonradiological Waste Management

STP generates nonradioactive wastes as part of routine plant maintenance, cleaning activities, and plant operations. In general, Resources Conservation and Recovery Act (RCRA) waste regulations governing the disposal of solid and hazardous waste are contained in 40 CFR Parts 239 through 299. Specifically, 40 CFR Parts 239 through 259 contain regulations for solid (nonhazardous) waste, and 40 CFR Parts 260 through 279 contain regulations for hazardous waste. RCRA, Subtitle C, establishes a system for controlling hazardous waste from “cradle to grave,” and RCRA, Subtitle D, encourages states to develop comprehensive plans to manage nonhazardous solid waste and mandates minimum technological standards for municipal solid waste landfills. Texas State RCRA regulations are administered by the Texas Commission on Environmental Quality (TCEQ) and address the identification, generation, minimization, transportation, and final treatment, storage, or disposal of hazardous and nonhazardous waste.

2.1.3.1 Nonradioactive Waste Streams

STP generates solid waste, defined by the RCRA, as part of routine plant maintenance, cleaning activities, and plant operations. Texas administers the RCRA Program in Texas Administrative Code (TAC) 335.

EPA classifies certain nonradioactive wastes as hazardous based on characteristics including ignitability, corrosivity, reactivity, or toxicity (hazardous wastes are listed in 40 CFR Part 261). State-level regulators may add wastes to EPA’s list of hazardous wastes. RCRA supplies standards for the treatment, storage, and disposal of hazardous waste for hazardous waste generators (regulations are available in 40 CFR Part 262).

EPA recognizes the following main types of the hazardous waste generators (40 CFR 260.10) based on the quantity of the hazardous waste produced:

- large quantity generators that generate 2,200 lb (1,000 kg) per month or more of hazardous waste, more than 2.2 lb (1 kg) per month of acutely hazardous waste, or more than 220 lb (100 kg) per month of acute spill residue or soil;
- small quantity generators that generate more than 220 lb (100 kg) but less than 2,200 lb (1,000 kg) of hazardous waste per month; and
- conditionally exempt small quantity generators that generate 220 lb (100 kg) or less per month of hazardous waste, 2.2 lb (1 kg) or less per month of acutely hazardous waste, or less than 220 lb (100 kg) per month of acute spill residue or soil.

TCEQ recognizes STP as a small quantity generator of hazardous wastes under TAC 335. STP hazardous wastes include waste oil, grease, electrohydraulic fluid, adhesives, liquid paint, and solvent for fuel blending and thermal energy recovery. Used oil diesel fuels and used oil filters are sent to a recycling vendor for re-processing. Lead-acid batteries are returned, when possible, to the original manufacturer for recycling or are shipped to a registered battery recycler.

EPA classifies several hazardous wastes as universal wastes; these include batteries, pesticides, mercury-containing items, and fluorescent lamps. TCEQ has incorporated EPA's regulations (40 CFR Part 273) regarding universal wastes in TAC 335.261. Universal wastes produced by STP are disposed of or recycled in accordance with TCEQ regulations.

Conditions and limitations for wastewater discharge by STP are specified in Texas Pollution Discharge Elimination System (TPDES) Permit No. WQ0001908000. In 2009, STP applied for a renewal of this wastewater discharge permit and, at the writing of this supplemental environmental impact statement (SEIS), continues to work with TCEQ on its renewal. Radioactive liquid waste is addressed in Section 2.1.2 of this SEIS. Section 2.2.4 gives more information about STP TPDES permit and permitted discharges, including a discussion of the staff's request for information about the STP TPDES permit status.

The Emergency Planning and Community Right-to-Know Act (EPCRA) requires applicable facilities to supply information about hazardous and toxic chemicals to local emergency planning authorities and EPA (42 USC 11001). On October 17, 2008, EPA finalized several changes to the Emergency Planning (Section 302), Emergency Release Notification (Section 304), and Hazardous Chemical Reporting (Sections 311 and 312) regulations (63 FR 31268). STP is subject to Federal EPCRA reporting requirements; thus, STP submits an annual Section 312 (Tier II) report on hazardous substances to local emergency response agencies.

2.1.3.2 Pollution Prevention and Waste Minimization

The EPA encourages the use of environmental management systems (EMSs) for organizations to assess and manage the environmental impacts associated with their activities, products, and services in an efficient and cost-effective manner. The EPA defines an EMS as "a set of processes and practices that enable an organization to reduce its environmental impacts and increase its operating efficiency." EMSs help organizations fully integrate a wide-range of environmental initiatives, establish environmental goals, and create a continuous monitoring process to help meet those goals. The EPA Office of Solid Waste especially advocates the use of EMSs at RCRA-regulated facilities to improve environmental performance, compliance, and pollution prevention (EPA 2010a).

Related to the use of EMSs, STP has waste minimization measures in place currently, as verified during the STP site visit conducted by NRC in July 2011. In support of nonradiological waste-minimization efforts, EPA's Office of Prevention and Toxics has established a clearinghouse that supplies information about waste management and technical and operational approaches to pollution prevention (EPA 2010c). The EPA clearinghouse can be used as a source for additional opportunities for waste minimization and pollution prevention at STP, as appropriate.

2.1.4 Plant Operation and Maintenance

Maintenance activities conducted at STP include inspection, testing, and surveillance to maintain the current licensing basis (CLB) of the facility and to ensure compliance with environmental and safety requirements. Various programs and activities currently exist at STP to maintain, inspect, test, and monitor the performance of facility equipment. These maintenance activities include inspection requirements for reactor vessel materials, boiler and pressure vessel inservice inspection and testing, the Maintenance Structures Monitoring Program, and maintenance of water chemistry.

Additional programs include those carried out to meet technical specification (TS) surveillance requirements, those implemented in response to the NRC generic communications, and various periodic maintenance, testing, and inspection procedures. Certain program activities are carried out during the operation of the unit, while others are carried out during scheduled refueling outages. Nuclear power plants must periodically discontinue the production of electricity for refueling, periodic inservice inspection, and scheduled maintenance. STP operates on an 18-month refueling cycle.

2.1.5 Power Transmission System

Nine 345-kV lines were constructed specifically to connect STP to the regional power grid. These lines share transmission line corridors and are owned by four service providers: American Electric Power Texas Central Company, CenterPoint Energy, City of Austin, and CPS Energy. This section summarizes each line and discusses vegetative maintenance procedures. Below, the common name for each line appears first, followed by its Electric Reliability Council of Texas (ERCOT) name in parentheses. The discussion of the power transmission system is adapted from the ER (STPNOC 2010b), the COL application (STPNOC 2010d), STPNOC's October 2011 response to requests for additional information (STPNOC 2011f), or information gathered at NRC's July 2011 environmental site audit.

2.1.5.1 Transmission Line Descriptions

Velasco Line (DOW 18 and DOW 27). The Velasco Line is a 45-mi (72-km)–long, double-circuit line that extends east from the STP site to the Velasco substation in Brazoria County. Its corridor is 100 ft (30 m) wide. CenterPoint Energy owns and operates this line.

Blessing Line (Blessing 44). The Blessing line extends west and then north from the STP site for 15 mi (24 km) to its termination point at the Blessing substation in Matagorda County. Its corridor is 100 ft (30 m) wide. American Electric Power Texas Central Company owns and operates this line.

Hillje Line (Hillje 64). The Hillje line extends 20 mi (32 km) northwest from the STP site to the Hillje substation in Wharton County. Its corridor is 400 ft (120 m) wide and is shared with the remaining lines discussed in this section. For simplification, this corridor will be referred to as the Hillje corridor in this section. CenterPoint Energy owns and operates the Hillje Line.

Hillje W.A. Parrish Loop (WAP 39). The Hillje W.A. Parrish Loop is one of two 20-mi (32-km) connector lines that join the STP site to a pre-existing (and out of scope) transmission line, the W.A. Parrish-to-Lon Hill Line. The Hillje W.A. Parrish Loop travels along the Hillje corridor. CenterPoint Energy owns and operates this line.

Hillje Lon Hill Loop (White Point 39). The Hillje Lon Hill Loop is the second of two 20-mi (32-km) connector lines that join the STP site to a pre-existing (and out of scope) transmission line, the W.A. Parrish-to-Lon Hill Line. The line travels along the Hillje corridor, and CenterPoint Energy owns and operates this line.

Holman Line (Hillje 44). The Holman Line travels through the Hillje corridor and then extends northwest for an additional 75 mi (121 km) to the Holman substation in Fayette County. The total length of the line is 95 mi (153 km). Beyond the Hillje corridor, the corridor is 100 ft (30 m) wide. CenterPoint Energy owns and operates the portion of the line within the Hillje corridor, and the City of Austin owns and operates the remaining length of the line.

Skyline Line (Elm Creek 27). The Skyline Line travels through the Hillje corridor, extends west an additional 119 mi (192 km) to the Elm Creek substation in Guadalupe County, and then extends an additional 29 mi (47 km) to the Skyline substation in Bexar County. The total length of the line is 168 mi (271 km). Beyond the Hillje corridor, this line’s corridor is 100 ft (30 m) wide. CPS Energy owns and operates the full length of this line.

Hill Country Line (Elm Creek 18). The Hill Country line follows the same corridor path as the Skyline Line. However, the Hill County line extends an additional 12 mi (19 km) from the Skyline substation (where the Skyline Line terminates) to the Hill Country Substation in Bexar County. The total length of this line is 180 mi (290 km).

White Point Loop (White Point 39). The White Point Loop is a connector line that joins the STP site to the Lon Hill Line. This line is 10 mi (16 km) long and travels along a 100-ft (30-m) wide corridor. American Electric Power Texas Central Company owns and operates this line.

2.1.5.2 Transmission Line Maintenance

> A transmission line right-of-way (ROW) is a strip of land used to construct, operate, maintain, and repair transmission line facilities. The transmission line is usually centered in the ROW. The width of a ROW depends on the voltage of the line and the height of the structures. ROWs must typically be clear of tall-growing trees and structures that could interfere with a powerline.

American Electric Power Texas Central Company, CenterPoint Energy, City of Austin, and CPS Energy use an integrated vegetative management program that combines manual, mechanical, biological, and chemical control techniques to maintain proper clearance from transmission lines and structures. The degree and type of clearance varies by line voltage and the type, growth rate, and branching characteristics of trees and vegetation. The majority of the in-scope transmission lines traverse agricultural land and grasslands. Therefore, maintenance activities are minimal. Those areas that are not already cultivated or developed in some other way are maintained to promote herbaceous vegetation, which includes shrubs, bushes, and other low-growing groundcover.

2.1.6 Cooling and Auxiliary Water Systems

STP uses a cooling pond-based heat-dissipation system that withdraws and discharges cooling water to the MCR. STPNOC intermittently withdraws and discharges makeup water from the lower Colorado River to raise the water level and maintain water quality within the MCR. Unless otherwise cited, the NRC staff drew information about STPNOC's cooling and auxiliary water systems from the TPDES Permit (TCEQ 2005) and the applicant's ER (STPNOC 2010b).

Circulating Water System. Water is intermittently drawn from the lower Colorado River through the Reservoir Makeup Pumping Facility (RMPF) to the MCR. The RMPF is located on the west bank of the lower Colorado River and consists of four makeup pumps with a total current capacity of approximately 269,000 gallons per minute (gpm) (600 cubic feet per second (cfs) or 17 m^3/s). STPNOC intermittently draws water from the Colorado River to replace water lost in the MCR due to evaporation and seepage. This is depending on weather (patterns of rainfall in the river basin), water quality conditions in the MCR, Colorado River flows, operational considerations, and TPDES restrictions.

The RMPF withdraws water through a 406-ft (124-m) long intake structure located parallel to the shoreline. Water flows through a coarse trash rack with 4-in. (10-cm) openings and into traveling water screens (STPNOC 2010d). Each traveling screen is 10-ft (3-m) wide and has a mesh size of 3/8 in. (9.5 mm) (STPNOC 2010d, 2010e). A handling and bypass system on the traveling screens collects fish caught on the screens and returns them via a sluice downstream to the river (STPNOC 2010d). Water that passes through the traveling screens goes into a siltation basin, across a sharp-crested weir, and into the pumping station. The water is then pumped into the northeast corner of the MCR through two buried 108-in. (274-cm) diameter pipelines.

The MCR is a 7,000-ac (2,833-ha) engineered impoundment enclosed by a 12.4-mi (20-km) embankment that consists of a clay fill and is lined with a "soil-cement" to prevent erosion (located adjacent to and south of STP, Units 1 and 2; see Figure 2–1). At the maximum normal operating pool of 49 ft (15 m) above mean sea level (MSL), the reservoir contains approximately 202,700 ac-ft (250 million m^3) of water. The normal operating level is 47 ft (14.3 m) above MSL due to a procedural limit for a two-unit operation.

Water flows from the MCR to the main condensers as water is suctioned by four circulating water pumps located within the cooling water intake structure (CWIS). Water then passes to a common distribution header for the condensers for both units. In the condenser, the circulating water absorbs waste heat. Heated water is discharged to the MCR through a discharge structure. Each unit circulates 906,957 gpm (3,433 cfs or 97.2 m^3/s) for circulating water flow (STPNOC 2009a).

Dikes within the MCR slow the flow of cooling water from the circulating water system discharge structure to the CWIS. As the heated water circulates in the MCR, the heat is gradually dissipated to the environment through evaporation, conduction, and long-wave radiative cooling.

To maintain water chemistry and quality within the MCR, STPNOC discharges water from the MCR to the Colorado River. Discharge from the MCR enters the Colorado River along the west bank through a series of seven 36-in. (91-cm) pipes directed downstream at an angle of 45 degrees from the shore. The discharge structures are 2 mi (3 km) downstream of the RMPF.

The pipes entering the river are spaced 250 ft (76 m) apart. STPNOC's TPDES permit limits the daily discharge to 144 mgd (5.45 million m^3/d) and shall not exceed 12.5 percent of the flow of the Colorado River at the discharge point (TCEQ 2005). The TPDES permit also prohibits STPNOC from discharging wastewater when the Colorado River adjacent to the plant is less than 800 cfs (22.7 m^3/s). The Texas Administrative Code limits the daily average temperature to 95 °F (35 °C) and daily maximum temperature to 97 °F (36 °C) (STPNOC 2010b). STPNOC has discharged to the Colorado River once during the operation of STP in 1997 as part of a system test (STPNOC 2010b).

Auxiliary Cooling Water and Essential Cooling Water Systems. The MCR supplies the auxiliary cooling water system with cooling water for nonsafety-related systems. Water travels from the MCR to the auxiliary cooling water system through a separate bay in the MCR intake structure and then heated water discharges to the MCR. The design flow rate is 23,600 gpm (52.6 cfs or 1.5 m^3/s).

The essential cooling pond (ECP) supplies the essential cooling water system with cooling water for safety-related systems. The ECP is approximately 46 ac (19 ha). Three groundwater wells are the primary makeup to the ECP. The design flowrate is 19,280 gpm (43 cfs or 1.2 m^3/s). After going through the essential cooling water system, the water is discharged to the ECP, which is the ultimate heat sink. STPNOC discharges water from the ECP to the MCR to maintain water chemistry.

2.1.7 Facility Water Use and Quality

STP, Units 1 and 2, use water systems that include the circulating water systems (CWSs), the freshwater and service water systems, the potable and sanitary water systems, and the auxiliary cooling water and essential cooling water systems (ECWSs) (see Section 2.1.6). STP uses a cooling pond to reject waste heat from normal operations to the atmosphere. The 7,000-ac (2,830-ha) MCR is located adjacent to and south of STP, Units 1 and 2 (see Figure 2–1). The MCR has a spillway near its southeast corner for the discharge of excess water from the MCR to the Colorado River during heavy precipitation events. The MCR also has a buried discharge pipe that runs for 1.1 mi (1.8 km), adjacent to the spillway discharge channel, which ends at a seven-port outfall. This is STPNOC's combined outfall (001) under STPNOC's TPDES permit. This pipe allows for the discharge of blowdown (i.e., water high in dissolved solids) from the MCR to the Colorado River. The MCR spillway is seldom used, and the blowdown pipeline has only been used as part of a test in 1997. The MCR has a normal maximum operating level of 49 ft (15 m) above MSL for a four-unit operation, but it currently operates under a procedural limit of 47 ft (14 m) above MSL for a two-unit operation (STPNOC 2010b).

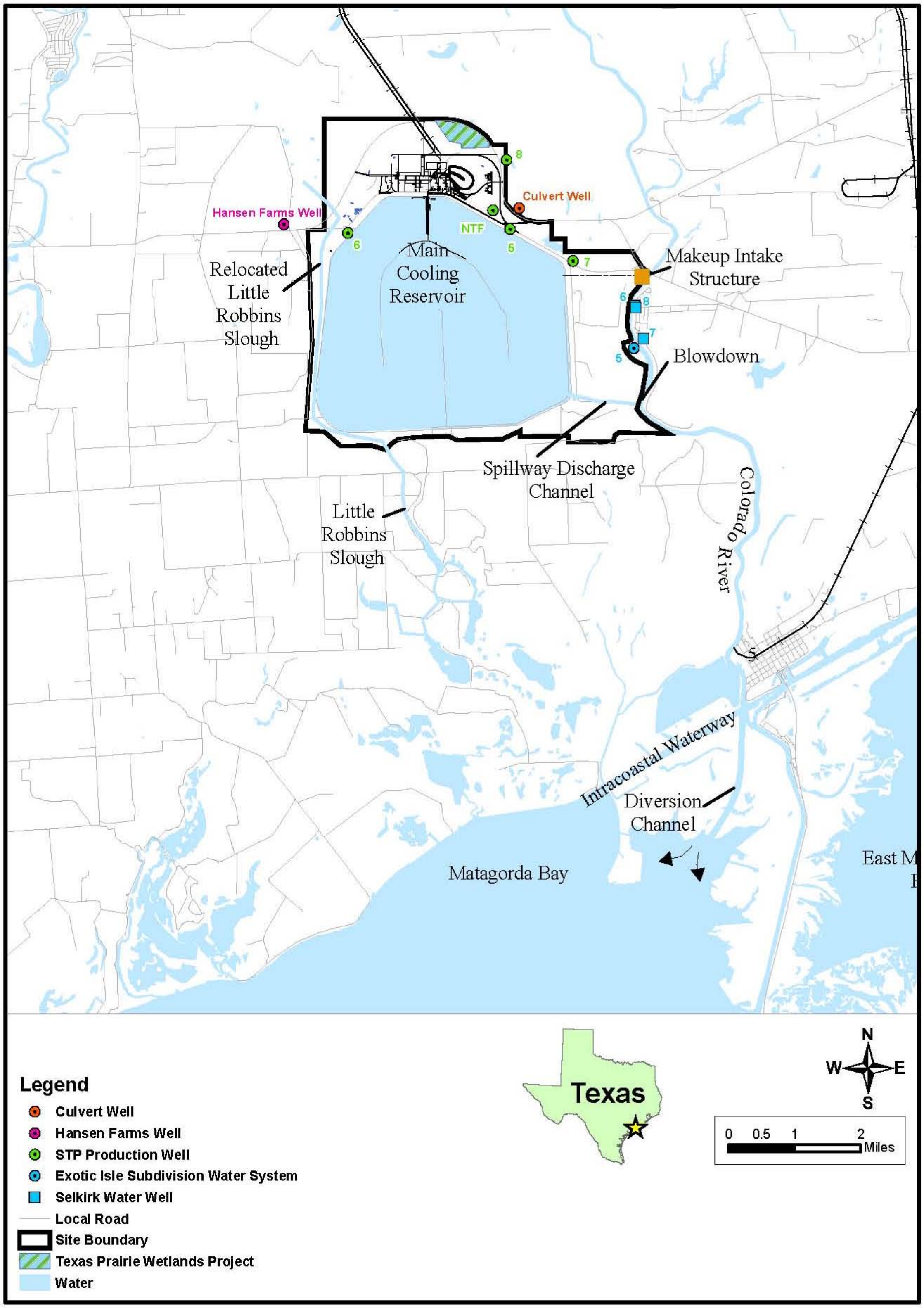
The RMPF diverts water from the Colorado River to the MCR to replenish water lost due to evaporation and seepage. The RMPF is located on the Colorado River to the east of the operating units and delivers water to the MCR through two buried 108-in. (274-cm) diameter makeup water lines. As currently configured (e.g., screens and pumps), the intake structure has a pumping capacity of 269,000 gpm (600 cfs or 17 m^3/s).

In addition to the water supply from the Colorado River, STPNOC maintains five groundwater supply wells at STP as the source for the freshwater and service water systems (including the demineralizer system), potable and sanitary water systems, the firewater storage tanks, the Nuclear Support Center cooling tower, and fire protection for the Nuclear Training Facility. Three of the five onsite wells provide water to the service system and the fire water storage tanks, and one well each supports the Nuclear Support Center cooling tower and the Nuclear Training Facility (STPNOC 2010b).

The auxiliary cooling water system draws cooling water for nonsafety-related systems from the MCR. Heated water from this system returns to the MCR. The design flow rate of this system is 23,600 gpm (53 cfs or 1.5 m^3/s). The essential cooling water system (ECWS) draws cooling water for safety-related systems from the ECP. Heated water from this system returns to the ECP. The design flow rate for this system is 19,280 gpm (43 cfs or 1.2 m^3/s). Makeup to the ECP is from one of the three groundwater wells providing service water and fire water storage. The ECP also is equipped with the capability to discharge blowdown to the MCR to maintain water chemistry (STPNOC 2010b).

A description of surface water resources at STP and vicinity is provided in Section 2.2.4, and a description of the groundwater resources is presented in Section 2.2.5. The following sections further describe the water use from these resources.

1 **Figure 2–1. Surface Water Bodies and Groundwater Wells in**
2 **Vicinity of STP (STPNOC 2011b)**



2.1.7.1 Surface Water Use

Feedwater for the STP, Units 1 and 2, CWS is supplied by the MCR, with makeup water for the MCR diverted from the lower Colorado River using the RMPF, as previously described. The RMPF was designed to accommodate operations of four units at the STP site. Currently, the RMPF has 269,000 gpm (600 cfs or 17 m^3/s) of installed pumping capacity to support the operation of Units 1 and 2. The MCR also supplies water to the auxiliary cooling water systems, which provide cooling for nonsafety-related systems (STPNOC 2010b).

Through a Certificate of Adjudication issued by the Texas Water Commission, STPNOC has priority water rights through the lower Colorado River Authority to use 102,000 ac-ft/yr (126 million m^3/yr) of water from the lower Colorado River. STP can withdraw river water up to a maximum rate of 540,000 gpm (1,200 cfs or 34.4 m^3/s). However, STPNOC's diversions are limited to 55 percent of the flow of the lower Colorado River that is in excess of a 300-cfs (8.5-m^3/s) base flow at the diversion point. This is intended to protect freshwater inflows to Matagorda Bay during low flow conditions. The Certificate of Adjudication also provides rights for an additional 20,000 ac-ft (24.7 million m^3) of water for operation of STP, Units 1 and 2. Should sufficient water not be available from the lower Colorado River to maintain the MCR at or above an elevation of 27 ft (8.2 m) above MSL, stored water would be released by the lower Colorado River Authority from sources (i.e., Highland Lakes) upstream of Bay City Dam (STPNOC 2009b, 2010b).

To operate STP, Units 1 and 2, STPNOC diverted an average of 37,850 ac-ft (46.7 million m^3) of water per year from the Colorado River between 2003 and 2010. STPNOC's diversion during this period ranged from zero in 2003, due to low flow restrictions, to 72,464 ac-ft (89.4 million m^3) during 2009 (STPNOC 2010b, 2011b).

2.1.7.2 Groundwater Use

Groundwater is withdrawn at STP via five onsite wells to supply the freshwater and service water systems, potable and sanitary water systems, and fire protection storage tanks and to provide makeup water for the ECWS (see Section 2.1.7).

The five water-supply wells (see Figure 2–1) were installed during construction of STP, Units 1 and 2, and all are completed in the Deep Chicot Aquifer, as further described in Section 2.2.5. These wells range in depth below ground surface (BGS) from 600 to 700 ft (183 to 213 m) and have design capacities between 200 and 500 gpm (760 to 1,890 L/min) (NRC 2011b; STPNOC 2010b). STP holds a permit from the Coastal Plains Groundwater Conservation District to withdraw 9,000 ac-ft (11.1 million m^3) of groundwater over an approximately 3-year permit period (CPGCD 2011). This is a pumping rate of approximately 1,860 gpm (7,040 L/min) or 3,000 ac-ft/yr (3.7 million m^3/yr). Based on data from 2001 through 2010, STPNOC's total annual groundwater production ranged from 682 to 863 gpm (2,580 to 3,270 L/min) or 1,100 to 1,392 ac-ft/yr (1.4 to 1.7 million m^3/yr) and averaged 768 gpm (2,910 L/min) or 1,239 ac-ft/yr (1.5 million m^3/yr) (STPNOC 2010b, 2010d, 2011b).

2.2 Surrounding Environment

Sections 2.2.1 through 2.2.10 provide general descriptions of the environment near STP as background information. They also provide detailed descriptions, where needed, to support the analysis of potential environmental impacts of operation during the renewal term, as discussed in Sections 3 and 4.

2.2.1 Land Use

STP is located in Matagorda County, 8 mi (3.2 km) north-northwest of Matagorda and sits between Farm-to-Market Road (FM) 1095 to the west and the Colorado River to the east. The STP site is located on approximately 12,220 ac (4,945 ha). The operations area, consisting of the reactor buildings, support facilities, and transmission ROWs occupies approximately 65 ac (26 ha); the ECP, approximately 46 ac (19 ha); and the MCR, an additional 7,000 ac (2,833 ha). Another 1,700 ac (688 ha) is natural low land habitat. The rest of the site is mostly undeveloped land; a portion of which, east of the MCR, is leased for cattle grazing (STPNOC 2010b).

Onsite facilities include the two reactor and steam generator containment buildings, various buildings auxiliary to the reactors such as warehouses, a chemical storage building, switchyard, fuel handling buildings, radioactive waste building, training center, outdoor firing range, administrative buildings, and miscellaneous supporting buildings (STPNOC 2010b).

Nearby communities include Matagorda, approximately 8 mi (13 km) north-northwest; Palacios, 11 mi (18 km) north-northwest; and Bay City, 13 mi (21 km) southeast. The western bank of the Colorado River forms the eastern STP property boundary. A 13-acre (5-ha) park, developed by the lower Colorado River Authority (LCRA) and operated by Matagorda County, is located on FM 521 on the west side of the Colorado River. The Port of Bay City terminal is located approximately 5 mi (8 km) north-northeast of the STP site.

2.2.2 Air Quality and Meteorology

STP is located in Matagorda County, a coastal county located on the Gulf of Mexico in the southeastern portion of Texas. There are 10 climatic divisions of Texas, with Matagorda County falling into the Gulf Coastal Plain, primarily a combination of prairies and marshes. The climate for this region is classified as maritime subtropical, which is marked by relatively short, mild winters; long, hot summers; and mild springs and falls. The Azores high-pressure system is the source of maritime tropical air masses much of the year. During the winter months, occasional cold continental air masses displace the maritime air. The STP site is flat with no topographic features that would cause the local climate to deviate significantly from the regional climate. While tornadoes and floods are the primary weather hazards in the rest of the State, the Gulf Coastal Plain is most vulnerable to hurricanes.

The closest first-order National Weather Service (NWS) station representative of the STP site is Victoria, Texas, located about 53 mi (85.3 km) to the west of the site. The NWS station at Corpus Christi, Texas, about 100 mi (161.0 km) to the southwest, is also representative of the site due to its proximity to the coast. Summer climate extends from May through September, with the highest average temperatures occurring during July and August, which are 83.8 °F (28.8 °C) and 83.7 °F (28.7 °C), respectively. The winter climate extends from December through February, with the coldest weather occurring in January at 55.7 °F (13.2 °C) on average. The fall climate occurs in October and November, with average temperatures of 72.6 °F (22.6 °C) and 64.6 °F (18.1 °C) respectively. The spring climate at STP extends from March to April, with average temperatures of 65.4 °F (18.6 °C) and 70.2 °F (21.2 °C), respectively. The Gulf of Mexico can modify outbreaks of polar air masses such that temperatures below 32 °F (0 °C) may occur, on average, less than four times per year.

2.2.2.1 Air Quality

Matagorda County is within the Metropolitan Houston–Galveston Intrastate Air Quality Control Region (AQCR). Other counties in the region include Austin, Brazoria, Chambers, Colorado, Fort Bend, Galveston, Harris, Liberty, Montgomery, Walker, Waller, and Wharton Counties (40 CFR 81.38).

The EPA regulates six criteria pollutants under the National Ambient Air Quality Standards (NAAQS)—carbon monoxide, lead, nitrogen dioxide, ozone, sulfur dioxide, and particulate matter. Matagorda County is designated as unclassified or in attainment for all NAAQS criteria pollutants. However, the counties of Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller are classified as "[N]onattainment[/]Severe" (40 CFR 81.344) for the 8-hour ozone standard. These counties are located northeast or north-northeast of Matagorda County, with the closest being Brazoria County, located approximately 21 mi northeast of the STP site. All other counties in this AQCR are designated as unclassified or in attainment with respect to the NAAQS criteria pollutants.

STP has many stationary emission sources, such as standby emergency diesel generators, an auxiliary boiler to furnish steam for start-up when the nuclear steam supply is unavailable, and several petroleum fuel storage tanks. STP submits a report of air emissions to TCEQ annually. Actual total emissions from all sources at STP from 2004 to 2010 were 62.86 tons per year (tpy), 58.15 tpy, 56.24 tpy, 47.07 tpy, 60.68 tpy, 59.97 tpy, and 65.37 tpy, respectively. With the exception of volatile organic compounds (VOC), the highest emissions were reported in 2004, with 1.11 tpy of particulate matter, 12.41 tpy of carbon monoxide, 46.62 tpy of oxides of nitrogen, and 0.78 tons per year of sulfur dioxide. The highest VOC emissions were reported in 2009 and were 2.07 tpy. There are no plans for refurbishment of structures or components at the STP site for license renewal. Therefore, there are no changes to expected air emissions associated with license renewal (STPNOC 2010b, 2012a)

Mandatory Class I Federal Areas, where visibility is an important value, are listed in 40 CFR Part 81, Subpart D. There are no mandatory Class I Federal areas within 50 mi (81 km) of the STP site. The closest Class I area to STP is the Big Bend National Park located in west Texas, which is over 500 mi (805 km) west of the STP site. Due to the significant distance from the site and prevailing wind direction, no adverse impacts on Class I areas are anticipated from STP operation. Furthermore, there are no expected additional air emissions associated with license renewal (no new emission sources).

STP has had a Meteorological Monitoring Program on site since July 1973. The initial measurements were to provide the onsite meteorological information required for licensing of STP, Units 1 and 2. Measurements have continued in support of the existing STP, Units 1 and 2, operations. The primary meteorological tower is approximately 1.5 mi (2.4 km) to the east of STP, Units 1 and 2. Its instruments include wind speed and direction and temperature sensors at 10 m (33 ft) and 60 m (197 ft) above ground, dew point temperature at 10 m (33 ft) above ground, and precipitation and solar radiation near ground level. A 10 m (33 ft) backup meteorological tower is located about 0.4 mi (0.6 km) south of the primary tower. Instrumentation on the backup tower consists of wind speed and direction and temperature at 10 m (33 ft).

2.2.2.2 Meteorology

Wind at the STP site is consistent with the dominant influence of the Azores high-pressure system and the coastal location of the site. Seasonal variation of the prevailing directions shows a predominance of southeasterly winds except in January, July, and August, when south winds prevail, and November and December, when northerly winds prevail. The coastal location of the site leads to typical onshore (southeast) winds during the day and offshore winds at night.

Precipitation at the STP site ranges from about 2 in. (5.1 cm) per month in February, peaking to about 4 to 5 in. (10.2 to 12.7 cm) per month in May and June and again in September and October. Snow occurs during more than 50 percent of the winters, but snowfall is generally limited to trace amounts. STP can experience severe weather in the form of thunderstorms, tornadoes, and tropical storms. Thunderstorms are the most frequent severe weather events. They occur on an average of about 55 days per year at the Victoria NWS station and about 31 days per year at Corpus Christi NWS station. The majority of the thunderstorms occur from the months of May through September. It is likely that the frequency of thunderstorms at the STP site is closer to that of the Corpus Christi NWS station than the Victoria NWS station due to Corpus Christi's proximity to the coastline. Tropical cyclones, including hurricanes and tropical storms, pass near the STP site an average of about once every other year, and an average of about two to three hurricanes pass near the site every 10 years. Nine hurricanes have made landfall between Corpus Christi and Galveston since 1950, the most recent being hurricanes Humberto in 2007 and Ike in 2008. Tornadoes are the least frequent of these extreme weather events.

2.2.3 Geologic Environment

This section describes the current geologic environment of the STP site and vicinity including landforms, geology, soils, and seismic setting.

Physiography. STP is located within the Coastal Prairies portion of the Texas Gulf Coastal Plains physiographic province. The Coastal Prairies subprovince is a broad band paralleling the Texas Gulf coasts (BEG 1996). The topography in the immediate vicinity of the site is characterized by a relatively flat coastal plain with elevations generally ranging from 20 to 30 ft (6 to 9 m) above MSL, with an average elevation of 23 ft (7 m) above MSL across STP (NRC 2011b; STPNOC 2009a).

One unique topographic feature in the region is the presence of "pimple mounds," which can be seen throughout the Texas coastal area. These round or elliptical features are typically about 2 ft (0.6 m) high and 50 ft (15 m) or less in diameter. They are most frequently associated with low-lying, poorly drained areas or bodies of water. These mounds are not restricted to a specific soil series or type, but they occur on many different types of soils with various moisture contents and have no connection to deeper sediments. Although many theories have been proposed for their origin, their structure indicates that they result from normal sedimentary deposition in calm water environments (STPNOC 2009a).

Geology. STP sits on the Beaumont depositional plain, one of several such surfaces trending northeast-southwest along the Texas Gulf coasts that formed during the Pleistocene Age (i.e., between approximately 12,000 and 2.6 million years ago), due to changes in sea level associated with coastal subsidence and inland geologic uplift. This plain reflects the uppermost surface of a sequence of Quaternary Age sediments approximately 3,000 ft (910 m) thick that were deposited by ancient river systems and in deltas. Test borings indicate such sediments are present to a depth of at least 2,619 ft (798 m) beneath the site with ages of no more than 700,000 years. Nevertheless, there has been little modification of this depositional plain since the uppermost Beaumont Formation was deposited approximately 70,000 years ago. Today, this plain is crossed by the very shallow but relatively wide (4 mi or 6.6 km) Colorado River valley, which the river has meandered back and forth across over time (STPNOC 2009a).

The uppermost geologic unit across and underlying the STP site is the Beaumont Formation, which is estimated to extend to a depth of 1,400 ft (430 m). The top 125 ft (38 m) of this unit is comprised of silt, sandy silt, and fine- to medium-grained sand, interbedded with clay. Clay predominates below 125 ft (38 m). Lenses of moderately dense to very dense reddish-brown to gray silty sand are found in the clay layers. Along the eastern boundary of the site, Holocene (recent) Age alluvial age sediments, which range up to 50 ft (15 m) thick, overlie the Beaumont Formation. In addition, Holocene sand, silt, and clay deposits are found in the Colorado River meander belt and floodplain east of the plant site. While finer sediments (silt, clay) were generally deposited in low areas, sand was deposited as point bars or sheet deposits during flood stages (STPNOC 2009a).

No geologic (tectonic) faults capable of producing earthquakes have been identified in the STP region, and no unstable subsurface materials or conditions (e.g., salt domes) have been identified at the plant site. The closest tectonic faults are located approximately 85 mi (140 km) northwest of the STP site in association with the Ouachita geologic province. Many "growth" faults have been mapped at depth in the STP site area and extensively studied through geophysical data. Common across the Texas Gulf coasts, these features are thought to arise from gravity-related processes associated with the consolidation, slumping, and creeping of sediments during and after being deposited. At STP, nearly all of these features are confined to strata at depths of at least 5,000 ft (1,520 m) BGS in Oligocene age strata comprised of the massive marine shales of the Anahuac Formation. This indicates that the growth faults are at least as old as the strata in which they are found (i.e., as old as 26 million years) and further indicates that they are depositional and not tectonic in nature (STPNOC 2009a).

Soils. Soil unit mapping by the National Resources Conservation Service (NRCS) identifies the natural soils across the STP main plant complex as Laewest clay, 0 to 1 percent slopes, with areas of Dacosta sandy clay loam, 0 to 1 percent slopes, to the east and north of the main plant complex. These units are deep (greater than 80 in. (200 cm)), moderately well drained soils, which developed from clayed clayey fluviomarine deposits. Both soils are prime farmland where otherwise not committed to developed uses (7 CFR 675.5). The soils have some limitations for site development due to shrink-swell from high expansive clay content and a slight erosion hazard (NRCS 2011).

Overall, the plant area excavation consisted of a large open-cut excavation covering the footprint of both units to a depth of approximately 40 ft (12 m) BGS. Excavations for the two reactor containment buildings (RCBs) extended deeper to nearly 70 ft (21 ft) BGS. These excavations penetrated the shallow aquifer zone (see Section 2.2.5 for details), requiring groundwater dewatering during construction. The excavated area was backfilled to the foundation elevations and to within 18 in. (46 cm) of surface grade with clean, well-graded, medium-to-coarse sand. The total amount of Category I structural backfill used for Units 1 and 2 was approximately 1.6 million tons (1.45 million MT) (STPNOC 2009a).

Seismic Setting. The central Texas Gulf coast is a region of very low historical seismicity and very low seismic risk (USGS 2011a). No earthquakes have been recorded within a radius of 62 mi (100 km) of STP. Within a radius of 124 mi (200 km), only seven earthquakes have been recorded. The closest event was a magnitude 2.7 event with an epicenter 70 mi (113 km) northwest of STP (USGS 2011b).

Site and regional studies across the Gulf coasts have concluded that the geologic strata in which the previously described growth faults are known to occur are not capable of storing strain energy sufficient to produce earthquakes larger than about magnitude 4.0 or shaking greater than Modified Mercalli Intensity (MMI) IV or both. Historically, earthquake activity in the region attributed to growth faulting has been of magnitude 1.5 or less (microseismic). Further, as reported in the applicant's updated final safety analysis report (FSAR), no earthquakes are known to have occurred or been felt at the STP site. Nevertheless, larger earthquakes have occurred along the Gulf coasts. The largest historical earthquake in the Gulf coasts region occurred in October 1930 near Donaldsonville, Louisiana, approximately 320 mi (515 km) east-northeast of the STP site. Although not recorded on instruments, its epicenter and effects were based on historical accounts. It is believed to have occurred in the upper basement rock rather than in the overlying strata and produced shaking of MMI of V to VI at its epicenter (STPNOC 2009a). USGS information provides an estimated magnitude of 4.2 with a conservative MMI of VI for this event (USGS 2011c). Nevertheless, the 1930 Donaldsonville earthquake was used as one of the bases to establish the safe shutdown earthquake (SSE) for STP where an earthquake producing shaking of MMI VI at the surface was assumed to occur in basement rock directly beneath the site. The maximum vibratory (peak) ground acceleration (PGA) associated with an MMI VI earthquake is about 0.07 g (i.e., force of acceleration relative to that of Earth's gravity, "g"). Nonetheless, because 0.07 g is below the minimum PGA value in 10 CFR Part 100, Appendix A, 0.10 g was adopted for the SSE (STPNOC 2009a).

For the purposes of comparing the SSE with a more contemporary measure of predicted earthquake ground motion for the site, the NRC staff also reviewed current PGA data from the U.S. Geological Survey (USGS) National Seismic Hazard Mapping Project. The PGA value cited is based on a 2 percent probability of exceedance in 50 years. This corresponds to an annual frequency (chance) of occurrence of about 1 in 2,500 or 4×10^{-4} per year. For STP, the calculated PGA is approximately 0.03 g (USGS 2008).

2.2.4 Surface Water Resources

The STP site is situated on the west bank of the lower Colorado River, approximately 13 mi (21 km) southwest of Bay City, Texas, and 10 mi (16 km) north of Matagorda Bay. The STP site is approximately 12,200 ac (4.940 ha) in size, the majority of which is occupied by the 7,000-ac (2,830-ha) MCR. This reservoir is formed by approximately 12.4 mi (20 km) of embankment consisting of clay fill that is constructed above natural ground elevation. The MCR also has 7 mi (11 km) of internal baffles (raised berms) to enhance the circulation of cooling water (STPNOC 2010b).

As described in Sections 2.1.6 and 2.1.7, the MCR is part of the closed-loop cooling system for the normal operations of STP, Units 1 and 2. The CWSs of STP, Units 1 and 2, discharge heated water to the MCR, where rejected heat is dissipated mostly via evaporation. To replenish the waters lost to evaporation, the RMPF supplies makeup water from the lower Colorado River. The pumps in the RMPF are operated intermittently consistent with Colorado River flow conditions, operational considerations, and permit restrictions.

2.2.4.1 Surface Water Hydrology

The Colorado River Basin is approximately 42,318 mi^2 (109,600 km^2) in area (NRC 2011b). STP is located at lower Colorado River Mile 14.6 upstream from Matagorda Bay. The river is tidally influenced in the vicinity of the STP site, and this tidal influence extends as far as 32 mi (51 km) upstream from Matagorda Bay under conditions of low flow. The extent of tidal influence depends on tidal fluxes at the mouth of the river, freshwater inflow down the river, and other conditions. In addition, saltwater may move as far as 24 mi (39 km) upstream of Matagorda Bay, along the bottom of the Colorado River (STPNOC 2010b). The mean annual discharge measured at the USGS gauge near Bay City for water years 1949 through 2010 is 2,620 cfs or 1.17 million gpm (74.1 m^3/s) (USGS 2011d). August is the low-flow month, and June is the high-flow month (NRC 2011b).

Texas experiences frequent droughts, primarily caused by the formation of a stationary high-pressure system called the Bermuda High. Multi-year droughts have occurred in the past in the Colorado River Basin; for example, annual discharges during 1951 to 1956, 1962 to 1967, 1983 to 1986, and 1988 to 1991 ranged from 23 to 48 percent, 21 to 79 percent, 25 to 72 percent, and 21 to 78 percent of the mean annual discharge, respectively (NRC 2011b). Of the 56 years of data reported by USGS from 1949 to 2010 water years,[1] the annual discharge was less than the mean annual discharge during 26 years.

In the Colorado River Basin, the LCRA operates six dams that impound six Highland Lakes, having a combined water storage capacity of 2.18 million ac-ft (2,690 million m^3). The LCRA operates the Colorado River and Lakes Buchanan and Travis as a single system for water supply in the lower Colorado River Basin, including for STP (see Section 2.1.7.1). Water from the lakes is released when the flow in the river is insufficient to meet downstream water rights (NRC 2011b).

Other noteworthy surface water features at STP include Little Robbins Slough, an intermittent stream, which originates approximately 2 mi (3.2 km) northwest of the STP site; it has a drainage area of approximately 4 mi^2 (10.4 km^2). During construction for Units 1 and 2, the original course of Little Robbins Slough was relocated along the west portion of the MCR embankment. Currently, the relocated Little Robbins Slough flows south along the west MCR embankment, turns east at the southwest corner of the MCR embankment, and rejoins its original course approximately 1 mi (1.6 km) east of the southwest corner of the MCR embankment (NRC 2011b) (see Figure 2–1).

Kelly Lake is a 34-ac (14-ha) natural water body located north of the northeast edge of the MCR embankment and is fed by a small catchment area to its north. The ECP, which serves as the ultimate heat sink for STP, Units 1 and 2, is located east of the power block and comprises another 46 ac (19 ha) of land (NRC 2011b; STPNOC 2010b).

2.2.4.2 Surface Water Quality and Effluents

In support of maintaining the quality of waters of the State and in establishing designated uses of surface waters, TCEQ has designated the segment of the lower Colorado River (Segment 1401, Colorado River Tidal), adjacent to STP, for use in primary contact recreation and for high aquatic life use, as well as for general and fish consumption uses applicable to all surface waters (30 TAC 1-307). The numeric water quality criteria specified for the river segment include a minimum 24-hour mean dissolved oxygen at any point of 4.0 mg/L, a pH range of 6.5 to 9.0 units, an indicator bacteria count of 35 colonies per 100 milliliters (mL), and a maximum temperature of 95 °F (35 °C) (NRC 2011b; TCEQ 2011).

The lower Colorado River Authority has a water quality monitoring station on the lower Colorado River at Selkirk Island, located approximately 0.7 mi (1.1 km) downstream from the STPNOC's RMPF. For the period of October 1982 through November 2008, dissolved oxygen levels ranged from 0 to 13.5 mg/L with an average of 6.5 mg/L, pH ranged from 6.6 to 9.8 units with an average of 7.9, and water temperatures ranged from 43.5 to 92.1 °F (6.4 to 33.4 °C) with an average of 72.5 °F (22.5 °C). Between 1994 and 2001, fecal coliform ranged from 0 to 13,000 colonies per 100 mL, with an average of 391 colonies per 100 mL (NRC 2011b).

Texas' draft 2010 Clean Water Act, Section 303(d), list of impaired waters proposes to continue the listing of the tidal lower Colorado River as impaired by bacteria; it was first listed for bacteria exceedances in 2006 (based on best available information). The other surface water bodies near the STP site—including Little Robbins Slough, West Branch of the Colorado River, and Kelly Lake—are not on the Section 303(d) list (NRC 2011b; TCEQ 2011).

Wastewater discharges from STP are governed by a TCEQ-issued TPDES permit. This is the Texas equivalent of a National Pollutant Discharge Elimination System permit. STPNOC's

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[1] For statistical calculations, the USGS does not use years during which data are incomplete. For calculating the annual statistics for Colorado River stream flow at Bay City, the USGS did not use water years 1996 through 2000 and 2009.

current TPDES permit (No. WQ0001908000) was issued by TCEQ with an effective date of July 27, 2005; the permit expired on December 1, 2009. However, STPNOC submitted a permit renewal application to the State on June 2, 2009, which the TCEQ accepted as administratively complete on July 13, 2009. Consequently, STPNOC's TPDES permit remains valid and in effect (i.e., administratively continued) until a new permit is issued (STPNOC 2011d; TCEQ 2009). Regarding Water Quality Certification requirements under Section 401 of the Clean Water Act, TCEQ issued a waiver to STPNOC with respect to renewal of STPNOC's NRC operating licenses as STP discharges are otherwise subject to TPDES permitting requirements (STPNOC 2012b).

The site's TPDES permit sets effluent limitations for site discharges to the Colorado River from the MCR via outfall 001 including comingled recirculated cooling water, MCR blowdown, stormwater, and makeup water from Colorado River. This also includes limits on several "previously monitored" effluent streams or internal outfalls that discharge to the MCR and identified as outfall numbers 101, 201, 401, 501, and 601. Additionally, the permit covers discharges from other miscellaneous sources such as MCR relief wells, MCR spillway gate leakage, and from groundwater monitoring wells that may flow to the Colorado River, to the West Branch of the Colorado River, to Little Robbins Slough, and to the East Fork of Little Robbins Slough, as appropriate (TCEQ 2005).

In addition to limitations on specific pollutants and on discharge temperature, the current TPDES permit requires that the discharge from outfall 001 not exceed 12.5 percent of the flow of the Colorado River at the discharge point and prohibits discharges from outfall 001 when river flow adjacent to the plant is less than 800 cfs (23 m^3/s). It also imposes an average daily discharge flow limit of 144 million gallons per day (mgd) (585,000 m^3/day) (TCEQ 2005). As noted above (and previously in Section 2.1.7), the MCR is equipped with a blowdown discharge pipeline to reduce the level of dissolved solids in the circulating water. While this blowdown pipeline has only been used once before, it may be necessary to discharge from the MCR via outfall 001 in the future to maintain proper circulating water chemistry (STPNOC 2010b).

The NRC staff's review of the last 3 years of TPDES discharge monitoring reports submitted by STPNOC to the TCEQ revealed no exceedances of TPDES effluent limitations. Further, STPNOC has not received any Notices of Violation, nonconformance notifications, or related infractions associated with the site's TDPES permit or related to other water quality matters within the past 5 years (STPNOC 2011e).

2.2.5 Groundwater Resources

2.2.5.1 Site Description and Hydrogeology

Underlying the STP site is a wedge of southeasterly dipping sedimentary deposits. Three depositional environments are evident—continental (alluvial plain), transitional (delta, lagoon, beach), and marine (continental shelf). As further discussed in Section 2.2.3, oscillations of the ancient shoreline and other processes have resulted in overlapping mixtures of sediments. Numerous local aquifers exist in the thick sequences of alternating and interfingering beds of clay, silt, sand, and gravel, which yield groundwater ranging in quality from fresh to saline (Ryder 1996; STPNOC 2010d).

The USGS identified the aquifers underlying the STP site as the Texas coastal lowlands aquifer system, and it divides the aquifer system into hydrogeologic units or permeable zones A through E (Ryder and Ardis 2002). Within the State of Texas, both the Texas Water Development Board and the LCRA refer to the aquifer system as both the Gulf Coast Aquifer system and the coastal lowlands aquifer system, and they use hydrogeologic unit names rather than letters to describe the aquifer system (TWDB 2006, 2007; Young et al. 2007). Common hydrogeologic unit names, from shallow to deep, are as follows (STPNOC 2010d):

- Chicot Aquifer,
- Evangeline Aquifer,
- Burkeville Confining Unit,
- Jasper Aquifer,
- Catahoula Confining Unit, and
- Vicksburg–Jackson Confining Unit.

This SEIS adopts the naming convention used by the State of Texas. The aquifers underlying the site are located in the Holocene-aged alluvium and the Pleistocene-aged Beaumont, Montgomery, Bentley Formations, and Willis Sands that make up the Chicot Aquifer (NRC 2011b). In descending order from the land surface, the aquifers of interest are the Upper Shallow Chicot Aquifer, the Lower Shallow Chicot Aquifer, and the Deep Chicot Aquifer. The Upper and Lower Shallow Chicot aquifers exhibit semi-confined behavior with some movement of groundwater between them. Local to STP, Units 1 and 2, this communication between the upper and lower zones is also a result of the excavation of the semi-confining material separating the two zones during construction of the units. The top of the Upper Shallow Chicot Aquifer is designated at approximately 15 to 30 ft (4.6 to 9.1 m) BGS, and its base is at about 50 ft (15 m) BGS. The Lower Shallow Chicot Aquifer lies between 50 and 150 ft (15 to 46 m) BGS (NRC 2011b). The depth to groundwater within this shallow aquifer system lies at approximately 15 to 20 ft (4.6 to 6.1 m) BGS (MACTEC 2009). The upper surface of the Deep Chicot Aquifer is between 250 and 300 ft (76 to 91 m) BGS. The approximate depth where groundwater has a total dissolved solids (TDS) concentration of more than 10,000 mg/L defines the base of the Deep Chicot Aquifer. Beneath the STP site, the Chicot Aquifer thickness is somewhat greater than 1,000 ft (305 m). The Upper Shallow Chicot Aquifer exhibits a somewhat higher potentiometric head than the Lower Shallow Chicot Aquifer, and groundwater moves from the Upper into the Lower Shallow Chicot Aquifer through the confining zone that separates them. The Deep Chicot Aquifer is separated from the Lower Chicot Aquifer by 100 to 150 ft (30 to 46 m) of low-conductivity confining zone sediments (NRC 2011b).

Recharge to the Chicot Aquifers underlying the STP site occurs to the northwest of the site, and discharge occurs generally to the east, south, and southeast of the site. The Shallow Chicot Aquifer outcrops at the land surface, is recharged a few miles northwest of the STP site in Matagorda County, and discharges to the Colorado River alluvium near the site. The Deep Chicot Aquifer outcrops and is recharged farther north and northwest in Wharton County. It discharges into Matagorda Bay and the Colorado River estuary approximately 5 mi (8 km) southeast of the STP site. In the upland areas of the aquifer watersheds, where the aquifer sediments are exposed at the land surface, infiltration from irrigation also contributes to recharge of both the Shallow and Deep Chicot aquifers. The Colorado River is a gaining stream where the Shallow and Deep Chicot aquifers discharge to the river (NRC 2011b). The alluvial aquifer adjacent to the river also undergoes bank storage, whereby water is retained in and discharged from the permeable alluvium of the river bank, with the rise and fall of the Colorado River.

Additionally, the MCR, as described in Section 2.1.7, is unlined and acts as a local recharge source for the Upper Shallow Chicot Aquifer. A series of 770 relief wells surround the MCR embankment and collect and discharge some of the seepage from the MCR and otherwise relieve hydrostatic pressure on the outer slope and toe of the embankment. Analyses presented in the updated FSAR for STP, Units 1 and 2 (STPNOC 2009a), estimate total seepage from the MCR into the Upper Shallow Chicot Aquifer at 3,530 gpm or 5,700 ac-ft/yr (7 million m^3/yr)). These analyses also estimate that 68 percent of the seepage (2,390 gpm or 3,850 ac-ft/yr (4.7 million m^3/yr)) from the MCR would be captured by the relief well system for an MCR maximum pool elevation of 49 ft (14.9 m) above MSL. More recent simulations of the MCR indicate approximately 50 percent capture (NRC 2011b).

Groundwater quality and aquifer yields dictate that the Deep Chicot Aquifer is the primary source of groundwater in the region. STP wells completed in the Deep Chicot Aquifer and used for groundwater production at the site are described in Section 2.1.7.2 (see also Figure 2–1). The nearest offsite public water supply wells are located in the communities of Selkirk and Exotic Isle, which are located adjacent to the STP site eastern boundary. Wells for these communities are approximately 1 mi (1.6 km) from the nearest STP production well, Well 7, and 3.75 mi (6 km) from STP, Units 1 and 2 (see Figure 2–1). Two non-public water supply wells used for livestock watering are located about 1,800 ft (549 m) north of STP Well 5 and 2,230 ft (680 m) west of STP Well 6. They are completed to depths of 500 and 400 ft (152 and 122 m) and have screened intervals of 200 to 300 ft (61 to 91 m), respectively, above the screened intervals of the STP production wells (STPNOC 2010b).

Groundwater use from the Gulf Coast Aquifer system increased between 1940 and the mid-1980s. One cause was rice irrigation, and Matagorda County was among the counties where this occurred. As a result of subsidence issues and substantial increases in pumping lift, groundwater use has declined in the region. The Texas Water Development Board forecasts a decline in groundwater use from the Gulf Coast Aquifer through 2030. Matagorda County is projected to see a net decrease of 48 percent, with pumping decreasing from 21,528 gpm (81,490 L/min) or 31 mgd in 1985 to 11,111 gpm (42,060 L/min) or 16 mgd in 2030 (Ryder and Ardis 2002). Decreased usage, consistent with this estimate, occurred through the year 2000; however, drought periods since then have resulted in an increase in groundwater usage.

Established under Texas State law (Water Code, Title 2, Subtitle E, Chapter 36), the Coastal Plains Groundwater Conservation District (CPGCD), which has the same boundaries as Matagorda County, has the authority and responsibility to define the modeled available groundwater in the district, to define the amount of groundwater being used in the district, and to issue permits based on the available groundwater resource. The NRC staff interviewed the manager of the CPGCD in July 2011 and learned that the current modeled available groundwater in the district (i.e., Matagorda County) is 46,000 ac-ft (57 million m^3) annually or 28,522 gpm (107,970 L/min), and the current usage is 36,000 ac-ft (44 million m^3) or 22,322 gpm (84,500 L/min). Annual permitted groundwater withdrawals for the period 2008 through 2010 (i.e., permits are issued for a 3-year period) were 51,285 ac-ft/yr (63.2 million m^3) or 31,800 gpm (120,400 L/min) (NRC 2011b). Groundwater use in the largely agricultural region encompassing STP fluctuates with the availability of surface water (e.g., with the occurrence of drought). Thus, annual permits that total in excess of the modeled available groundwater, an annual average value, is not unexpected. As presented in Section 2.1.7.2, annual average groundwater use by STP, Units 1 and 2 (i.e., 768 gpm), represents approximately 2.7 percent of the modeled available groundwater quantity in Matagorda County and 3.4 percent of current usage.

2.2.5.2 Groundwater Quality

The Shallow Chicot Aquifer exhibits poor water quality and low productivity, and it is used in the vicinity of the STP site primarily for livestock watering. However, occasional domestic use is not precluded. Of 12 wells completed in the Shallow Chicot Aquifer within 10 mi (16 km) of the STP site, 9 wells have TDS concentrations above the EPA secondary drinking water standard (DWS) of 500 mg/L (STPNOC 2010b).

As noted above, the MCR is unlined and acts as a local recharge source for the Upper Shallow Chicot Aquifer. Therefore, locally to the STP site, the MCR also influences the groundwater quality of the Upper Shallow Chicot Aquifer. A maximum tritium concentration of 17,410 picocuries per liter (pCi/L) was reported for MCR waters in 1996 (STPNOC 2010b).

While 50 to 68 percent of the MCR seepage into the aquifer is estimated to be removed by the series of 770 relief wells surrounding the MCR embankment, the remainder of the MCR waters seep into the aquifer, migrate downgradient, and discharge to the Colorado River southeast of the STP site. Monitoring of relief wells and monitoring wells around the MCR has shown that tritium from the MCR arrived at relief wells approximately 2 years after plant startup in 1988. It arrived at monitoring wells south of the MCR (wells MW-235 and MW-251) in 1999 and 2000 and at monitoring wells west of the MCR (wells MW-258 and MW-259) in 2006 (STPNOC 2007, 2011a). Since its first detection, the concentration of tritium in relief wells increased to a peak of approximately 7,500 pCi/L in 1999 and now varies between 5,000 and 6,000 pCi/L. Since its first detection in 2000, the concentration of tritium in MW-251, which is located south of the MCR, peaked in 2001 and then declined somewhat, remaining close to the concentrations in the relief wells since then (i.e., 5,000 to 6,000 pCi/L). Since its first detection in 2006, the concentration of tritium in monitoring wells west of the MCR has increased, peaked, and remained steady since 2009 at around 2,500 pCi/L. Monitoring wells to the west of the MCR include wells slightly beyond the site boundary, which were observed by the NRC staff during the site audit. These wells are showing tritium levels consistent with those inside the site boundary. Sampling stations south of the MCR and on private property (MW-245 and MW-269) showed no detectable tritium in 2009 (STPNOC 2010a). All observed values for tritium are below the EPA primary DWS of 20,000 pCi/L (40 CFR Part 141).

The 2006 annual environmental operating report (STPNOC 2007) presents information generated from sampling 18 groundwater wells outside the STP, Units 1 and 2, protected area and from sampling 16 groundwater wells within the STP, Units 1 and 2, protected area. Sampling of wells within the protected area resulted from STPNOC's participation in the Nuclear Energy Institute's (NEI's) Groundwater Protection Initiative. During site characterization for STPNOC's application for proposed Units 3 and 4, 28 groundwater observation wells were installed in 2006, and an additional 26 observation wells were installed in 2008 (STPNOC 2010d). Since 2006, additional wells have been installed and added to the Environmental Monitoring Program to further characterize plumes within the protected area and originating from the MCR. For example, during 2008, three additional wells were installed in the protected area, and two additional wells were installed outside the protected area.

In 2006, sampling of wells completed in the Shallow Chicot Aquifer within the protected area provided eight positive results for tritium, all below the EPA primary DWS of 20,000 pCi/L (40 CFR Part 141). Eight wells had no detectable tritium. The results were attributed to seepage of MCR water into the Shallow Chicot Aquifer and underground pipe failures within the protected area. Two of these wells showed relatively higher values of tritium at 15,000 pCi/L and 1,250 pCi/L (STPNOC 2007). Tritium concentrations in the location of the high value in 2006 decreased to 1,500 pCi/L by 2010. Individual wells exhibiting lower concentrations have shown trends upward over individual years and over the period from 2005 through 2010. However, well sampling within the protected area through 2010 (STPNOC 2011a) continues to show concentrations well below the EPA DWS for tritium.

In response to the NEI initiative, STPNOC commissioned a report on the groundwater within the protected area (MACTEC 2009). Three sources of tritium in groundwater beneath the protected area were identified: (1) seepage from the MCR, (2) leaks from the TDS pipeline, and (3) discharge from the turbine steam trap drain or steam condensate lines of each reactor. The first potential source is limited in concentration to the tritium levels in the MCR and subsequent decay in the groundwater pathway from the reservoir. The second source is described as having a maximum tritium concentration of 80,000 pCi/L (MACTEC 2009). The third source is described as having a maximum tritium concentration of less than 90,000 pCi/L (STPNOC 2011d). Within the protected area, the highest tritium concentration in groundwater was approximately 15,000 pCi/L in 2006 (STPNOC 2010b). The highest tritium concentration in the tendon galleries that circle the RCBs was less than 20,000 pCi/L in 2010 (STPNOC 2011d). The latter measurement may be indicative of tritium concentrations in groundwater resulting from discharge from the steam condensate lines. STPNOC has evaluated releases inside the protected area and concluded that no release is occurring from an unidentified pathway, no radioactive material is being released off site, and there is no impact on drinking water or on public health and safety (STPNOC 2011a).

The monitoring program has observed tritium in the shallow aquifer for several years in wells to the south of the MCR. The tritium movement is consistent with simulations conducted during licensing of STP, Units 1 and 2, and shows concentrations below the EPA DWS. In 2010, the monitoring program (STPNOC 2011a) results indicated stable tritium concentrations in groundwater wells surrounding the MCR. Higher levels reported in recent years are consistent with drought conditions and low MCR water levels. From the latest STP groundwater monitoring data, the peak groundwater tritium concentration in 2010 was 6,600 pCi/L—well below the EPA DWS of 20,000 pCi/L (STPNOC 2011b).

Based on groundwater data from 2006 through 2008 presented in the FSAR for proposed STP, Units 3 and 4 (STPNOC 2010c), the piezometer head gradient from the existing STP, Units 1 and 2, to the site boundary to the east is approximately 3 ft (0.9 m), and the distance is approximately 1 mi (1.6 km) (5,280 ft or 1,609 m). Representative values for saturated hydraulic conductivity and effective porosity of the lower shallow aquifer are 72 ft/day (22 m/day) and 0.31, respectively. The lower shallow aquifer is the more likely pathway for releases in the vicinity of the RCBs to offsite receptors (see Section 2.2.5.1) (NRC 2011b). Using these data, the travel time from STP, Units 1 and 2, to the site boundary is approximately 100 years. Such a travel time within the shallow aquifer presents adequate time for tritium source concentrations to decay (i.e., tritium has a 12.3 year half-life) to levels below the EPA DWS.

2.2.6 Aquatic Resources

2.2.6.1 Colorado River and Matagorda Bay

The Colorado River extends approximately 862 mi (1,387 km) from the high plains to the coastal marshes in Matagorda County. It is one of the largest river systems within the State of Texas. The drainage area for the lower Colorado River basin includes approximately 22,700 mi^2 (58,792 km^2), from Lake O.H. Ivie in Mills County, Texas, to Matagorda Bay (TWDB 2007).

STP is located in the Texas coastal plain physiographic province. The section of the Colorado River near STP is a diverse, fluvial system that meanders through the coastal plain providing sediments and nutrients to Matagorda Bay (ENSR 2008c). The river in this area is generally surrounded by steep banks. Little vegetation can grow on the steep banks, but some bottomland forests and wetlands occur on land adjacent to the river (ENSR 2008c).

The Colorado River is tidally influenced near STP, which means that saltwater from Matagorda Bay and the Gulf of Mexico regularly flows upstream and mixes with freshwater from the river. During periods of low flow, the salinity can reach as high as 20 parts per thousand (ppt) near STP (ENSR 2008c). Flow from the gulf and bay influences the aquatic community near STP by transporting organisms and increasing the salinity in the river. The distribution and density of aquatic plants and animals living in tidally influenced rivers is often determined by salinity concentrations.

Environmental History. Freshwater flow between the Colorado River and Matagorda Bay has important ecological implications. Flow from the Colorado River can increase the biological productivity within Matagorda Bay by providing freshwater, soil, and debris, which can facilitate the growth of marsh habitats. Saltwater flow from the bay to the river can influence the species distribution and diversity within the river by transporting organisms up the river and providing habitat (e.g., higher salinity) for estuarine and marine organisms.

Various development projects have influenced the flow between the Colorado River and Matagorda Bay in the past 100 years. Prior to the 1920s, the Colorado River flowed directly into Matagorda Bay. In an attempt to control flooding, the U.S. Army Corps of Engineers (USACE) dredged a channel down the middle of Matagorda Bay (Holtcamp 2006). The USACE lined the channel with the dredged mud, which divided the bay into an eastern and western portion. As a result of the lined channel, the water from the Colorado River then flowed directly into the Gulf of Mexico (ENSR 2008c).

Dredging projects in the 1950s and 1990s reestablished flow between the Colorado River and Matagorda Bay. In the 1950s, the USACE dredged the Tiger Island Channel through the west side of Matagorda Bay, re-establishing flow between the river and the bay. In part because of ecological importance for freshwater to reach the bay, the USACE conducted a series of dredging projects to increase the flow from the river to the bay in the 1990s (Holtcamp 2006). In 1990, the USACE constructed a deeper river diversion channel northwest of the Tiger Island Channel. In 1991, the USACE constructed two dams to divert the river flow, including one across the Tiger Island Channel (called the Tiger Island Cut Dam, recently renamed to Parker's Cut) and a diversion dam across the river channel on Matagorda Peninsula. By July 1992, the Colorado River flowed directly into Matagorda Bay, through the Gulf Intracoastal Waterway (GIWW) and the newly constructed diversion channel. Wilber and Bass (1998) determined that the changes in freshwater inflow to Matagorda Bay over time, and the changes to flow from the Gulf of Mexico into the Colorado River, have likely influenced the aquatic communities historically in the river and bay.

Common Taxa. The most comprehensive studies of the aquatic community within the lower Colorado River near STP are studies conducted as part of the licensing processes for STP, Units 1, 2, 3, and 4. Below is a brief summary of the aquatic surveys conducted near STP. Although the owner of the STP site has changed over time, the owner is referred to as STPNOC for simplicity purposes below.

- 1973 to 1974: STPNOC sampled phytoplankton (microscopic floating photosynthetic organisms), zooplankton (small animals that float, drift, or weakly swim in the water column, including fish and invertebrate eggs and larvae), juvenile and adult macroinvertebrates (invertebrates visible without a microscope), and juvenile and adult fish (HPLC 1974). NRC (1975) summarized these results in the final environmental statement for the construction of STP, Units 1 and 2.

- 1975 to 1976 and 1983 to 1984: Due to the usually wet conditions during the 1973 to 1974 surveys, STPNOC conducted additional fish surveys in the Colorado River in 1975 to 1976 and 1983 to 1984 (McAden 1984, 1985). NRC (1986) summarized these results in the final environmental statement for the operation of STP, Units 1 and 2.

- 2007 to 2008: In support of STPNOC's application to build and operate STP, Units 3 and 4, STPNOC sampled macroinvertebrates and fish within the Colorado River near STP (ENSR 2008c; STPNOC 2011d). NRC (2011b) summarized these results in its final EIS for the proposed construction and operation of STP, Units 3 and 4.

Since the Colorado River diversion project, which increased the flow between the Colorado River and Matagorda Bay, species diversity and the number of estuarine-marine species increased in the Colorado River near STP (NRC 2011b). Because of this change, the summary of aquatic organisms focuses on the most current studies. An analysis of the change in the aquatic community since the beginning of STP operations is provided in Section 4.5.2.

Phytoplankton: Phytoplankton are microscopic floating photosynthetic organisms that form the basis of the food chain. Phytoplankton play key ecosystem roles in the distribution, transfer, and recycling of nutrients and minerals. STPNOC most recently surveyed the phytoplankton community in the summer of 1973 in the lower Colorado River and an adjacent stretch of GIWW. STPNOC collected 524 taxa, representing six major divisions (NRC 1975, 2011b). Diatoms and cynobacteria (blue-green algae) dominated the phytoplankton community. Diatoms were more numerous at the bottom-water samples, and cyanobacteria and dinoflagellates were predominant in the water column.

Zooplankton: Zooplankton are small animals that float, drift, or weakly swim in the water column. Zooplankton include, among other forms, fish eggs and larvae with limited swimming ability, larvae of benthic invertebrates, medusoid forms of hydrozoans, copepods, shrimp, and krill (order Euphausiids).

STPNOC surveyed the lower Colorado River and an adjacent stretch of GIWW in 1973 to 1974 for macrozooplankton (HPLC 1974). STPNOC collected 319 zooplankton species, which included protozoans (101 species), rotifers (75 species), copepods (31 species), and cladocerans (27 species) (NRC 1975). The survey showed that the zooplankton community structure changed based on salinity, such that during periods of higher salinity (e.g., low river flow and strong incoming tides), species diversity increased at upstream stations.

STPNOC most recently surveyed macrozooplankton in 1975 to 1976 and 1983 to 1984 at five stations in the lower Colorado River (Figure 2–2). The abundance and occurrence of invertebrate eggs and larvae were greatest downstream (Station 5); these decreased in fresher water upstream (NRC 1986). In the 1975 to 1976 samples, both freshwater and estuarine-marine decapod larvae dominated the macrozooplankton community from May to September, and estuarine-marine decapod larvae dominated the community from October to December (NRC 1986). The abundance and diversity of decapod larvae were lowest from January through April, when the copepod *Acartia tonsa* was most prevalent (NRC 1986). In 1983, the most abundant macrozooplankton were cladocerans, Malacostraca species, and copepods (NRC 1986). In 1984, the most abundant macrozooplankton were immature stages of the Harris mud crab (*Rhithropanopeus harrissi*), ghost shrimp (*Callianassa* spp.), and jellyfish (family Cnidaria) (NRC 1986).

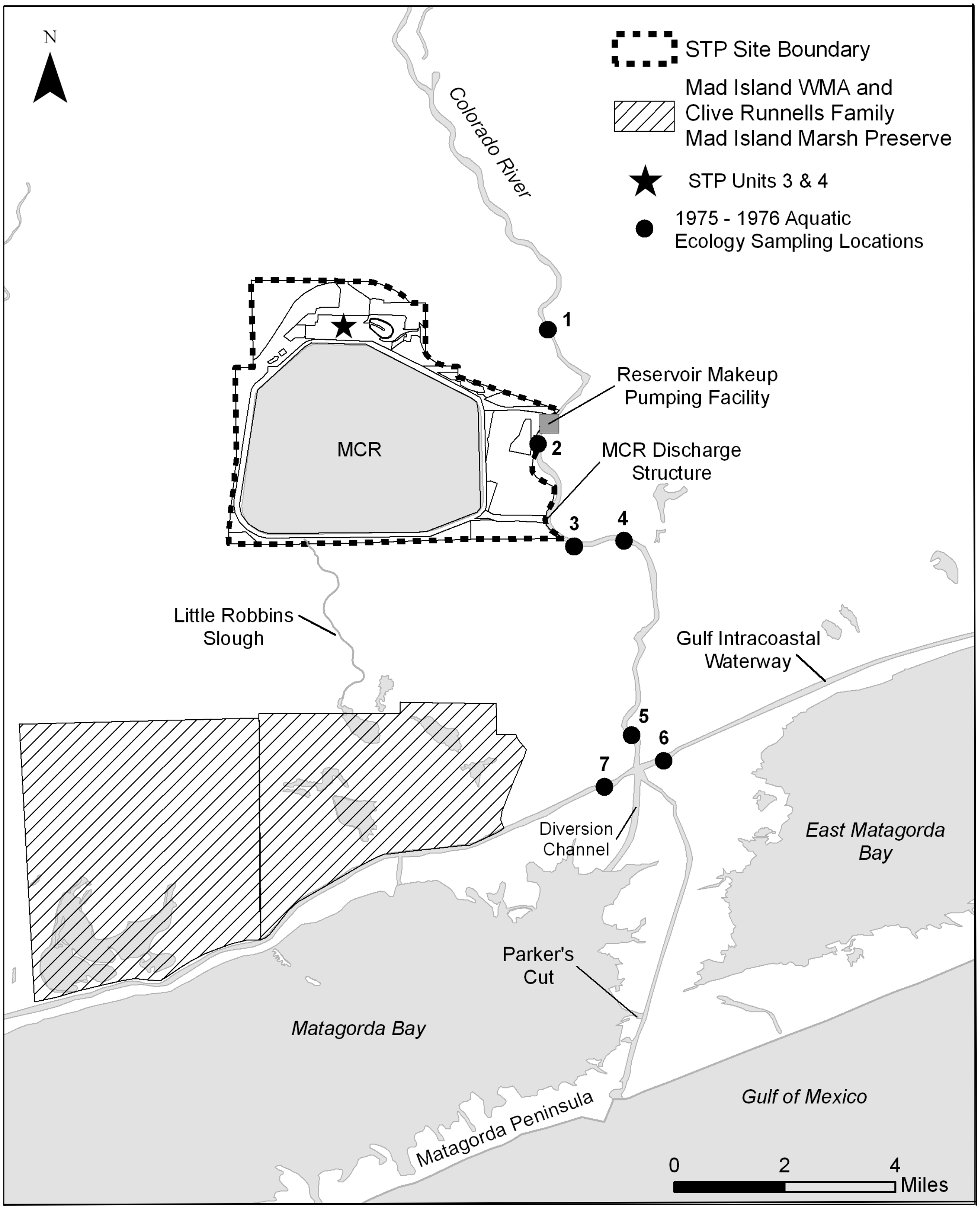
STPNOC also collected commercially important species, including early life stages of blue crab (*Callinectes sapidus*), white shrimp (*Litopenaeus setiferus*), and brown shrimp (*Farfantepenaeus aztecus*, formerly known as *Penaeus aztecus*). In general, the density of these species was greatest in higher salinity water (e.g., in the salt wedge or further downstream), and lower densities occurred near the STP site (NRC 1975, 1986).

STPNOC most recently collected ichthyoplankton (fish eggs and larvae) in 1975 to 1976 and 1983 to 1984 at five stations in the lower Colorado River (Figure 2–2). NRC (1986) reported the highest densities of ichthyoplankton from May to October 1975 and March to April 1976. Densities of ichthyoplankton was highest in higher salinity waters (NRC 1986). The most common species were often estuarine or marine species, such as Gulf menhaden (*Brevoortia patronus*), bay anchovy (*Anchoa mitchelli*), Atlantic croaker (*Micropogonia undulatus*), and naked goby (*Gobiosoma bosc*) (NRC 1986). In early May and August, when the salinity dropped in the Colorado River, the abundance of ichthyoplankton shifted to freshwater drum (*Aplodinotus grunniens*) and cyprinid species (NRC 1986). At the sampling station next to the RMPF, STPNOC collected three species (bay anchovy, darter goby (*Ctenogobius boleosoma*), and naked goby), which were three of the most commonly collected species in the survey along the lower Colorado River.

Survey results suggest that the lower Colorado River near STP is an estuarine nursery ground for many commercially important species including Gulf menhaden, Atlantic croaker, sand seatrout (*Cynoscion arenarius*), spotted seatrout (*C. nebulosus*), spot croaker (*Leiostomus xanthurus*, also called spot), sheepshead (*Archosargus probatocephalus*), pigfish (*Orthopristis chrysopterus*), black drum (*Pogonias cromis*), red drum (*Sciaenops ocellatus*), and southern flounder (*Paralichthys dentatus*) (NRC 1986).

Adult and Juvenile Macroinvertebrates: STPNOC sampled adult and juvenile macroinvertebrates in 1975 to 1976 at eight sampling stations in the Colorado River (Figure 2–2). In 1983 to 1984, STPNOC sampled at Station 2, which is closest to the RMPF (Figure 2–2). In 2007 to 2008, STPNOC sampled along a 9-mi (14-km) stretch of the lower Colorado River extending from the GIWW north to the FM 521 bridge (Figure 2–3 and Figure 2–4). Within this portion of the river, STPNOC divided the area into three 3-mi (5-km) segments and randomly sampled each segment monthly from June 2007 through May 2008. Within each month, STPNOC collected samples during a 2-day period randomly selected each month. STPNOC collected samples if the river flow was 5,000 cfs or less to reduce variability in sampling conditions.

1 **Figure 2–2. The STP Site and 1975 to 1976 Aquatic Ecology Sampling Location**
2 **(NRC 2011b)**



3

Figure 2–3. The STP Site and 2007 to 2008 Aquatic Ecology Sampling Locations from Segment C through the Upstream Portion of Segment B (NRC 2011b)

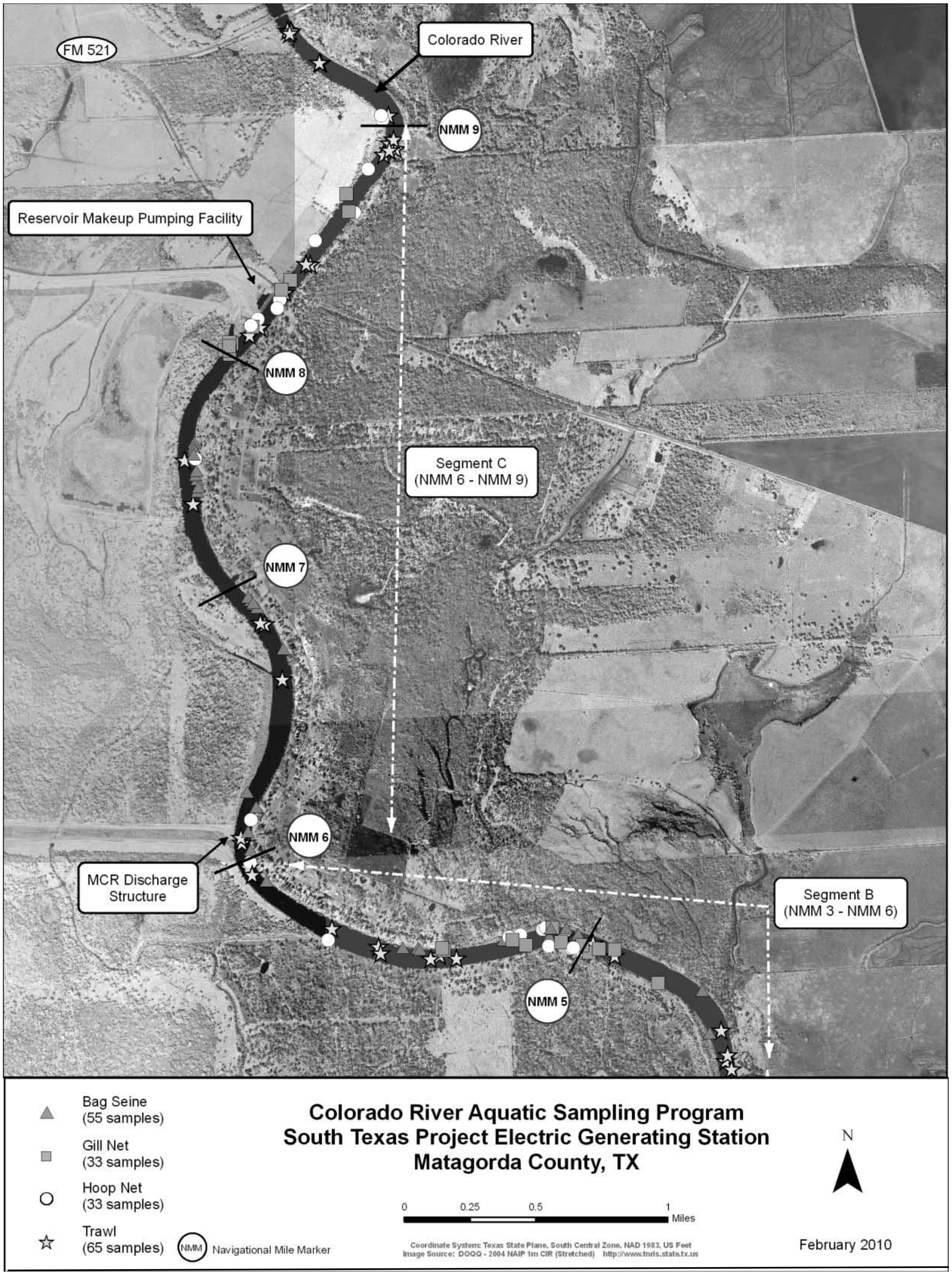
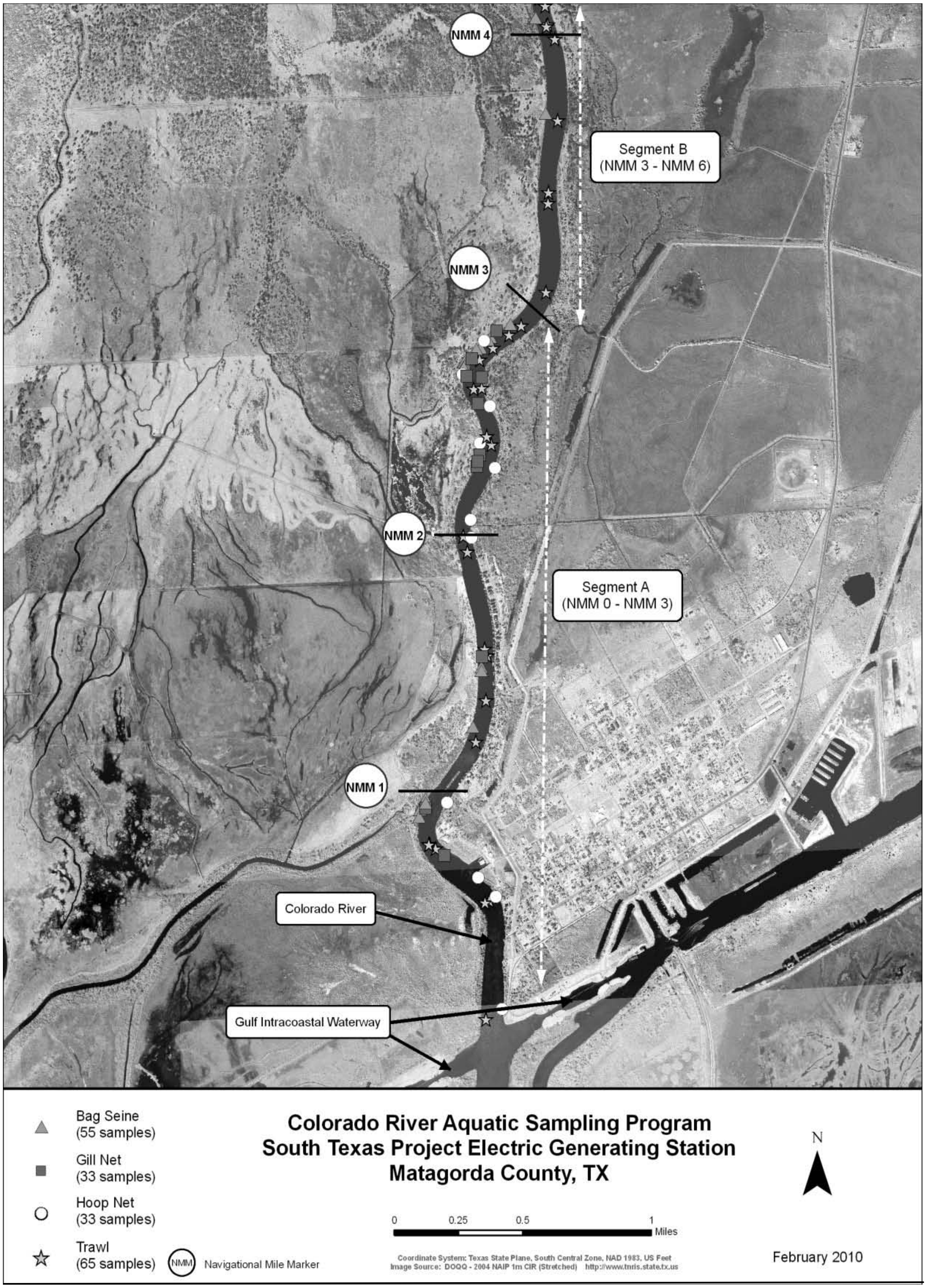


Figure 2–4. The STP Site and 2007 to 2008 Aquatic Ecology Sampling Locations from the Downstream Portion of Segment B through Segment A (NRC 2011b)



All studies used seines and trawls to sample macroinvertebrates. In 2007 to 2008, STPNOC also used gill nets and hoop nets primarily to capture fish (ENSR 2008c). However, STPNOC collected a few macroinvertebrates in gill nets and hoop nets; therefore, the methodology and results of these sampling programs is presented below. ENSR (2008c) used the four different types of gear to capture a variety of taxa in terms of size (or life stage) and habitat location (e.g., open water vs. benthic). The information below describes the sampling gear used in the 2007 to 2008 study within each of the three sampling segments (segments A, B, and C) (Figure 2–3 and Figure 2–4):

- Trawls: STPNOC conducted two tows, each for 10 minutes, with a 6.1-m (20-ft) otter trawl fitted with a 3.5-cm (1.4-in.) stretched mesh and doors (i.e., otter boards) measuring 46 cm by 91 cm (18 in. by 36 in.) attached to each wing of the net. The trawl was designed to capture benthic or demersal fishes and macroinvertebrates.

- Gill nets: STPNOC set one gill net perpendicular to the shoreline. It set the net within 1 hour of sunset and retrieved it at sunrise the following morning. The gill net was 33-m (108-ft) long, 1.2-m (3.9-ft) deep, and consisted of 10.2-cm (4-in.) stretched monofilament mesh. It was designed to capture adult fish using shoreline habitats.

- Hoop nets: STPNOC placed one set of hoop nets within 1 hour of sunset and retrieved them at sunrise the following morning. Hoop nets consisted of a multi-chambered conical net that was 3.6-m (12-ft) long with one 1-m (3-ft) diameter hoop at the beginning, followed by smaller hoops, and covered with 2.5-cm (1-in.) stretched mesh netting. Each hoop net had wings that were 7.5-m (25-ft) long by 1.8-m (5.9-ft) deep and comprised of 5-cm (2-in.) stretched mesh. Hoop nets were designed to capture sub-adult fish using shoreline habitats.

- Seines: STPNOC conducted two seine pulls per month for 15.2 m (50 ft) parallel to the shoreline. Seines were comprised of a 19-mm (0.75-in.) mesh net that measured 18.3-m (60-ft) long and 1.8-m (6-ft) deep. In the center was a 1.8 m (6 ft) by 1.8 m (6 ft) by 1.8 m (6 ft) bag that was covered in 13-mm (0.5-in.) stretched mesh. Seines were designed to capture macroinvertebrates and juvenile and sub-adult fishes using shoreline habitats.

The most abundant invertebrate species in the 1975 to 1976 and 1983 to 1984 studies were river and white shrimp (McAden et al. 1984, NRC 1986). At Station 1, the most upriver station near STP, brown shrimp was the most abundant species in trawl samples, and blue crabs were the most abundant species in seine samples (NRC 2011b). At Station 2, which is closest to the RMPF, STPNOC collected river shrimp, white shrimp, blue crabs, and crayfish (NRC 1986).

In the 2007 to 2008 study, ENSR (2008c) reported the most common species to be white shrimp (30 percent), grass shrimp (*Palaemonetes pugio*) (29 percent), brown shrimp (7 percent), and blue crab (4 percent) (Table 2–1). ENSR (2008c) collected macroinvertebrates most often in the river segment with the highest salinity (segment A) and least often in the river segment with the lowest salinity (segment C) (Figure 2–3 and Figure 2–4). ENSR (2008c) reported the greatest density of macroinvertebrates and fish during the following periods:

- Trawls: October through January,

- Gill Nets: September through December and March through May,

- Hoop Nets: October through February and April through June, and
- Seines: January through April.

Brown, pink (*Farfantepenaeus brasiliensis*), and white shrimp are of commercial importance in the vicinity of the STP site (TPWD 2002; USACE 2007). STPNOC observed various life stages of brown and white shrimp in all three studies (NRC 1986; STPNOC 2008c). STPNOC only observed pink shrimp during the 1984 to 1985 studies (NRC 1986).

Table 2–1. Macroinvertebrates Collected in the Colorado River by Gear Type, 2007 to 2008

Common Name	Scientific Name	Seine	Gill Net	Hoop Net	Trawl	Total	% of Total
Atlantic brief squid	*Lolliguncula brevis*	1	0	0	30	31	<1
Atlantic seabob	*Xiphopenaeus kroyeri*	0	0	0	127	127	2
Blue crab	*Callinectes sapidus*	190	2	3	77	272	4
Brown shrimp	*Farfantepenaeus aztecus*	264	0	0	192	456	7
Grass shrimp	*Palaemonetes pugio*	1,762	0	0		1,762	29
white shrimp	*Litopenaeus setiferus*	584	0	0	2,870	3,454	30
Other		11	0	1	12	24	<1
Total invertebrates		2,812	2	4	3,308	6,126	

Source: ENSR 2008c

Adult and Juvenile Fish: STPNOC sampled adult and juvenile fish in 1975 to 1976 at eight sampling stations in the Colorado River (Figure 2–3). In 1983 to 1984, STPNOC sampled at Station 2, which is closest to the RMPF (Figure 2–3). In 2007 to 2008, STPNOC sampled along a 9-mi (14-km) stretch of the lower Colorado River extending from the GIWW north to the FM 521 bridge (Figure 2–3 and Figure 2–4). All studies used seines and trawls to sample fish. In 2007 to 2008, STPNOC also used gill nets, hoop nets, and trawls (ENSR 2008c). ENSR (2008c) followed the same methodology described above for the macroinvertebrate sampling.

The most abundant fish species in the 1974 to 1975 study were Gulf menhaden, bay anchovy, Atlantic croaker, and striped mullet (*Mugil cephalus*) (NRC 1986). All of these species, except for menhaden, were most abundant at sampling stations furthest down the river (NRC 1986). Similarly, STPNOC only collected many of the commercially important estuarine species (e.g., red drum and southern flounder) at the most downstream station, Station 5. The density of menhaden, on the other hand, was greatest at the most upstream station, Station 1.

In the 2007 to 2008 study, STPNOC (2008c) reported the most common species to be Gulf menhaden (35 percent), striped mullet (14 percent), black drum (*Pogonia cromis*) (12 percent), and Atlantic croaker (9 percent) (Table 2–2). All other species comprised 3 percent or less of the total fish collected. ENSR (2008c) collected fish most often in the river segments with the highest salinity (segments A and B) and least often in the river segment with the lowest salinity (segment C) (Figure 2–3 and Figure 2–4).

Table 2–2. Fish Collected in the Colorado River by Gear Type, 2007 to 2008

Common Name	Scientific Name	Seine	Gill Net	Hoop Net	Trawl	Total	% of Total
Atlantic croaker	*Micropogonias undulatus*	562	1	0	482	1,045	9
Bay anchovy	*Anchoa mitchilli*	24	0	0	264	288	2
Black drum	*Pogonias cromis*	1	1	1	1,360	1,363	12
Blue catfish	*Ictalurus furcatus*	51	22	3	677	753	6
Channel catfish	*Ictalurus punctatus*	22	0	2	6	30	<1
Gafftopsail catfish	*Bagre marinus*	0	9	0	183	192	2
Gizzard shad	*Dorosoma cepedianum*	8	0	2	52	62	<1
Gulf menhaden	*Brevoortia patronus*	2,960	5	2	1,076	4,043	35
Hardhead catfish	*Ariopsis felis*	0	1	1	252	254	2
Red drum	*Sciaenops ocellatus*	8	8	38	25	79	<1
Sailfin molly	*Poecilia latipinna*	150	0	0	0	150	1
Sand seatrout	*Cynoscion arenarius*	22	5	0	294	321	3
Sharptail goby	*Oligolepis acutipennis*	39	0	0	0	39	<1
Sheepshead	*Archosargus probatocephalus*	14	1	6	48	69	<1
Sheepshead minnow	*Cyprinodon variegatus*	79	0	0	7	86	<1
Silver perch	*Bairdiella chrysoura*	0	0	0	350	350	3
Smallmouth buffalo	*Ictiobus bubalus*	0	32	5	0	37	<1
Spot croaker	*Leiostomus xanthurus*	88	0	1	156	245	2
Spotted seatrout	*Cynoscion nebulosus*	0	4	0	53	57	<1
Star drum	*Stellifer lanceolatus*	0	0	0	86	86	<1
Striped mullet	*Mugil cephalus*	1,676	0	1	1	1,678	14
White mullet	*Mugil curema*	181	0	0	2	183	2
Other		109	15	33	78	235	2
Total Fish		**5,994**	**104**	**95**	**5,452**	**11,645**	

Source: ENSR 2008c

Species Richness: In the 2007 to 2008 studies, ENSR (2008c) calculated the species richness, or number of fish and macroinvertebrate species collected, within each river segment and for each type of sampling gear. ENSR (2008c) reported the highest species richness in the river segment with the highest salinity (segment A) for trawl, seine, and gill net samples (Table 2–3). The species richness was similar across all three-river segments for hoop net samples (Table 2–3).

Table 2–3. Species Richness (number of species) in Three River Segments by Gear Type

	River Segment		
Gear Type	**A**	**B**	**C**
Trawl	37	29	24
Seine	38	35	22
Gill nets	14	12	9
Hoop nets	11	12	12

Source: ENSR 2008c

STPNOC's studies in the 1970s and 1980s also found greater species diversity and density further downstream in higher salinity waters (NRC 1975, 1986). NRC (1975) attributed the lower density and diversity near the STP site to the relatively large and frequent fluctuations in salinity. Downstream areas, on the other hand, exhibit relatively stable salinity, which allows for the establishment of a variety of estuarine and marine species assemblages.

2.2.6.2 Onsite aquatic features

STP is located approximately 23 ft (7 m) above MSL on a site with relatively flat topography. Water covers approximately 58 percent of the 12,220 ac (4,945 ha) STP site (STPNOC 2010b). The onsite aquatic features include the MCR, the ECP, several sloughs, drainage areas, wetlands, and Kelly Lake.

Construction activities for STP, Units 1 and 2, extensively altered several aquatic features on the STP site. For example, during the building of the MCR, STPNOC removed up to 65 percent of the drainage area for Little Robbins Slough in the southern part of the site (NRC 1975). STPNOC also created a new channel for the slough, which is the same as the current configuration (NRC 2011b). The reconfiguration of Little Robbins Slough reduced the annual freshwater runoff into onsite marshes and marshes south of the STP site. Reduced flow can displace freshwater species and reduce the quality of nursery grounds for estuarine-dependent organisms (NRC 1975). As a result of seepage flow from the MCR into the slough, NRC (1986) estimated the total long-term average annual reduction of freshwater input into the marshes to be 6 percent. NRC (1986) concluded that, at this rate, the reduction in flow of freshwater from the slough into the marshes, and any subsequent changes in salinity or nutrient input, were not expected to alter the structure and function of the upper marsh aquatic community (NRC 1986).

Below is a description of the main aquatic features currently located on the STP site.

Main Cooling Reservoir. The MCR is a 7,000-ac (2,833-ha), man-made impoundment that is the normal heat sink for waste heat generated during operations of STP, Units 1 and 2. STPNOC maintains the water level and quality (e.g., total dissolved solids) in the MCR by pumping water from the Colorado River through the RMPF, as described in Section 2.1.6. A variety of aquatic organisms currently inhabit the MCR (ENSR 2008a; STPNOC 2010b). Aquatic organisms were likely introduced into the MCR when small life stages (e.g., eggs or larvae) or species were entrained during the initial filling and subsequent refilling of the MCR.

ENSR (2008a) collected samples of the aquatic community within the MCR four times a year from May 2007 through April 2008. ENSR (2008a) sampled the aquatic community at fixed stations within five regions of the MCR. Each region was varying distance from the cooling water discharge and CWIS. ENSR (2008a) used four different types of gear to capture a variety of taxa in terms of size (or life stage) and habitat location (e.g., open water vs. benthic). ENSR (2008a) used the following gear types within each region that was sampled:

- Trawls: STPNOC conducted five tows, each for 10 minutes, with a 6.1-m (20-ft) otter trawl fitted with a 3.5-cm (1.4-in.) stretched mesh and doors (i.e., otter boards) measuring 46 cm by 91 cm (18 in. by 36 in.) attached to each wing of the net. The trawl was designed to capture benthic or demersal fishes and macroinvertebrates.
- Gill nets: STPNOC set three gill nets within 1 hour of sunset and retrieved them at sunrise the following morning. Gill nets were 91.4-m (300-ft) long, 3.0-m (10-ft) deep, and consisted of four separate panels measuring approximately 22.9-m (75-ft) in length and comprised of 2.5, 5.1, 7.6, and 10.2-cm (1, 2, 3, and 4-in.) stretched mesh connected in ascending order. The grill nets were designed to capture adult fish using open water surface habitats.
- Seines: STPNOC conducted one seine pull per sampling event. Seines were comprised of 6.4-mm (0.25-in.) mesh net and measured 30.5-m (100-ft) long and 3.0-m (10-ft) deep. Seines were designed to capture small macroinvertebrates and fish using shoreline habitats.
- Plankton nets: STPNOC conducted three oblique plankton tows through all depths of water per sampling event. It used a low speed Henson plankton net with a with a dimension of 30-cm (12-in.) mouth width by 120-cm (47-in.) length and covered with mesh size of 0.363 mm (0.014 in.). Plankton nets were designed to capture pelagic ichthyoplankton, invertebrate larvae, and small invertebrates.

ENSR (2008a) collected 11,605 fish and invertebrates using gill nets, seines, and trawls (Table 2–4). ENSR (2008a) identified 25 species of fish and invertebrates. Threadfin shad (*Dorosoma petenense*) was the most commonly collected species, representing 62 percent of all fish and invertebrates collected using gill nets, seine pulls, or trawls. Other commonly collected species include inland silverside (*Menidia beryllina*) (18 percent), rough silverside (*Membras martinica*) (12 percent), and blue catfish (*Ictalurus furcatus*) (3 percent) (ENSR 2008a). Blue crab was the most commonly collected invertebrate, and it comprised less than 1 percent of the total organisms collected using gill nets, seines, and trawls.

ENSR (2008a) collected a total of 5,362 organisms using plankton nets (Table 2–5). Greater than 99 percent of the organisms collected were invertebrates (crustaceans), and less than 1 percent was ichthoplankton (fish eggs and larvae). The most common species (84 percent of all plankton net samples) collected were Harris mud crab larvae (ENSR 2008a). ENSR (2008a) collected two fish taxa—clupeid shad (*Clupeidae* spp.) and gobi (*Gobiidae* spp.).

The fish and invertebrates collected in the MCR suggest that a robust aquatic community has developed in the MCR. This community is more representative of an estuarine river rather than a freshwater impoundment, likely because the source of fish and invertebrates is from the Colorado River during filling of the MCR.

While a diverse aquatic community exists in the MCR, its organisms no longer contribute to the riverine ecosystem because they are separate from the Colorado River. In addition, the organisms are not available for harvest, and there is no public access or use of the MCR. The USACE has determined that the MCR is not waters of the U.S. (USACE 2009), and TCEQ has stated that the MCR is not waters of the State (TCEQ 2007).

Table 2–4. Fish and Invertebrates Collected in the MCR by Gill Nets, Seines, and Trawls, 2007 to 2008.

Common Name Fish	Scientific Name	Gill Net	Seine	Trawl	Total	% of Total
Atlantic croaker	*Micropogonias undulatus*	17		86	**103**	<1
Black drum	*Pogonias cromis*	26			**26**	<1
Blue catfish	*Ictalurus furcatus*	308	35	50	**393**	3
Bluegill	*Lepomis macrochirus*		31		**31**	<1
Channel catfish	*Ictalurus punctatus*	3	21	6	**30**	<1
Common carp	*Cyprinus carpio carpio*	97		9	**106**	<1
Freshwater drum	*Aplodinotus grunniens*	7	3	39	**49**	<1
Gizzard shad	*Dorosoma cepedianum*		45	28	**73**	<1
Gulf menhaden	*Brevoortia patronus*	4		1	**5**	<1
Inland silverside	*Menidia beryllina*		2,068		**2,068**	18
Ladyfish	*Elops saurus*	36	1		**37**	<1
Gray (mangrove) snapper	*Lutjanus griseus*	2			**2**	<1
Naked goby	*Gobiosoma bosc*		3		**3**	<1
Needlefish	*Strongylura exilis*		1		**1**	<1
Pinfish	*Lagodon rhomboides*		3	1	**4**	<1
Red drum	*Sciaenops ocellatus*	1			**1**	<1
Rough silverside	*Membras martinica*		1,362		**1,362**	12
Sheepshead minnow	*Cyprinodon variegatus*		4		**4**	<1
Smallmouth buffalo	*Ictiobus bubalus*	2			**2**	<1
Spotted gar	*Lepisosteus oculatus*		1	2	**3**	<1
Striped mullet	*Mugil cephalus*	1	41		**42**	<1
Threadfin shad	*Dorosoma petenense*		6,463	768	**7,231**	62
White mullet	*Mugil curema*		7		**7**	<1
Invertebrates						<1
Blue crab	*Callinectes sapidus*	11	2	6	**19**	<1
Rangia clam	*Rangia cuneata*			3	**3**	<1
Total		**515**	**10,091**	**999**	**11,605**	

Source: ENSR 2008a

Table 2–5. Fish and Invertebrates Collected in the MCR by Plankton Tows, 2007 to 2008

Common Name Fish	Taxa	Total	% of Total
Clupeid shad	Clupeidae spp.	15	<1
Gobi	Gobiidae spp.	2	<1
Invertebrates			
Water flea	Cladocera spp.	8	<1
Amphipods	Amphipoda spp.	1	<1
Copepods	Copepoda spp.	22	<1
Fish lice	Branchiura spp.	1	<1
Decapods	Panopeidae spp.	539	10
Harris mud crab	*Rhithropanopeus harrissi*	4,582	85
Decapod zoea	Decapoda spp.	153	3
Brachyuran decapod	*Brachyura* spp.	29	1
Mysid shrimp	*Mysida* spp.	2	<1
Bivalvia	Bivalvia spp.	3	<1
Unidentified		**5**	**<1**
Total		**5,362**	

Source: ENSR 2008a

Essential Cooling Pond. The ECP is a 46-ac (19-ha) cooling pond and serves as the ultimate heat sink for Units 1 and 2. ENSR (2002) conducted a survey of the ECP and indentified two fish species: sailfin molly (*Poecilia latipinna*) and sheepshead minnow (*Cyprinodon variegates*). ENSR (2002) captured fewer fish near the discharge structure compared to elsewhere in the ECP. ENSR (2007, 2008c) identified sailfin molly and sheepshead minnow in the main drainage channel (MDC) and the Colorado River, and ENSR (2008a) indentified sheepshead minnow in the MCR.

Other Aquatic Features. Other onsite aquatic features include the Little Robbins Slough, wetlands, Kelly Lake, and drainage areas.

Little Robbins Slough is a stream that flows across the site, from the northwest corner, along the western edge of the MCR embankment, and then out the southwest corner. This water flow is critical to the function and structure of the marshes both on site and south of the site (Mad Island Wildlife Management Area (WMA) and Clive Runnells Family Mad Island Marsh Preserve). These marshes provide nursery grounds for juvenile fish and shellfish. The water from Little Robbins Slough eventual flows into the GIWW.

Kelly Lake is located in the northeast edge of the MCR embankment (STPNOC 2010d). The lake covers approximately 34 ac (14 ha) and is primarily fed by drainage areas but may also receive groundwater discharge (STPNOC 2010d). The NRC staff is not aware of any aquatic ecology surveys of Kelly Lake (NRC 1975, 1986, 2011b; STPNOC 2010b).

The STP site also includes numerous drainage areas, many of which are man-made ditches (NRC 2011b). NRC (1975, 1986) included a description of the prevalent aquatic communities on the STP site in drainage areas. The most common species from these studies include the following: grass shrimp (*Palaemonetes kadiakensis*; also known as Mississippi grass shrimp), crayfish (possibly of several genera), blue crab, red shiner (*Cyprinella lutrensis*), mosquitofish (*Gambusia affinis*), silverband shiner (*Notropis shumardi*), sailfin molly, green sunfish (*Lepomis cyanellus*), warmouth (L. gulosus), bluegill (*L. macrochirus*), white crappie (*Pomoxis annularis*), tidewater silverside (*Menidia peninsulae*), striped mullet, and several species of killifish (Family Cyprinodontidae, likely *Lucania* spp. and *Fundulus* spp.). NRC (1975, 1986) reported aquatic invertebrates, such as the early life stages of midges, beetles, mayflies, biting midges, dragonflies, and damselflies. The fish and invertebrates found in drainage areas are common species along the Texas coastline, and most are generally tolerant of salinity and water temperature fluctuations (Hassan-Williams and Bonner 2009; NRC 1975, 1986, 2011b; STPNOC 2010d; Thomas et al. 2007).

More recently, ENSR (2007) conducted a rapid bio-assessment of the MDC. The MDC is a 150-m (492-ft) unlined channel that runs north of the proposed STP, Units 3 and 4, power block, crosses the existing railroad track, and eventually joins the Little Robbins Slough west of the MCR (ENSR 2007; NRC 2011b). STPNOC relocated the MDC further north of the proposed STP, Units 3 and 4, power block as part of STPNOC's proposal to build Units 3 and 4 (STPNOC 2010e). There is no continual flow of water in the MDC. Saturated soils and possible groundwater support shallow pooled areas. Water depth increases during rain events, and water drains into Little Robbins Slough during high flows (ENSR 2007; NRC 2011b).

ENSR (2007) conducted the survey using seine nets and followed a modified version of EPA's rapid bioassessment protocols (Barbour et al. 1999). ENSR (2007) identified 11 fish taxa, 2 invertebrate taxa, and 1 turtle. The three most common species were largemouth bass (*Micropterus salmoides*), mosquitofish, and sailfin mollies. Other species included other sunfish species (redear sunfish (*Lepomis microlophus*), pumpkinseed (*L. gibbosus*), and bluegill), killifish (Bayou killifish (*undulus pulverous*), Gulf killifish (*Fundulus grandis*), sheepshead minnows), gobies (*Gobiidae*), inland silverside, crayfish (several genera occur in the area, e.g., *Procambarus* spp.), grass shrimp, and red eared slider (*Chrysemys scripta*). Similar to the fish and invertebrates that inhabited drainages areas in 1970s and 1980s, the taxa found in the MDC are common species along the Texas coastline, and most are generally tolerant of salinity and water temperature fluctuations (Barbour et al. 1999; Ross 2001; STPNOC 2010d).

2.2.6.3 Transmission Lines

Power generated from STP during the proposed license renewal term would be transmitted using existing transmission line corridors. The transmission corridors pass through forested, agricultural, and grasslands typical of the Texas coastal prairie (STPNOC 2010b). The water bodies crossed by the transmission corridors include small rivers, small streams, agricultural ponds, drainage areas, and wetlands (NRC 1975). The NRC staff is not aware of any aquatic surveys conducted along these corridors. The staff's review of the terrain along the Hillje transmission line during a pre-application site visit for the proposed STP, Units 3 and 4, did not indicate any notable aquatic features within that region of the corridor (NRC 2008a). Observed water bodies included wetlands and small ponds. Aquatic species in the water bodies along the transmission corridors are likely similar to those communities typically found along the coastal plain and are likely tolerant to temporary changes in water quality (NRC 2011b; STPNOC 2010d).

2.2.7 Terrestrial Resources

STP Ecoregion. Beginning in the 1980s, the USGS, EPA, the Commission for Environmental Cooperation, and various other Federal agencies and interagency groups have begun delineating North American ecoregions to provide a common geographical framework by which to assess and manage the environment. Ecoregions are divided into Levels I through IV; Level I encompasses large areas of land and is the broadest category, while Level IV is the most specific. Ecoregions are delineated by many factors to include location, climate, vegetation, hydrology, terrain, wildlife, and land use. The STP site lies within the following Level I through IV ecoregions:

- Level I: Great Plains,
- Level II: Texas–Louisiana Coastal Plains,
- Level III: Western Gulf Coastal Plain, and
- Level IV: Floodplains and Low Terraces.

The Great Plains cover the majority of the midwestern states and are broadly characterized by a subhumid to semiarid climate, shortgrass and tallgrass prairie, and little topographic relief (EOE 2008). Within the Great Plains, the Texas-Louisiana Coastal Plains contain flat coastal plains, barrier islands, dunes, beaches, bays estuaries, and tidal marshes (Wiken et al. 2011). Historically, tallgrass prairie dominated the region. Within these coastal plains, STP lies within the floodplains and low terraces of the Western Gulf Coastal Plain, a 50- to 90-mi (80- to 140-km) wide strip of flat land adjacent to the Gulf of Mexico (Griffith et al. 2007). The Western Gulf Coastal Plain comprises 1,743 ac (705 ha), with an elevation range of 5 to 200 ft (2 to 60 m) above MSL (Griffith et al. 2007). The terrain is relatively flat, and grasslands dominate undeveloped areas. Inland regions contain some forested land and savannah lies inland, but the majority of this ecoregion is used as cropland for rice, cotton, and soybeans (Griffith et al. 2007). Other natural features include sloughs, natural levees, and alluvial terraces, as well as low gradient streams.

Natural habitats include deciduous bottomland forest and swamps. Maintained lands include cropland and pastureland. Common bottomland tree species include pecan (*Carya illinoensis*), water oak (*Quercus nigra*), southern live oak (*Q. virginiana*), and elm (*Ulmus* spp.) (Griffith et al. 2007). Baldcypress (*Taxodium distichum*), black hickory (*C. texana*), post oak (*Q. stellata*) and winged elm (*U. alata*) also grow in this region but are not as common (Griffith et al. 2007). Coastal marshes contain cordgrass (*Spartina* spp.), saltgrass (*Distichlis spicata*), needlerush (*Juncus* spp.), and saltmarsh bulrush (*Scirpus paludosus*) (Wiken et al. 2011). Common wildlife species include white-tailed deer (*Odocoileus virginianus*), ocelots (*Leopardus pardalis*), jaguarondi (*Puma yagouaround*), coyote (*Canis latrans*), ringtail cat (*Bassariscus astutus*), armadillo (*Asypus novemcinctus*), peccary (*Pecari tajacu*), swamp rabbit (*Sylvilagus aquaticus*), American alligator (*Alligator mississippiensis*), ferruginous pygmy-owl (*Glaucidium brasilianum*), green jay (*Cyanocorax yncas*), Altamira oriole (*Icterus gularis*), Attwater's prairie-chicken (*Tympanuchus cupido attwater*), whooping cranes (*Grus americana*), and various species of ducks and geese (Wiken et al. 2011).

STP Site. The STP site occupies about 12,220 ac (4,950 ha) immediately west of the Colorado River and approximately 10 mi (16 km) from the river's confluence with Matagorda Bay (STPNOC 2010b). Of that 12,220 ac (4,950 ha), the MCR occupies 7,000 ac; the STP buildings, warehouses, and infrastructure occupy about 300 ac (120 ha); and the ECP occupies 46 ac (19 ha). The remaining land is undeveloped and includes bottomland, agricultural and pastureland, wetlands, mixed grasslands, and shrub scrub. ENSR conducted an ecological survey of the STP site between 2006 and 2008. The NRC staff derived the majority of the information presented in this section from this assessment.

Along the Colorado River, on the eastern boundary of the STP site, lies about 1,176 ac (476 ha) of bottomland forested habitat that contains a mixture of trees, shrubs, and grasses. Dominant tree species include sugarberry (*Celtis laevigata*), pecan, cottonwood (*Populus* spp.), water oak, southern live oak, American elm (*Ulmus americana*), willow (*Salix* spp.), and Chinese tallow (*Sapium sebifera*). Common shrub species include yaupon (*Ilex vomitoria*), Chinese privet (*Ligustrum sinense*), McCartney rose (*Rosa meizeli*), and American beautyberry (*Callicarpa americana*). Grassy areas contain woodoats (*Chasmanthium latifolium*), carpet grass (*Axonopus affinis*), crab grass (*Digitaria* spp.), broomsedge, and Bermuda grass (*Cynodon dactylon*). Another 53-ac (21-ha) forested area lies on the STP site north of the heavy haul road. The dominant species are the same as in the larger bottomland area (ENSR 2008b).

Within the west and north of the developed portion of the site lies 976 ac (395 ha) of scrub shrub. Sea-myrtle (*Baccharis halimifolia*), goldenrod (*Solidago* spp.), ragweed (*Ambrosia* spp.), aster (*Aster* spp.), southern dewberry (*Rubus trivialis*), peppervine (*Ampelopsis arborea*), and sumpweed (*Iva annua*) are the most common vegetation (ENSR 2008b).

About 486 ac (197 ha) of the site is mixed grasslands, some of which STPNOC regularly mows or maintains. Common grass species in these areas include angleton bluestem (*Dichanthium aristatum*), King Ranch bluestem (*Bothriochloa ischaemum* var. *songarica*), and bristle grass (*Setaria* spp.) (ENSR 2008b).

Many wetlands exist on the site, some of which the USACE has determined to be jurisdictional wetlands. The non-jurisdictional wetlands include Kelly Lake and a 110-ac (45-ha) managed wetland along the northern portion of the site.

Kelly Lake is a 34-ac (14-ha) natural water body within the northeast corner of the site along the MCR embankment. It is fed by a small catchment area north of the lake. At least two drainages flow into the lake, and one drainage flows south along the east site of the MCR embankment and exits the lake (NRC 2011b). Cattail (*Typha* spp.) and arrowhead (*Sagittaria* spp.) surround Kelly Lake (NRC 2011b).

The 110-ac (45-ha) managed wetland is part of the larger Texas Prairie Wetland Project, a series of at least 35,000 ac (14,100 ha) of wetlands along the Gulf coasts that have been set aside or restored through a partnership with Ducks Unlimited, the Texas Parks and Wildlife Department, the U.S. Fish and Wildlife Service, the U.S. Department of Agriculture, and private landowners (Ducks Unlimited 2006). This wetland provides forage and wintering habitat for waterfowl, wading birds, and shorebirds (STPNOC 2010b). Houston Lighting and Power Company (HPLC), on behalf of STP, signed an agreement in October 1996 with Ducks Unlimited to manage and restore or enhance this portion of the STP property as part of the Texas Prairie Wetlands Project (Ducks Unlimited and HPLC 1996). As part of the agreement, HPLC committed to developing and managing the 110 ac (45 ha) to provide seasonal or semi-permanent wetland habitat for wintering migratory birds and other wetland-dependent wildlife (Ducks Unlimited and HPLC 1996). HPLC also built multiple impoundments to create foraging habitat (Ducks Unlimited and HPLC 1996).

The jurisdictional wetlands include 29 small wetlands within the northern portion of the site, most of which are ditches or depression wetlands (USACE 2009). The largest delineated wetland is 3.78 ac (1.53 ha), and 16 of the delineated wetlands are less than 0.5 ac (0.2 ha) (ENSR 2008b). In total, jurisdictional wetlands cover 17.6 ac (7.1 ha) (USACE 2009). Dominant wetland vegetation includes spikerush (*Eleocharis* spp.), cattail (*Typha* spp.), water hyssop (*Bacopa monnieri*), knotgrass (*Polygonum* spp.), bushy bluestem (*Andropogon* *glomeratus*), sea-myrtle, and rattlebox (*Crotalaria* spp.) (ENSR 2008b). Additionally, the USACE has designated 24,639 linear feet (7,510 linear meters) of non-wetland areas as jurisdictional waters.

The most common wildlife on the site include white-tailed deer, rabbit (*Silvilgus* spp.), squirrel (*Sciurus* spp.), and feral hogs (*Sus scrofa*) (STPNOC 2010b). Cardinals (*Cardinalis cardinalis*), mourning doves (*Zenaida macroura*), bobwhite quail (*Colinus virginianus*), red-winged blackbirds (*Agelaius phoeniceus*), grackles (*Quiscalus* spp.), black vultures (*Coragyps atratus*), and turkey vultures (*Cathartes* aura) are the most common birds. Wading birds, such as great blue heron (*Ardea herodias*), great egret (*Ardea alba*), roseate spoonbill (*Ajaia ajaja*), white ibis (*Eudocimus albus*), and little blue heron (*Egretta caerulea*), are common near Kelly Lake, the MCR, and other water features (STPNOC 2010b). American alligators, discussed in more detail in Section 2.2.7, regularly inhabit the site. Other common reptiles include the copperhead snake (*Agkistrodon contortrix contortrix*), cottonmouth snake (*A. piscivorus*), eastern hog-nosed snake (*Heterodon platirhinos*), eastern racer (*Coluber constrictor*), corn snake (*Elaphe guttata*), eastern rat snake (*E. obsoleta*), diamondback watersnake (*Nerodia rhombifer rhombifer*), eastern box turtle (*Terrapene carolina*), ornate box turtle (*T. ornata*), snapping turtle (*Chelydra serpentina*), red-eared pond slider (*Trachemys scripta elegans*), green anole (*Anolis carolinensis*), and five-lined skink (*Eumeces fasciatus*) (NRC 2011b).

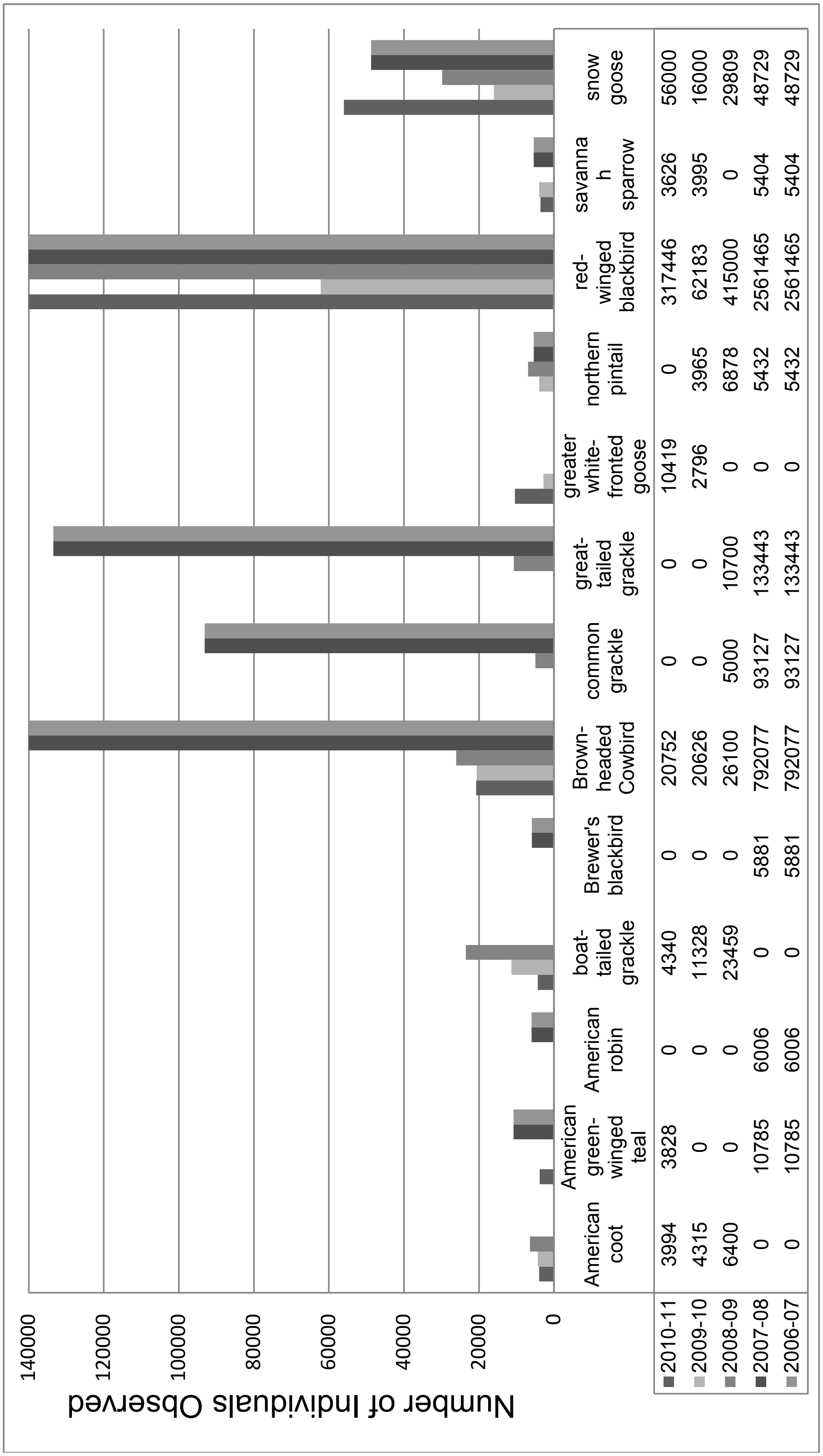
Each year, Matagorda County hosts a Christmas Bird Count, a volunteer bird count organized by the Audubon Society that runs from December 14 through January 5 of each year. The count centers on Mad Island and encompasses about 113,000 ac (45,700 ha) within a 15-mi (24-km) radius. Because the STP site lies near the southern terminus of the Central Flyway, a great diversity of birds inhabit or pass through the site and surrounding region, and the region provides important stopover and wintering habitat for migrating birds. During the 2010 to 2011 bird count, participants recorded 231 different bird species (Audubon 2011). Within the past 5 years of bird count data, red-winged blackbirds (*Agelaius phoeniceus*) and brown-headed cowbirds (*Molothrus ater*) accounted for the overwhelming majority (70 and 19 percent, respectively) of recorded observations. Figure 2–5 identifies the most commonly observed species in the past 5 years of Christmas Bird Counts. The birds in this figure were of the top 10 most commonly recorded species for at least 2 years out of the past five Christmas Bird Counts. In addition to the bird species in Figure 2–5, six additional species appeared in the top 10 recorded species for only one data year. Table 2–6 lists these species and the year and number of each.

Table 2–6. Birds Observed in High Numbers for One Christmas Count Year, 2007 through 2011

Species	Year Recorded Within Top 10 Most Common Species	# of Individuals Recorded
American white pelican	2009–2010	1,700
blackbird spp.	2010–2011	5,115
lesser scaup	2010–2011	85,438
redhead	2008–2009	15,005
Ross’s goose	2009–2010	2,537
sandhill crane	2008–2009	10,000

Source: Audubon 2011

Figure 2–5. Most Commonly Recorded Christmas Bird Count Species, 2007 through 2011 (Audubon 2011)



	American coot	American green-winged teal	American robin	boat-tailed grackle	Brewer's blackbird	Brown-headed Cowbird	common grackle	great-tailed grackle	greater white-fronted goose	northern pintail	red-winged blackbird	savanna h sparrow	snow goose
2010-11	3994	3828	0	4340	0	20752	0	0	10419	0	317446	3626	56000
2009-10	4315	0	0	11328	0	20626	0	0	2796	3965	62183	3995	16000
2008-09	6400	0	0	23459	0	26100	5000	10700	0	6878	415000	0	29809
2007-08	0	10785	6006	0	5881	792077	93127	133443	0	5432	2561465	5404	48729
2006-07	0	10785	6006	0	5881	792077	93127	133443	0	5432	2561465	5404	48729

In addition to the data available from the Christmas Bird Counts, ENSR conducted a bird survey in 2006 and 2007 on the STP site as part of the STP, Units 3 and 4, COL application. Table 2–7 lists the bird species that ENSR observed on the STP site during this survey and the types of habitats or areas of the site in which each was associated.

Table 2–7. Birds Documented on the STP Site, 2007 through 2008

Species	Common Name	Habitat Type or Area Observed	Trans-Gulf Migrant[(a)]
Agaelaius phoeniceus	red-winged blackbird	grassland/scrub-shrub	
Anhinga anhinga	anhinga	MCR	
Ardea herodias	great blue heron	wetland/MCR	
Bubulcus ibis	cattle egret	grassland/wetlands	
Buteo jamaicensis	red-tailed hawk	grassland/scrub-shrub	
Buteo lineatus	red-shouldered	grassland/scrub-shrub	
Caracara cheriway	crested caracara	grassland	
Cathartes aura	turkey vulture	grassland/scrub-shrub/developed	
Charadrius vociferus	killdeer	grassland/developed	
Circus cyaneus	northern harrier	grassland/scrub-shrub	
Colinus virginianus	northern bobwhite	grassland/scrub-shrub	
Coragyps atratus	black vulture	grassland/scrub-shrub/developed	
Corvus brachyrhynchos	American crow	grassland/scrub-shrub	
Cyanocitta cristata	bluejay	scrub-shrub	
Dendrocygna bicolor	fulvous whistling-duck	wetland	
Egretta caerulea	little blue heron	wetlands	
Egretta thula	snowy egret	wetland/MCR	
Egretta tricolor	tri-colored heron	wetland/MCR	
Eudocimus albus	white ibis	grassland/wetlands	
Fulica americana	American coot	wetlands	
Gelochelidon nilotica	gull-billed tern	MCR	
Geothlypis trichas	common yellowthroat	scrub-shrub	x
Haliaeetus leucocephalus	bald eagle	river shoreline	
Hirundo rustica	barn swallow	grassland/developed	x
Leucophaeus atricilla	laughing gull	MCR/developed	
Megaceryle alcyon	belted kingfisher	wetlands	x

Species	Common Name	Habitat Type or Area Observed	Trans-Gulf Migrant[a]
Mimus polyglottos	northern mockingbird	MCR/developed	
Molothrus ater	brown-headed cowbird	grassland/scrub-shrub/developed	
Nycticorax nycticorax	black-crowned night-heron	grassland/scrub-shrub	
Pandion haliaetus	osprey	wetland	
Pelecanus erythrorhynchos	American white pelican	MCR	
Pelecanus occidentalis	brown pelican	MCR	
Petrochelidon pyrrhonota	cliff swallow	MCR	x
Platalea ajaja	roseate spoonbill	MCR	
Progne subis	purple martin	grassland/scrub-shrub/developed	x
Quiscalus major	boat-tailed grackle	grassland/scrub-shrub/developed	
Sturnella magna	eastern meadowlark	grassland/scrub-shrub	
Turdus migratorius	American robin	grassland	
Tyrannus forficatus	scissor-tailed flycatcher	grassland/scrub-shrub	x
Zenaida macroura	mourning dove	grassland/developed	

(a) Birds that cross the Gulf of Mexico from the Yucatan Peninsula to the Gulf coasts

Source: ENSR 2008b; NRC 2011b

Waterbirds nest on the ends “Y” dike that directs water flow in the MCR. STPNOC first observed nesting on the MCR dikes in 1986 (STPNOC 2010d). The dominate nesting species include laughing gulls (*Leucophaeus atricilla*) (53 percent) and gull-billed terns (*Gelochelidon nilotica*) (31 percent), which account for a collective 84 percent of the 1,200 to 1,600 nests per year (STPNOC 2010d). Seven additional bird species nest on the dikes with typically fewer than 100 nests each (STPNOC 2010d).

<u>Transmission Line Corridors</u>. The transmission lines traverse mostly agricultural lands, as well as forests and grasslands in 12 counties. The habitat is typical of that described previously under “STP ecoregion.” The corridors do not cross any designated critical habitat, Federal or State parks, wildlife preserves, refuges, or sanctuaries (STPNOC 2010b).

<u>Parks and Wildlife Preserves</u>. Many parks and wildlife preserves provide valuable terrestrial habitat to native migrating birds. Those in the vicinity of STP are discussed briefly below.

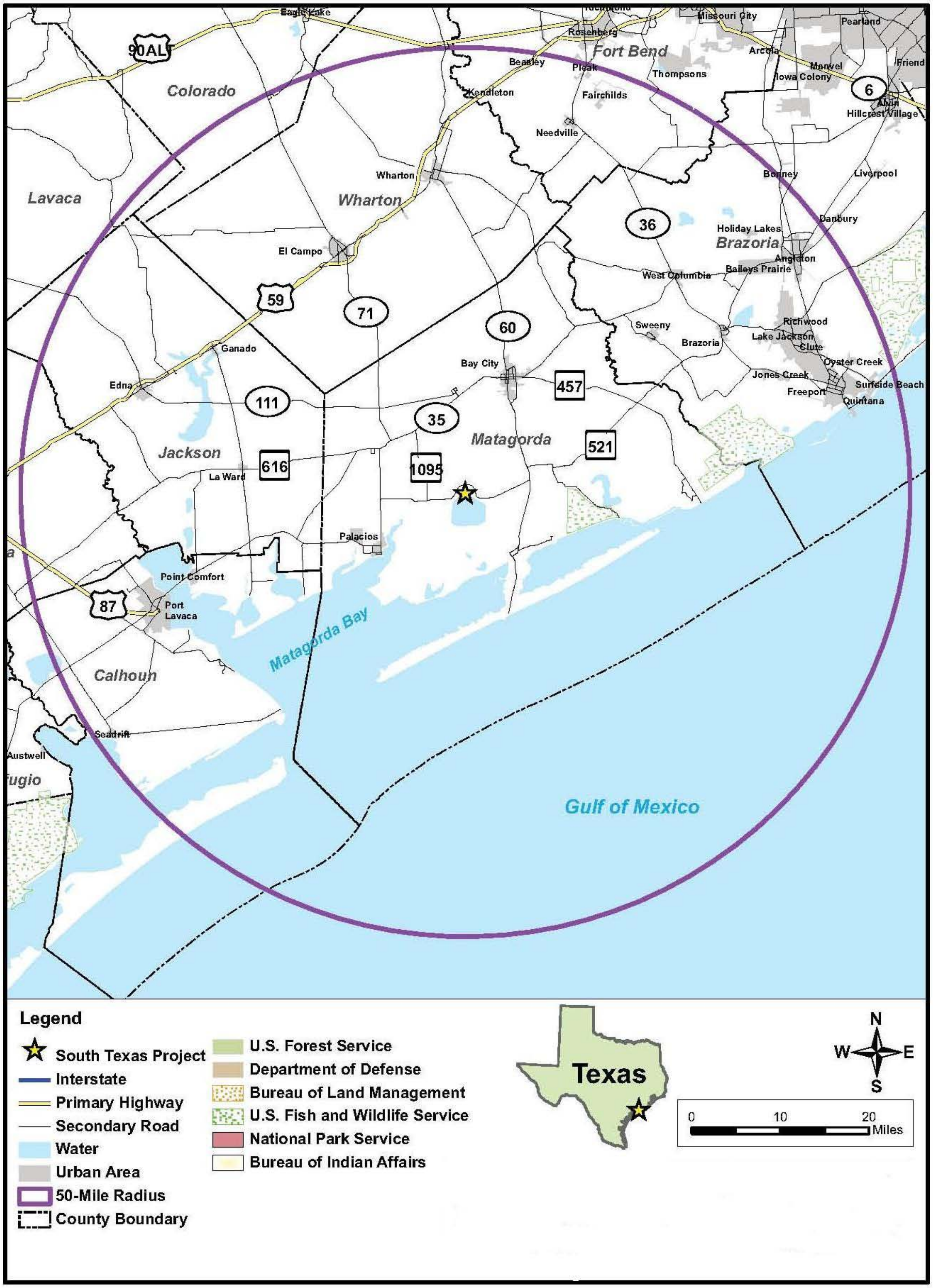
The Brazos Bend State Park is a 5,000-ac (2,000-ha) park located about 35 mi (56 km) northeast of the STP site. The Texas Parks and Wildlife Department established this park in 1976. Natural habitats include the Brazos River floodplains, upland coastal prairie, bottomland hardwood forest, seasonal freshwater marshes, and oxbow lakes (TPWD 2011a). The park is home to over 300 species of birds, 21 species of reptiles and amphibians, 17 species of mammals, 39 species of dragonflies, and 500 species of plants (TPWD 2011a).

The Mad Island Marsh Preserve lies about 4 mi (6 km) southwest of STP. This preserve is situated on West Matagorda Bay around Mad Island Lake and encompasses a total of 7,063 ac (2,860 ha) (GCBO 2011). The preserve includes coastal prairie, freshwater wetlands, tidal saltwater wetlands, and shrubland. The Gulf Coast Bird Observatory has recorded over 300 species of birds within the preserve, including sandhill cranes (*Grus canadensis*), cinnamon teal (*Anas cyanoptera*), blue-winged teal (*A. discors*), northern pintail (*A. acuta*), Canada goose (*Branta canadensis*), and snow goose (*Chen caerulescens*) (GCBO 2011). Many habitat restoration and enhancement projects within this preserve—including prescribed burns, erosion control, and rotational cattle grazing in limited areas—continue to enhance the value of the habitat.

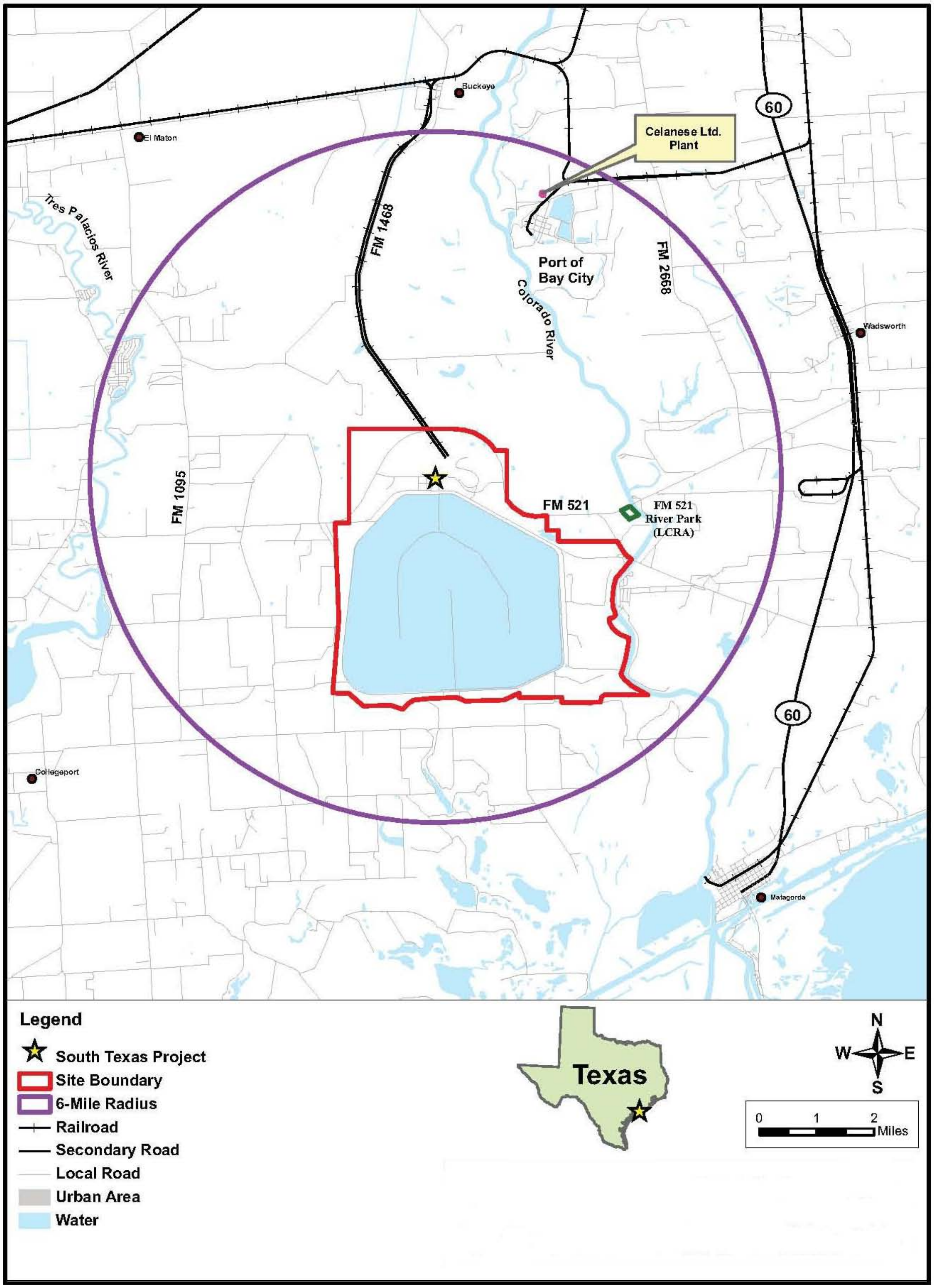
The Texas Parks and Wildlife Department manages the 7,200-ac (2,900-ha) Mad Island Wildlife Management Area, which lies about 3 mi (5 km) south of STP (TPWD 2011d). The State of Texas purchased this parcel of land to preserve coastal wetland habitat for wintering waterfowl. The management area contains brackish marsh and coastal prairies and provides habitat for a wide variety of wildlife

The U.S. Fish and Wildlife Service (FWS) manages the Big Boggy National Wildlife Refuge, which lies about 10 mi (16 km) southwest of STP (FWS 2011c). Figure 2–6 and Figure 2–7 show the STP 50-mi (80-km) radius map (STPNOC 2010b) and STP 6-mi (10-km) radius map (STPNOC 2010b), respectively. The FWS established this 4,526-ac (1,832-ha) refuge in 1983 to protect saltmarsh habitat for migratory birds. Within the refuge, Dressing Point Island in East Matagorda Bay is an important rookery for brown pelicans, roseate spoonbills, white ibis, snowy egrets, and other colonial nesting birds.

Figure 2–6. STP 50-mi (80-km) Radius Map (STPNOC 2010b)



1 **Figure 2–7. STP 6-mi (10-km) Radius Map (STPNOC 2010b)**



2

2.2.8 Protected Species and Habitats

This section discusses species and habitats that are:

- Federally protected under the Endangered Species Act (ESA) of 1973, as amended;
- designated as a species of concern under the National Marine Fisheries Service (NMFS)'s Species of Concern Program;
- Federally protected under the Bald and Golden Eagles Protection Act of 1940, as amended;
- Federally protected under the Migratory Bird Treaty Act of 1918 (MBTA), as amended;
- Federally protected under the Magnuson–Stevens Fishery Conservation and Management Act (MSA), as amended;
- Federally protected under the Marine Mammal Protection Act (MMPA) of 1972, as amended; or
- State-protected under Title 5, *Wildlife and Plant Conservation*, Chapter 68, *Endangered Species*, and Chapter 88, *Endangered Plants*, of the State of Texas's Statutes.

2.2.8.1 Species and Habitats Protected Under the Endangered Species Act

The FWS and the NMFS jointly administer the ESA. The FWS manages the protection of and recovery effort for listed terrestrial and freshwater species, while the NMFS manages the protection of and recovery effort for listed marine and anadromous species. Table 2–8 identifies species under the FWS and NMFS's jurisdiction that occur in Matagorda County, in which STP is located, or within one of the 12 counties through which the transmission line corridors traverse.

Table 2–8. Species Listed Under the ESA

Species	Common Name	Status[a]		Potential Occurrence[b]	
		Federal	State	Matagorda County	T-line Counties
Amphibians					
Bufo houstonensis	Houston toad	E	E		x
Eurycea nana	San Marcos salamander	T	T		x
Typhlomolge rathbuni	Texas blind salamander	E	E		x
Arachnids					
Cicurina baronia	Robber Baron Cave meshweaver	E	-		x
Cicurina madla	Madla Cave meshweaver	E	-		x
Cicurina venii	braken bat cave meshweaver	E	-		x
Cicurina vespera	Government Canyon bat cave meshweaver	E	-		x

Species	Common Name	Status[a]		Potential Occurrence[b]	
		Federal	State	Matagorda County	T-line Counties
Neoleptoneta microps	Government Canyon bat cave spider	E	-		x
Texella cokendolpheri	Cokendolpher cave harvestman	E	-		x
Birds					
Charadrius melodus	piping plover	T	T	x	x
Dendroica chrysoparia	golden-cheeked warbler	E	E		x
Falco femoralis septentrionalis	northern aplomado falcon	E	E	x	x
Grus americana	whooping crane	E	E	x	x
Tympanuchus cupido attwateri	Attwater's greater prairie-chicken	E	E		x
Vireo atricapilla	black-capped vireo	E	E		x
Crustaceans					
stygobromus pecki	Peck's cave amphipod	E	-		x
Fish					
Etheostoma fonticola	fountain darter	E	E		x
Gambusia georgei	San Marcos gambusia	E	E		x
Pristis pectinata	smalltooth sawfish	E	E	x	
Pristis pristis	largetooth sawfish	E	-	x	
Insects					
Batrisodes venyivi	helotes mold beetle	E	-		x
Heterelmis comalensis	Comal Springs riffle beetle	E	-		x
Rhadine exilis	unnamed beetle	E	-		x
Rhadine infernalis	unnamed beetle	E	-		x
Stygoparnus comalensis	Comal Springs dryopid beetle	E	-		x
Mammals					
Balaenoptera borealis	sei whale	E	-	x	
Balaenoptera musculus	blue whale	E	-	x	
Balaenoptera physalus	finback whale	E	E	x	
Herpailurus yaguarondi cacomitli	Gulf coast jaguarundi	E	E		x
Leopardus pardalis	ocelot	E	E	x	x
Megaptera novaeangliae	humpback whale	E	E	x	

Species	Common Name	Status[a]		Potential Occurrence[b]	
		Federal	State	Matagorda County	T-line Counties
Physeter macrocephalus	sperm whale	E	-	x	
Trichechus manatus	West Indian manatee	E	E	x	
Plants					
Spiranthes parksii	Navasota ladies' tresses	E	E		x
Spiranthes parksii	Texas wild rice	E	E		x
Reptiles					
Alligator mississipiensis[c]	American alligator	T(SA)	-	x	x
Caretta caretta	loggerhead sea turtle	T	T	x	
Chelonia mydas	green sea turtle	T	T	x	
Dermochelys coriacea	leatherback sea turtle	E	E	x	
Eretmochelys imbricata	hawksbill sea turtle	E	E	x	
Lepidochelys kempii	Kemp's ridley sea turtle	E	E	x	

[a] E=endangered; P=proposed; T=threatened; T(SA)=threatened due to similarity of appearance; - = not listed

[b] The STP site is located in Matagorda County. The transmission lines associated with the STP site traverse Matagorda County as well as Bexar, Brazoria, Colorado, DeWitt, Fayette, Gonzales, Guadalupe, Jackson, Lavaca, Wharton, and Wilson Counties.

[c] The American alligator is designated as threatened due to its similarity of appearance with the American crocodile (*Crocodylus acutus*).

Sources: FWS 2011a, 2011b; NMFS 2011c; NRC 2011b; STPNOC 2010b; TPWD 2011c, 2011f

STPNOC has observed one Federally listed species on the STP site since the facility began operating—the American alligator (*Alligator mississippiensis*) (STPNOC 2010b). The FWS has designated the American alligator as "threatened due [to] similarity of appearance" with the threatened American crocodile (*Crocodylus acutus*). Additionally, two delisted species occur on the site—the bald eagle (*Haliaeetus leucocephalus*) and the brown pelican (*Pelecanus occidentalis*). This section also discusses in more detail the piping plover (*Charadrius melodus*), whooping crane (*Grus americana*), ocelot (*Leopardus pardalis*), and Gulf coast jagaurundi (*Herpailurus yaguarondi cacomitli*). None of these four species occur on the STP site (STPNOC 2010b), but the FWS has designated piping plover as critical habitat along Matagorda Bay about 7 mi (11 km) south of the STP site. Additionally, the FWS identified the whooping crane, ocelot, and Gulf coast jagaurundi as species of interest in its correspondence with the NRC (FWS 2011b). The NRC staff did not identify any proposed species or proposed critical habitat in the vicinity of the STP site or along the transmission line corridors during its environmental review.

American Alligator. The FWS listed the American alligator in 1967 under the Endangered Species Preservation Act of 1966, the predecessor regulation to the ESA. Following reclassification actions in several states, the FWS declared the species fully recovered in 1987 and reclassified it as "threatened due to similarity of appearance" to the American crocodile (*Crocodylus acutus*) throughout the remainder of the species' range (52 FR 21059). American alligators inhabit coastal swamps from North Carolina southward and around the Gulf of Mexico as far west as Texas (Audubon 2004). They also inhabit coastal flatlands as far north as Arkansas (Audubon 2004).

Alligators inhabit the wetlands on the STP site as well as the MCR (STPNOC 2010b). During a 1987 to 1988 ecological study, Baker and Greene (1989) observed small numbers of alligators near Kelly Lake, the south drainage canal, Little Robins Slough, and the various dikes associated with the MCR. In 2007 through 2008, ENSR (2008b) did not observe any Federally listed species during a threatened and endangered species survey. However, ENSR conducted this survey during the winter months, during which time alligators are less active and likely seek refuge in swamps and wetlands near the STP site that provide more shelter.

Piping Plover and Designated Critical Habitat. Piping plover is a Federally and State-listed threatened species that winters along the Gulf of Mexico coast. A recent study of the taxonomy of the species (Miller et al. 2009) confirmed genetic uniqueness of only two subspecies—Atlantic (*C.m. melodus*) and Interior (*C.m. circumcinctus*). The FWS recognizes three distinct population segments in its ESA rulemakings—the Atlantic Coast, the Great Lakes, and the Northern Great Plains populations (FWS 2009). The Atlantic Coast population is *C.m. melodus*, while the Great Lakes and Northern Great Plains populations are *C.m. circumcinctus*.

The Texas coast provides wintering habitat for all three distinct population segments between September and March. Piping plovers inhabit wide, flat, open, sandy beaches and nest in small creeks and wetlands (FWS 2011d) such as those found along the Texas coast. STPNOC (2010b) reported that it has not observed the species on the STP site; however, the species inhabits the nearby shoreline of Matagorda Bay and the Gulf of Mexico.

STP is in close proximity to four units of designated piping plover critical habitat. The closest critical habitat unit is TX-26, Colorado River Diversion Delta, which consists of 13 ac (5 ha) that follow the shore of the northeast corner of West Matagorda Bay from Culver Cut to Dog Island Reef (66 FR 36038). This unit is about 7 mi (11 km) south of the STP site boundary. It includes roosting areas and is infrequently inundated by seasonal winds. The other three units are (66 FR 36038):

(1) TX-23, West Matagorda Peninsular Beach—769 ac (311 ha) of Gulf of Mexico shoreline from the Matagorda Ship Channel jetties to the old Colorado River channel,

(2) TX-25, West Matagorda Bay and Eastern Peninsula Flats—575 ac (232 ha) following the bayside of Matagorda Peninsula from Maverick Slough southwest for 3 mi (5 km), and

(3) TX-27, East Matagorda Bay and Matagorda Peninsular Beach West—728 ac (295 ha) of Gulf of Mexico shoreline from the mouth of the Colorado River northeast along the peninsula for 14 mi (23 km).

Within these units, only the areas that contain “primary constituent elements” (the physical and biological landscape features that a species requires to survive and reproduce) are considered critical habitat (FWS 2000). Therefore, buildings, marinas, parking lots, and other developed areas do not constitute critical habitat.

Other Federally Listed Species. In addition to the species discussed above, in its correspondence with the NRC, the FWS (2011b) provided information and recommendations concerning three additional Federally listed species—the whooping crane, the ocelot, and the Gulf coast jaguarundi.

The whooping crane migrates to the Texas coast between late October and mid-November and generally stays through late March to mid-April before returning to breeding grounds in Canada (FWS 2011b). Whooping cranes fly relatively high when migrating (1,000 to 6,000 ft (300 to

1,800 m) in altitude) but will fly lower when searching for stopover habitat (FWS 2011b). The species is present in Matagorda County as well as all counties through which the transmission lines traverse. However, the whooping crane has not been observed on the STP site and is unlikely to use the inland habitat on the site (NRC 2011b).

The ocelot and the Gulf coast jaguarundi inhabit dense, low brush. The ocelot requires 70 to 90 percent canopy cover, while the Gulf coast jaguarundi tolerates more open habitat (FWS 2011b). The ocelot historically occurred throughout southern Texas but is now restricted to southern Edwards Plateau and along the Coastal Plain (TPWD 2011e). The Gulf coast jaguarundi's available habitat has also diminished, and the cat now only occurs in the Rio Grande Valley within Cameron and Willacy Counties (TPWD 2011b). Neither of these species occurs on the STP site nor are they likely to occur along the transmission line corridors since the transmission lines pass through mostly agricultural lands. Additionally, since the transmission line corridors have been maintained for early successional habitat since their construction, they do not provide suitable habitat for either the ocelot or Gulf coast jaguarundi.

For the remaining Federally listed species that appear in Table 2–8, the FWS (2011b) did not note any of the remaining species under its jurisdiction either to occur on the STP site or to potentially be affected by the proposed license renewal. Though some of the marine species under NMFS's jurisdiction listed in Table 2–8 may occur in Matagorda Bay, none of these species would occur in the Colorado River due to their habitat requirements. Additionally, STPNOC (2010b) did not report occurrences of any of these species on the STP site. Therefore, these species are not discussed in detail.

2.2.8.2 Species Designated as NMFS Species of Concern

The NMFS established a Species of Concern Program and species of concern list in 2004 to distinguish between candidate species under the ESA and other species that the NMFS identifies as potentially at risk but for which no ESA listing action has been initiated (69 FR 19975). The NMFS defines "species of concern" as "those species about which the NMFS has some concerns regarding threats to continued existence and population status, but for which insufficient information is available to initiate listing actions under the ESA (NMFS 2011d)."

The term "species of concern" does not appear in either the ESA or its implementing regulations; therefore, it does not carry any procedural or substantive protections under the ESA. Only the NMFS, and not the FWS, maintains a Species of Concern Program and species of concern list. Species of concern in the vicinity of STP appear in Table 2–9.

Table 2–9. NMFS Species of Concern

Species	Common Name	Area of Concern[(a)]	Habitat
Anthrozoa			
Oculina varicosa	ivory tree coral	Atlantic Ocean—West Indies, Bermuda, North Carolina, Florida, Gulf of Mexico, Caribbean	inhabit shallow subtidal waters, limestone rubble and ledges, and soft-bottom sloping habitats from 2–152 m in depth
Fish			
Carcharhinus obscurus	dusky shark	Atlantic Ocean; Gulf of Mexico; Pacific	surf zone to waters 400 m deep; not commonly found in estuaries due to salinity requirements

Species	Common Name	Area of Concern[(a)]	Habitat
Carcharias taurus	sand tiger shark	Atlantic Ocean; Gulf of Mexico	surf zone to depths of 25 m; shallow bays; around coral reefs
Epinephelus drummondhayi	speckled hind	Atlantic Ocean—North Carolina to Gulf of Mexico	offshore rocky bottoms with depths of 25–183 m; most common between 60–120 m
Epinephelus nigritus	warsaw grouper	Atlantic Ocean—Maine southward to Gulf of Mexico	continental shelf reefs in waters 76–219 m deep
Fundulus jenkinsi	saltmarsh topminnow	Atlantic Ocean—TX, LA, MS, AL, FL	small, tidal marshes with salinity of 1–4 ppt

(a) Areas of concern are specified by the NMFS species of concern list (NMFS 2011e).

Sources: 75 FR 25174; Aronson et al. 2008; Musick et al. 2007; NMFS 2011c; NRC 2011b; Pollard and Smith 2005; Wai and Huntsman 2006a, 2006b; WEG 2010

Ivory Tree Coral. The ivory tree coral (*Oculina varicosa*) inhabits marine waters from Cape Hatteras, North Carolina, through the Gulf of Mexico and the Caribbean. However, it is only an NMFS species of concern along the eastern U.S. coast from North Carolina through Florida. Most of the species' population is concentrated off east-central Florida, where it occurs in its deep-water form and creates thicket-type structures. The species may occur in Matagorda Bay in its shallow form, in which the coral forms a symbiotic relationship with zooxanthellae. The shallow form reproduces in July and August via broadcast spawning. Ivory tree coral suspension feeds on planktonic organisms and provides refuge for over 300 species of invertebrates. (NMFS 2010d)

Sand Tiger Shark. The sand tiger shark (*Carcharias taurus*) is a species of concern in the western Atlantic and northern Gulf of Mexico, though the species is globally distributed in all warm and temperate seas and oceans except the eastern Pacific. Tiger sharks mature at about 6 ft (1.9 m) in length and reach up to 10.4 ft (3.18 m) in length. Individuals are generally solitary but occur in schools for feeding, courtship, mating, and birthing. Females give birth to one or two pups every other year. Sand tiger sharks migrate toward the equator in fall and winter and move poleward during the summer. They prey on bony fishes, small sharks, rays, squid, crabs, and lobster. (NMFS 2010e)

Saltmarsh Topminnow. The saltmarsh topminnow (*Fundulus jenkinsi*) is a species of concern in the coastal waters of Texas, Louisiana, Mississippi, Alabama, and Florida. Saltmarsh topminnow occur in estuaries, coastal salt marshes, and back water sloughs and tolerate water with salinities of 1 to 20 ppt (NMFS 2009). Females grow up to 60 mm (2.4 in.) in length and males grow to 50 mm (1.9 in.) (NMFS 2009). The NMFS (2009) reports that no information on reproductive behavior or diet is available for this species.

Other Species of Concern. The dusky shark (*Carcharhinus obscurus*), speckled hind (*Epinephelus drummondhayi*), and warsaw grouper (*Epinephelus nigritus*) are unlikely to occur in Matagorda Bay due to their habitat requirements.

In addition to the species already discussed, the NMFS (2011c) listed the night shark as a species of concern occurring in the vicinity of STP. However, the NMFS (2010c) removed the night shark from its species of concern list in 2010. It most often occurs in waters 50 to 100 m (160 to 330 ft) deep, but it can inhabit waters as deep as 600 m (2,000 ft) (Santana et al. 2006). Because of its depth requirements, the night shark is unlikely to occur in Matagorda Bay.

2.2.8.3 Species Protected Under the Bald and Golden Eagles Protection Act

The Bald and Golden Eagle Protection Act prohibits anyone from taking bald eagles (*Haliaeetus leucocephalus*) or golden eagles (*Aquila chrysaetos*), including their nests or eggs, without an FWS-issued permit. The term "take" in the Act is defined as to "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb" (50 CFR 22.3). "Disturb" means to take action that causes injury to an eagle; decreases its productivity by interfering with breeding, feeding, or sheltering behavior; or results in nest abandonment (50 CFR 22.3).

Bald eagles are present year-round throughout Texas. Breeding populations primarily inhabit the eastern half of the State and the coastal counties from Rockport to Houston (Campbell 2003). During ecological surveys associated with the COL application for STP, Units 3 and 4, ENSR (2007) listed bald eagles as one of the bird species observed on the STP site. An active bald eagle nest lies near the site's eastern boundary in remote woodlands along the Colorado River (NRC 2011b). STPNOC (2010c) first observed this nest site in 2004. A second bald eagle nest lies within 6 mi of the STP site (NRC 2011b).

2.2.8.4 Species Protected Under the Migratory Bird Treaty Act

The FWS administers the MBTA, which prohibits anyone from taking native migratory birds or their eggs, feathers, or nests. The MBTA definition of a "take" differs from that of the ESA and is defined as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or any attempt to carry out these activities" (50 CFR 10.12). Unlike a take under the ESA, a take under the MBTA does not include habitat alteration or destruction. The MBTA protects 1,007 migratory bird species (75 FR 9282). Of these 1,007 species, the FWS allows for the legal hunting of 58 species as game birds (FWS undated). Within Texas, the Texas Parks and Wildlife Department manages migratory bird hunting seasons and associated licenses for ducks, geese, coot, rail, gallinules, snipe, woodcock, doves, and sandhill cranes. All Federally and State-listed bird species that appear in Table 2–8 and Table 2–11 are protected under the MBTA. MBTA-protected-bird species that commonly occur near the STP site are discussed in Section 2.2.6. Additionally, all U.S.-native bird species that belong to the families, groups, or species listed in 10 CFR 10.13 are protected under the MBTA.

2.2.8.5 Species Protected Under the Marine Mammal Protection Act

The MMPA established a moratorium on the direct or indirect taking of all species of marine mammals in the U.S. The MMPA defines a "take" to mean "to hunt, harass, capture, or kill." The NMFS (for whales, dolphins, porpoises, seals, and sea lions) and FWS (for walrus, manatees, otters, and polar bears) may issue take permits for takes that are incidental to commercial fishing, scientific research, and other nonfishing activities.

Under the MMPA, the NMFS and FWS manage marine mammals by identifying the "optimum sustainable population" level for each species. Those species whose populations have fallen below the optimum sustainable level are considered "depleted." Within the Gulf of Mexico, 29 marine mammals occur (NMFS 2011b; TMMSN 2011). Of these, only the bottlenose dolphin (*Tursiops truncates*) occurs within Matagorda Bay due to the bay's shallow depth. Bottlenose dolphins inhabit pelagic waters along the continental shelf and may migrate into bays, estuaries, and river mouths (NMFS 2011a). Those bottlenose dolphins found in Matagorda Bay are part of the Northern Gulf of Mexico Bay, Sound, and Estuarine Stock. According to NMFS's 2010 stock assessment (NMFS 2010a), the status of this stock is unknown because the most recent population estimates are eight or more years old, but this stock is not considered depleted. The NMFS estimates the larger Northern Gulf of Mexico Coastal stock to be 4,191 individuals as of 2007 (NMFS 2011a).

2.2.8.6 Species Protected Under the Magnuson–Stevens Act

The Gulf of Mexico Fishery Management Council (GMFMC) has designated the lower Colorado River, the GIWW, and Matagorda Bay as essential fish habitat (EFH) for many species in accordance with the MSA. These waters are collectively referred to as part of Ecoregion 5 in the GMFMC's *Final EIS for the Generic Essential Fish Habitat Amendment for Gulf of Mexico* fishery management plans (GMFMC 2004).

Table 2–10 lists those species with designated EFH within Ecoregion 5 and specifies which of those species' life stages have the potential to occur in the vicinity of STP based on each stage's life history requirements.

Table 2–10. Ecoregion 5 Species with Designated EFH

Species	Common Name	Fishery Management Plan	EFH Life Stages in Ecoregion 5[(a)]	Life Stages in the Vicinity of STP[(b)]
Scomberomorus cavalla	king mackerel	coastal migratory pelagic	all stages	juveniles
Scomberomorus maculatus	Spanish mackerel	coastal migratory pelagic	all stages	all stages
Lutjanus griseus	mangrove snapper	reef fish	all stages	all stages
Sciaenops ocellatus	red drum	red drum	all stages	all stages
Farfantepenaeus aztecus	brown shrimp	shrimp	all stages	larvae, juveniles
Farfantepenaeus duorarum	pink shrimp	shrimp	all stages	larvae, juveniles
Litopenaeus setiferus	white shrimp	shrimp	all stages	larvae, juveniles
Menippe adina	Gulf stone crab	stone crab	all stages	all stages

(a) "All stages" indicates that egg, larvae, juvenile, and adult EFH are present.

(b) The species' life stages that do not occur in the vicinity of STP were eliminated based on depth or salinity requirements or both, which are presented in GMFMC's *Final EIS for the Generic Essential Fish Habitat Amendment* for Gulf of Mexico fishery management plans (GMFMC 2004).

A brief discussion of each EFH species appears below. This section summarizes information on each species from the GMFMC's *Final EIS for the Generic Essential Fish Habitat Amendment for Gulf of Mexico* fishery management plans (GMFMC 2004) unless otherwise noted.

King and Spanish Mackerel. King mackerel (*Scomberomorus cavalla*) and Spanish mackerel (*Scomberomorus maculates*) occur in the Gulf of Mexico. Concentrated populations of king mackerel occur in the coastal waters of South Florida and Louisiana, and the most concentrated population of Spanish mackerel is off the coast of Florida. Adults of both species generally inhabit reefs and coastal waters with salinity ranging from 32 to 36 ppt. Spanish mackerel prefer waters of up to 75 m (250 ft) and will occasionally inhabit estuaries. King mackerel inhabit waters up to 200 m (660 ft), though they most often occupy waters less than 80 m (260 ft). Adult king mackerel eat jacks, snappers, grunts, halfbeaks, penaeid shrimp, squid, and—less commonly—crustaceans and mollusks. Spanish mackerel eat clupeids, engraulids, carangids, and squid. Predators of both species include pelagic sharks, little tunny, and dolphin.

King mackerel spawn over the outer continental shelf from May to October, while Spanish mackerel spawn over the inner continental shelf. Both species' eggs are pelagic and buoyant. King mackerel larvae inhabit the middle and outer continental shelf, while Spanish mackerel larvae move to the inner continental shelf. Larvae consume smaller larval fish such as carangids, clupeids, and engraulids. Young tuna and dolphins prey upon king mackerel larvae. Juveniles inhabit both offshore and estuarine waters and eat smaller fish and invertebrates. Little tunny, dolphin, and other pelagic fish prey on juveniles.

Mangrove Snapper. Larval, juvenile, and adult mangrove snapper (*Lutjanus griseus*) primarily occupy inshore habitats, such as estuaries and continental shelf waters up to 180 m (590 ft) in depth. They inhabit waters about 32 km (20 mi) offshore and inshore waters through freshwater creeks and rivers. Mangrove snappers use a wide variety of habitats, including mangrove, sandy grassbeds, and coral reefs. Mangrove snapper spawn pelagic eggs off shore near reefs from June to August. As larvae grow, they move inshore toward estuarine habitats, especially those with dense beds of Halodule and Syringodium sea grasses. As with adults, juveniles inhabit marine, estuarine, and riverine habitats. Juveniles and adults are most often found near mangroves, where they forage on small fish and crustaceans (Croker 1962; Patillo et al. 1997). Patillo et al. (1997) indicated that only adults and juvenile stages occur within Matagorda Bay and that even these stages are rare.

Red Drum. Red drum (*Sciaenops ocellatus*) occur throughout the Gulf of Mexico in shallow estuarine waters up to about 40 m (130 ft) off shore. They inhabit a variety of substrates, including seagrass, sand, mud, and oyster reefs, and can tolerate freshwater through high salinity waters. Red drum move to deep offshore waters in the fall where they spawn in inlet and bay mouths. Eggs hatch in the Gulf, and larvae make their way into estuaries where they remain until maturity. Larvae feed exclusively on mysids, amphipods, and shrimp. Juveniles most often inhabit shallow, protected waters with grassy or muddy bottoms and feed on crabs, shrimp, and small fish. As red drum grow, they shift more of their diet to crabs and eat less fish. Predators include many larger fish species, such as spot (*Leiostomus xanthrus*) and Atlantic croaker (*Micropogon undulates*), sharks, amberjacks (*Seriola* spp.), and other large piscivorous fish. Patillo et al. (1997) indicated that all life stages of red drum were common in Matagorda Bay.

Brown, White, and Pink Shrimp. Brown shrimp (*Farfantepenaeus aztecus*) inhabit rivers, estuaries, and offshore Gulf waters to depths of 100 m (330 ft). Adults spawn in spring and summer months in waters at least 18 m deep and of temperatures between 17 and 29 °C (63 to 84 °F). Eggs are demersal, and larvae are pelagic and feed on planktonic algae and zooplankton. On flood tides, larvae and juveniles move into estuaries with shallow waters and submerged aquatic vegetation. They are tolerant of a wide-range of salinities and have been recorded as occurring in waters from 0 to 70 ppt. Adults inhabit Gulf waters from mean low tide to the continental shelf in areas with silt, muddy sand, or sandy substrate.

White shrimp (*Litopenaeus setiferus*) inhabit shallower waters than brown shrimp—generally only out to a depth of 40 m (130 ft) but most often less than 27 m (89 ft). They spawn in waters of 9 to 34 m (30 to 110 ft) in spring, summer, and fall. On flood tides, larvae and juveniles move into estuaries with muddy or peat bottoms and significant amounts of detritus. Juvenile white shrimp are often more highly associated with marsh edges, and they feed on sand, detritus, organic matter, mollusk fragments, ostracods, copepods, and insect larvae. Similar to brown shrimp, white shrimp emigrate from rivers and estuaries to deeper Gulf waters as adults.

Pink shrimp (*Farfantepenaeus duorarum*) occupy deeper waters (up to 110 m (360 ft)) than either the brown or white shrimp. They spawn year-round at depths of 22 to 47 m (72 to 150 ft) and temperatures from 19.6 to 30.6 °C (67.3 to 87.1 °F). Post-larvae migrate to estuaries on the flood tides at night in the spring and fall. They inhabit seagrass and mangrove habitats where they burrow into sand and shell mud substrate and return to the water column to feed at night. Juveniles eat a wide variety of organisms, including red and blue-green algae, diatoms, dinoflagellates, polychaetes, nematodes, shrimp, mysids, copepods, isopods, amphipods, mollusks, forams, and fish. Adults move from estuaries into Gulf waters with sand and shell substrate. They are most abundant in waters with depths of 9 to 48 m (30 to 160 ft).

Gulf Stone Crab. The Gulf stone crab (*Menippe adina*) occupies bottom habitats from less than 1 m (3 ft) (shoreline) to depths of 61 m (200 ft). Adults seek out habitat in which they can burrow under the surface, including rock ledges, coral heads, seagrass patches, oyster bars, rock jetties, and artificial reefs. Adults feed mainly on oysters (Wilber 1989). Females maintain eggs on their abdomen until they hatch and become planktonic. As they metamorphose to larvae, they become epibenthic and settle to areas providing cover such as rubble and seagrass beds. Juveniles inhabit the bottom of the water column but do not burrow. Both adults and juveniles can tolerate salinities up to 33 ppt. Juveniles feed on small mollusks, worms, and crustaceans. Larvae require higher salinities of 30 to 35 ppt and warm water (greater than 86 °F (30 °C)) for optimum growth and survival. All life stages of Gulf stone crab are considered common throughout the year in Matagorda Bay (Patillo et al. 1997).

EFH Species Identified During STP Aquatic Studies. This section briefly discusses EFH species in STP aquatic studies. Section 4.5 discusses these studies in detail. Of the nine species with designated EFH, two species (brown and white shrimp) have appeared in STP impingement or entrainment samples. ENSR (2008a) collected mangrove snapper via gill net, but this species has not appeared in impingement or entrainment samples. Additionally, ENSR (2008a) observed red drum, but ENSR did not collect this species in impingement and entrainment samples or with any of the sample gears.

McAden et al. (1984, 1985) conducted studies to estimate entrainment impacts by collecting surface plankton samples in front of the RMPF. McAden et al. (1984, 1985) also conducted impingement studies by washing all organisms off two intake screens and filtering them through a dip net. Section 4.5 discusses this study’s methods in more detail. McAden et al. undertook this study to confirm the accuracy of pre-operational entrainment and impingement loss predictions for 1975 through 1976. McAden (1984) collected the post-larval stage of brown and white shrimp sporadically in very low densities. Post-larval white and brown shrimp appeared in Colorado River plankton net, trawl, and seine samples sporadically and in very low densities (McAden et al. 1983). McAden et al. (1983, 1984) also collected white shrimp in plankton net samples in the siltation basin. White shrimp appeared in impingement samples in both 1983 (16 individuals) and 1984 (4 individuals) in very low numbers (McAden et al. 1983, 1984). Brown shrimp did not appear in impingement samples in either year.

In 2007 and 2008, ENSR (2008a) conducted impingement and entrainment studies at the CWIS on the MCR from May 2007 through April 2008 as part of the STP, Units 3 and 4, COL application. Section 4.5 discusses this study’s methods. During the study, ENSR (2008a) collected two mangrove snappers via gill net in the MCR. In October 2007, mangrove snappers accounted for 2 percent of the fish in trawl samples. The species was not present, or accounted for less than 1 percent of trawl samples, for all other sample months. ENSR noted that several large schools of red drum were observed during the study, but none were collected in any of the sample gears during the study. Of the shrimp species, ENSR (2008a) collected white shrimp and brown shrimp in entrainment samples. These species made up 3 percent and less than 1 percent of total samples, respectively. ENSR did not collect any king mackerel, Spanish mackerel, pink shrimp, or Gulf stone crab in any of the study samples.

2.2.8.7 Species Protected Under State of Texas Statutes

The Texas legislature authorized the TPWD to establish a list of State-endangered species in 1973, for animals, and in 1988, for plants. Title 5, *Wildlife and Plant Conservation*, Chapter 68, *Endangered Species*, of the State of Texas's Statutes prohibits individuals from capturing, trapping, taking, or killing as well as possessing, selling, or distributing listed animal species. Chapter 88, *Endangered Plants*, prohibits individuals from collecting or selling listed plants obtained from public land without a TPWD-issued permit. Table 2–11 contains State-listed species that have the potential to occur on the STP site or along the transmission line corridors. Additionally, all Federally listed species that appear in Table 2–9 are State-protected as well.

Table 2–11. State-listed Species

			Potential Occurrence[b]	
Species	**Common Name**	**State Status[a]**	**Onsite**	**Along T-line ROWs**
Amphibians				
Eurycea latitans	Cascade Caverns salamander	T		x
Eurycea tridentifera	comal blind salamander	T		x
Birds				
Buteo albicaudatus	white-tailed hawk	T	x	x
Buteo albonotatus	zone-tailed hawk	T		x
Egretta rufescens	reddish egret	T	x	x
Falco peregrinus anatum	American peregrin falcon	T	x	x
Falco peregrinus tundrius	arctic peregrin falcon	T	x	x
Haliaeetus leucocephalus	bald eagle	T	x	x
Mycteria americana	wood stork	T	x	x
Pelecanus occidentalis	brown pelican	E	x	x
Plegadis chihi	white-faced ibis	T	x	x
Sterna fuscata	sooty tern	T	x	x
Fish				
Cycleptus elongatus	blue sucker	T	x	x
Satan eurystomus	widemouth blindcat	T		x
Trogloglanis pattersoni	toothless blindcat	T		x
Mollusks				
Lampsilis bracteata	Texas fatmucket	T		x
Quadrula aurea	golden orb	T		x
Quadrula houstonensis	smooth pimpleback	T	x	x

Species	Common Name	State Status(a)	Potential Occurrence(b)	
			Onsite	Along T-line ROWs
Quadrula petrina	Texas pimpleback	T		x
Truncilla macrodon	Texas fawnsfoot	T	x	
Reptiles				
Cemophora coccinea lineri	Texas scarlet snake	T	x	x
Crotalus horridus	timber (canebrake) rattlesnake	T	x	x
Drymarchon melanurus erebennus	Texas indigo snake	T		x
Gopherus berlandieri	Texas tortoise	T	x	x
Liochlorophis vernalis	smooth green snake	T	x	
Macrochelys temminckii	alligator snapping turtle	T		x
Phrynosoma cornutum	Texas horned lizard	T	x	x

(a) E=endangered; T=threatened

(b) The STP site is located in Matagorda County. The transmission lines associated with the STP site traverse Matagorda County as well as Bexar, Brazoria, Colorado, DeWitt, Fayette, Gonzales, Guadalupe, Jackson, Lavaca, Wharton, and Wilson Counties.

Sources: NRC 2011b; STPNOC 2010b; TPWD 2011c, 2011f

2.2.9 Socioeconomics

This section describes current socioeconomic factors that have the potential to be directly or indirectly affected by changes in operations at STP, Units 1 and 2. STP, and the communities that support it, can be described as a dynamic socioeconomic system. The communities provide the people, goods, and services required to operate the nuclear power plant. Power plant operations, in turn, provide wages and benefits for people and dollar expenditures for goods and services. The measure of a communities' ability to support STP, Units 1 and 2, operations depends on the ability of the community to respond to changing environmental, social, economic, and demographic conditions.

The socioeconomics region of influence (ROI) is defined by the area where STP, Units 1 and 2, employees and their families reside, spend their income, and use their benefits, thereby affecting the economic conditions of the region. The ROI consists of a two-county area (Brazoria and Matagorda Counties), where approximately 84 percent of STP employees reside.

STPNOC employs a permanent workforce of approximately 1,378 workers at STP, Units 1 and 2, with approximately 84 percent living in Brazoria and Matagorda Counties (see Table 2–12) (STPNOC 2010b). Of the remaining 16 percent of the workforce, most are divided among 18 counties across Texas and other states, with numbers ranging from 1 to 62 employees per county. Given the residential locations of STP, Units 1 and 2, employees, the most significant impacts of plant operations are likely to occur in Brazoria and Matagorda Counties. The focus of the socioeconomic impact analysis in this SEIS is, therefore, on the impacts of continued STP, Units 1 and 2, operations on these two counties.

Table 2–12. STP, Employee Residence by County

County	# of Employees	% of Total
Brazoria	298	22
Matagorda	851	62
Fort Bend	54	4
Wharton	62	4
Other	96	7
Other states	17	1
Total	**1,378**	**100**

Source: STPNOC 2010b

Refueling outages at STP, Units 1 and 2, normally occur at 18-month intervals. During refueling outages, site employment increases by as many as 1,350 temporary workers for approximately 1 to 2 months (STPNOC 2010b). Most of these workers are assumed to be located in the same geographic areas as STP, Units 1 and 2, employees. The following sections describe the housing, public services, offsite land use, visual aesthetics and noise, population demography, and the economy in the ROI surrounding STP, Units 1 and 2.

2.2.9.1 Housing

Table 2–13 lists the total number of occupied and vacant housing units, vacancy rates, and median value in the two-county ROI. According to American Community Survey, there were approximately 138,000 housing units in the socioeconomic region, of which approximately 117,000 were occupied. The median value of owner-occupied housing units in Brazoria and Matagorda Counties were $146,700 and $90,400 respectively. Brazoria County had a lower vacancy rate (12.6 percent) than Matagorda County, which had a 27.9 percent vacancy rate (USCB 2011).

Table 2–13. Housing in Brazoria and Matagorda Counties in 2010

	Brazoria	Matagorda	ROI
Total units	118,813	18,827	137,640
Occupied housing units	103,828	13,568	117,396
Vacant units	14,985	5,259	20,244
Vacancy rate (%)	12.6	27.9	14.7
Median value ($)*	146,700	90,400	118,550

Key: * estimated

Source: USCB 2010

2.2.9.2 Public Services

Water Supply. Brazoria and Matagorda Counties are located in southeastern Texas. Information about municipal water suppliers in these counties, their permitted capacities or maximum design yields or both, reported annual peak usage, and population served are presented in Table 2–14. The Texas Water Development Board (TWDB) divided Texas into

16 water-planning regions (Region A through Region P). Brazoria County is located in Region H, while Matagorda County is located in Region K.

Brazoria County is 1 of 15 counties located in Region H, which includes the Houston metropolitan area. Over 20 percent of the State's 2010 population resides in Region H. As seen in Table 2–14, the city of Pearland serves the largest population at 56,877 and has the highest average daily consumption (11.0 mgd), while the city of Clute serves the smallest at 10,737 and has the lowest average daily consumption (0.361 mgd). Alvin serves 15 less people than Angleton but consumes slightly more water daily (EPA 2010).

Matagorda County is 1 of 14 counties located in Region K. Bay City, located approximately 19.5 mi (31.4 km) north-northeast of STP, serves a population of 19,263 from a groundwater source with an average daily consumption of 2.41 mgd (EPA 2010).

STP withdraws potable water primarily from the deep-confined aquifer within the Beaumont Fountain. In 2009, STP withdrew 368,766,200 gal (1,395,931,917.5 liters) of water from five active onsite groundwater wells, of which 5 percent was used for sanitary and drinking purposes. STPNOC is permitted to withdraw an average of 2.7 mgd (STPNOC 2010b).

Table 2–14. Brazoria and Matagorda County City Public Water Supply Systems (in mgd)

Water Supplier	Primary Water Source	Average Daily Demand (mgd)	System Capacity (mgd)	Population Served
Brazoria County				
Alvin	GW	2.18	8.74	19,152
Angleton	SW	2.05	5.47	19,167
Clute	SW	0.36	2.08	10,373
Freeport	SW	1.40	0.00 (production vs. purchased)	12,708
Lake Jackson	SW	3.10	6.69	25,890
Pearland	SW	11.00	15,26	56,877
Matagorda County				
Bay City	GW	2.41	8.86	19,263

Surface Water = SW, Groundwater = GW

Source: EPA 2010

Education. Brazoria County has eight school districts consisting of 4 pre-kindergarten, 43 elementary, 23 middle/junior high/intermediate, 15 high schools, 10 alternative, 1 charter, and 1 grade 9 school. During the 2009 to 2010 school year, enrollment was 60,251 (NCES 2011).

Matagorda County has five districts consisting of 8 pre-kindergarten, 8 elementary, 4 middle/junior high/intermediate, 4 high schools, and 1 alternative school. During the 2009 to 2010 school year, enrollment was 7,185 (NCES 2011).

Transportation. STP is located in an area severed by U.S. highways, FMs, and county roads. Within 50 miles of STP, there are no interstate highways; however, there are two U.S. highways (U.S. 59 and U.S. 87). U.S. 59 runs northeast to southwest connecting Fort Bend, Wharton, Jackson, and Victoria Counties. U.S. 87 runs northwest to southeast connecting Victoria and Calhoun County.

STP can be accessed by FM 521, which runs east and west. FM 521 is accessible by several FM and State highways, which would be most commonly commuted by STP workers. Workers traveling from the east side of Matagorda County and all of Brazoria County would likely take TX-60 south and exit at FM 521. Workers commuting from the north would likely travel on TX-35 west, exiting on to FM 1468 south or FM 1095 south. Workers arriving from the west are likely to travel on TX-35 east, exiting onto FM 521 east.

Table 2–15 lists commuting routes to STP and average annual daily traffic (AADT) volume values. The AADT values represent traffic volumes for a 24-hour period factored by both day of week and month of year.

Table 2–15. Major Commuting Routes in the Vicinity of STP, 2010 AADT

Roadway & Location	AADT [a]
TX-60 South from Bay City to FM 521 West	2,400–3,000
FM 2078 West to FM 2668 South	310
FM 2668 South from Bay City to FM 521 West	1,050–2,200
FM 1468 South from TX-35 to FM 521 East	700–940
FM 1095 South from TX-35 to FM 521 East	390–630
FM 2853 South to FM 521 East	510–580
FM 521 West from TX-60	1,600–2,500
FM 521 East from FM 1095	1,150

[a] All AADTs represent traffic volume during the average 24-hour day during 2010.
Key: FM = Farm-to-Market; TX = Texas

Source: TXDOT 2011

2.2.9.3 Offsite Land Use

Offsite land use conditions in Brazoria and Matagorda Counties are described in this section. Approximately 84 percent of the STP permanent workforce lives in these two counties. Within the region of STP, approximately 61 percent of the land is agricultural, 18 percent forest, 10 percent rangeland, 5 percent wetland, 2.5 percent urban or developed land, 2 percent freshwater bodies, and less than 1 percent barren land (STPNOC 2010d).

Brazoria County occupies approximately 1,350 mi^2 (3,496 km^2) (USCB 2010). Agricultural land is principally used as pasture (52.8 percent) and cropland (35.2 percent). Livestock (mostly cattle and calves) comprise 45 percent of the total market value of agricultural products (livestock and crop product) sold in the county while crop sales comprise the remaining 55 percent (mostly grains, dry beans and peas, nursery, and floriculture). The number of farms in Brazoria increased about 5 percent from 2002 to 2007. Farmland acreage in the county decreased 14 percent during the same period, and the average size of a farm decreased 18 percent to 205 ac (82 ha) (NASS 2009).

Matagorda County occupies approximately 1,100 mi^2 (2,849 km^2) (USCB 2010). Agricultural land is principally used as pasture (51.08 percent) and cropland (40.63 percent). Crop sales (mostly nursery, greenhouse, floriculture, and sod) comprise 57 percent of the market value of agricultural products sold from Matagorda County. Livestock sales (agricultural products of mostly cattle and calves) comprise the remaining 43 percent. The number of farms in Matagorda County decreased from 2002 to 2007 by 9 percent. The number of farmland acres decreased by 7 percent; however, the average size of farms increased by 2 percent from 625 ac to 640 ac (NASS 2009).

Even though population growth is projected to continue, there is ample urban and rural land to accommodate the anticipated growth over the next 20 years. However, agriculture will continue to be the major land use outside urban areas.

2.2.9.4 Visual Aesthetics and Noise

> The EPA generally uses 55 decibels (dBA) as the noise threshold level to protect against excess noise during outdoor activities. However, according to EPA, this threshold does "not constitute a standard, specification, or regulation," but it was intended to provide a basis for State and local governments establishing noise standards.

The STP site boundary encloses approximately 12,220 ac, with site buildings, operations area, support facilities, and transmission ROWs occupying approximately 65 ac. Approximately 7,046 ac are occupied by other STP features, the ECP, and the MCR (STPNOC 2010b).

The site includes approximately 1,700 ac of undeveloped natural lowland habitat, with characteristics of the Texas Coastal Plain Province, and the land surrounding the site is used for ranchland and farmland (STPNOC 2010b). STP is situated on low elevation, generally less than 60 feet MSL, with open prairie habitat interspersed with creek and river drainages flowing toward the Gulf coasts marshes. Trees are rare but can be found along streams and in oak groves (STPNOC 2010d). Given the flat nature of the land, the STP reactors are a prominent feature of the area, and the MCR is visible from the southeast along the Colorado River as well as other points around the site.

Noise from nuclear plant operations can be detected off site. Sources of noise at STP include the turbines and large pump motors. Given the industrial nature of the station, noise emissions from the station are generally nothing more than an intermittent minor nuisance. However, noise levels may sometimes exceed the 55 dBA level that EPA uses as a threshold level to protect against excess noise during outdoor activities (EPA 1974). However, according to EPA, this threshold does "not constitute a standard, specification, or regulation," but it was intended to provide a basis for State and local governments establishing noise standards.

2.2.9.5 Demography

According to 2000 Census information, an estimated 35,291 people lived within 20 mi (32 km) of STP, which equates to a population density of 36 persons per square mile (STPNOC 2010b). This translates to a Category 1, "most sparse," population density using the GEIS measure of sparseness (i.e., less than 40 persons per square mile and no community with 25,000 or more people within 20 mi). Based on the GEIS proximity matrix, the STP proximity population density is classified as Category 2 (no city with 100,000 or more people and less than 50 persons per square mile within 50 mi). Therefore, with STP regional population classifications of sparseness Category 1 and proximity Category 2, STP lies in a low-population area.

Table 2–16 shows population projections and growth rates from 1970 to 2050 in Brazoria and Matagorda Counties in Texas. The growth rate in Brazoria County showed an increase in population of nearly 30 percent between 2000 and 2010. Conversely, Matagorda County showed a 3.3 percent decrease in population between 2000 and 2010. Both county populations are projected to increase each decade through 2050.

Table 2–16. Population and Percent Growth in Brazoria and Matagorda Counties from 1970 to 2010 and Projected for 2020 to 2050

Year	Brazoria	% Change	Matagorda	% Change
1970	108,312	N/A	27,913	N/A
1980	169,587	56.6	37,828	35.5
1990	191,707	13.0	36,928	-2.4
2000	241,767	26.1	37,957	2.8
2010	313,166	29.5	36,702	-3.3
2020	349,474	11.6	40,789	11.1
2030	397,663	13.8	42,559	4.3
2040	445,852	12.1	44,330	4.2
2050	494,041	10.8	46,101	4.0

Source: USCB (2011) provided the population data for 1970 through 2010. The data forecast for 2020 through 2050 was calculated.

Demographic Profile. The 2010 demographic profiles of the two-county ROI population are presented in Table 2–17. In 2010, minorities (race and ethnicity combined) comprised 47.4 percent of the total two-county population. The minority population is largely Hispanic or Latino (28.8 percent) with the next largest minority population being Black or African American (11.7 percent).

Table 2–17. Demographic Profile of the Population in the STP Two-County Socioeconomic ROI in 2010

	Brazoria	Matagorda	ROI
Total population	313,166	36,702	349,868
Race (not Hispanic or Latino)—% of total population			
White	53.2	47.4	52.6
Black or African American	11.8	11.1	11.7
American Indian & Alaska Native	0.3	0.3	0.3
Asian	5.4	1.9	5.1
Native Hawaiian & Other Pacific Islander	0.0	0.0	0.0
Some other race	0.2	0.1	0.1
Two or more races	1.4	0.9	1.4
Ethnicity			
Hispanic or Latino	86,646	14,047	100,717
% of total population	27.7	38.3	28.8

	Brazoria	Matagorda	ROI
Total minority	146,492	19,302	165,794
% minority	46.8	52.6	47.4

Source: USCB 2010

Transient Population. Within 50 mi (80 km) of STP, colleges and recreational opportunities attract daily and seasonal visitors who create demand for temporary housing and services. In 2010, there were approximately 11,118 students attending colleges and universities within 50 mi (80 km) of STP (IES 2010).

In 2000, 1.7 percent of all housing units were considered temporary housing for seasonal, recreational, or occasional use in Brazoria County. By comparison, seasonal housing accounted for 12.9 percent of total housing units in Matagorda County (USCB 2010). Calhoun and Jackson Counties have the highest percent of temporary housing for seasonal, recreational, or occasional use, at 17.1 and 18.5 percent, respectively (USCB 2010). Table 2–18 provides information on seasonal housing for the nine counties located all or partly within 50 mi of STP.

Table 2–18. Seasonal Housing in Counties Located within 50 mi of STP

County [a]	Housing Units	Vacant Housing Units: For Seasonal, Recreational, or Occasional Use	%
Texas			
Brazoria	90,628	1,496	1.7
Calhoun	10,238	1,757	17.1
Colorado	9,431	634	6.7
Fort Bend	115,991	5,076	4.4
Jackson	6,545	1,209	18.5
Lavaca	9,657	377	3.9
Matagorda	18,611	2,407	12.9
Victoria	32,945	261	0.8
Wharton	16,606	291	1.8
Total	**310,652**	**13,508**	**7.5**

[a] Counties within 50 mi (80 km) of STP with at least one block group located within the 50-mi (80 km) radius

Source: USCB 2010

Migrant Farm Workers. Migrant farm workers are individuals whose employment requires travel to harvest agricultural crops. These workers may or may not have a permanent residence. Some migrant workers follow the harvesting of crops, particularly fruit, throughout rural areas of the U.S. Others may be permanent residents near the STP site who travel from farm to farm harvesting crops.

Migrant workers may be members of minority or low-income populations. Because they travel and can spend a significant amount of time in an area without being actual residents, migrant workers may be unavailable for counting by census takers. If uncounted, these workers would be "underrepresented" in USCB minority and low-income population counts.

Information on migrant farm and temporary labor was collected in the 2007 Census of Agriculture. Table 2–19 provides information on migrant farm workers and temporary farm labor (less than 150 days) within 50 mi of the STP. According to the 2007 Census of Agriculture, approximately 6,513 farm workers were hired to work for less than 150 days and were employed on 2,233 farms within 50 mi of the STP. The county with the largest number of temporary farm workers (1,176) on 396 farms was Wharton County, Texas (NASS 2011).

In the 2002 Census of Agriculture, farm operators were asked for the first time whether or not they hired any migrant workers, defined as a farm worker whose employment required travel that prevented the migrant worker from returning to his or her permanent place of residence the same day. In the 50-mi radius of STP, 185 farms reported hiring migrant workers in the 2007 Census of Agriculture. Lavaca and Wharton Counties reported the most farms (35 and 31, respectively) with hired migrant workers, followed by Brazoria and Fort Bend County, with 28 and 25 farms, respectively (NASS 2011).

According to the 2007 Census of Agriculture estimates, 1,001 temporary farm workers (those working fewer than 150 days per year) were employed on 414 farms in Brazoria County, and 754 temporary farm workers were employed on 247 farms in Matagorda County, respectively (NASS 2011).

Table 2–19. Migrant Farm Workers and Temporary Farm Labor in Counties Located within 50 mi of STP

County [a]	Number of Farms with Hired Farm Labor [b]	Number of Farms Hiring Workers for Less Than 150 Days [b]	Number of Farm Workers Working for Less Than 150 days [b]	Number of Farms Reporting Migrant Farm Labor [b]
Texas				
Brazoria	414	332	1,001	28
Calhoun	66	54	143	4
Colorado	372	319	853	23
Fort Bend	299	230	621	25
Jackson	200	164	408	12
Lavaca	475	410	925	35
Matagorda	247	208	754	16
Victoria	252	216	632	11
Wharton	396	300	1,176	31
Total	**2,721**	**2,233**	**6,513**	**185**

[a] Counties within 50 mi of STP with at least one block group located within the 50-mi radius

[b] Table 7. Hired Farm Labor—Workers and Payroll: 2007 Census of Agriculture

Source: NASS 2009

2.2.9.6 Economy

Employment and Income. Between 2000 and 2010, the civilian labor force in Brazoria County increased 34.5 percent from 112,798 to 151,791. Matagorda County also increased during that time, 5.6 percent from 16,434 to 17,365 (USCB 2010). Major industries in Matagorda County are presented in Table 2–20.

According to 2008 through 2010 American Community Survey 3-Year Estimates, educational, health, and social services industry employs the most workers in the socioeconomic ROI (22.5 percent) followed by wholesale trade (16.7 percent). A list of employment by industry in the ROI is presented in Table 2–21.

Table 2–20. Major Industries in Matagorda County

Company Name	Type of Business
STPNOC	Electricity generation
Lyondell Basell	High density polyethylene resins
Valerus Compressors	Compressor fabrication
McAda Drilling Fluids	Oilfield support
OXEA Corporation	Chemical products
Celanese	Chemical products
Henderson Fabrication	Steel fabrication

Source: Matagorda County EDC 2007

Table 2–21. Major Industries in ROI

Industry	Brazoria	Matagorda	Total	%
Total employed civilian workers	**142,741**	**15,080**	**157,821**	
Agriculture, forestry, fishing & hunting, & mining	3,677	1,560	5,237	3.3
Construction	14,889	1,274	16,163	10.2
Manufacturing	17,962	1,422	19,384	12.3
Wholesale trade	4,638	310	26,299	16.7
Retail trade	13,694	2,273	15,967	10.1
Transportation, warehousing, & utilities	7,362	1,643	9,005	3.8
Information	2,382	219	2,601	1.6
Finance, insurance, real estate, rental, & leasing	7,061	458	7,519	4.8
Professional, scientific, management, administrative, & waste management services	15,182	812	15,994	10.1
Educational, health, & social services	32,613	2,887	35,500	22.5
Arts, entertainment, recreation, accommodation, & food services	9,196	960	10,156	6.4
Other services (except public administration)	7,758	802	8,560	5.4
Public administration	6,057	460	6,517	4.1

Source: USCB 2010

Estimated income information for the STP ROI is presented in Table 2–22. According to the USCB, people living in Brazoria County had a higher median household and per capita income than the State average, while Matagorda had a lower median household and per capita income (UCSB 2010). An estimated 10.6 and 19.2 percent of the population in Brazoria and Matagorda Counties were living below the official poverty level, respectively. The State of Texas as a whole had a higher percentage of persons living below the poverty level (17 percent) than Brazoria County, but lower than Matagorda County. The percentage of families living below the poverty level in Brazoria County (8.2 percent) was lower than the State of Texas average (13.2 percent), but Matagorda County (17.4 percent) was higher than the State average (UCSB 2010).

Table 2–22. Estimated Income Information for STP ROI

	Brazoria	Matagorda	Texas
Median household income (dollars) [(a)]	66,221	41,586	49,585
Per capita income (dollars) [(a)]	27,381	23,138	24,671
Individuals living below the poverty level (percent)	10.6	19.2	17
Families living below the poverty level (percent)	8.2	17.4	13.2

[(a)] In 2008 inflation-adjusted dollars

Source: USCB 2011

Unemployment. According to the USCB's 2006 through 2008 American Community Survey 3-Year Estimates, the unemployment rates in Brazoria and Matagorda Counties were 4.0 and 8.1 percent, respectively, in comparison to the unemployment rate of 4.8 percent for the State of Texas (USCB 2010).

Taxes. All privately owned property in Texas is subject to taxation by the county and school district in which it is located, unless specifically exempted by the Texas Constitution. Most private property owners in Texas also pay property taxes to local jurisdictions like cities and special districts within whose boundaries they reside. As such, property tax revenues are the major tax revenue source for counties and cities and the sole source of tax revenue for school districts. Exemptions from these standard practices are governed by the State, while county appraisal districts determine the value of properties with local jurisdictions setting the tax rates. After assessment, private property owners then make a consolidated payment to the County Tax Assessor, who retains the county's portion and distributes the special district funds to the special districts, as appropriate (STPNOC 2010b).

STPNOC, owner of STP, Units 1 and 2, pays the majority of property taxes to the following taxing jurisdictions: Matagorda County, Matagorda County Hospital District, Navigation District #1, Drainage District #3, Palacios Seawall District, and the Coastal Plains Groundwater District (STPNOC 2010b). Table 2–23 presents each district's total property tax levies, STP payments, and the proportion of the total constituted by STP. STP payments represent a major portion of property tax revenues for each of the districts, ranging from 22 percent to 75 percent in the various districts from 2004 to 2008. From 2003 to 2007, in Matagorda County specifically (excluding special districts within the county), STP property tax payments to Matagorda County alone have represented approximately one-third of the county's total revenues (total revenues include property tax payments and other sources). In 2001, STPNOC negotiated an agreement with Matagorda County (to begin in 2002) to remit a county service fee in lieu of property taxes to the county, with a revenue cap of $6.1 million. STPNOC has a similar agreement with the local hospital district, capped at $2.6 million, to compensate the hospital for its extensive support of STPNOC's emergency response requirements (STPNOC 2010b).

Table 2–23. Comparison of STP Owner Payments with Taxing District Property Tax

			Total STP	
Year[a]	**Taxing District**	**Property Tax Levy($) [b]**	**Payments($) [c]**	**% of Property Tax Levy**
2003	Matagorda County [d]	8,214,934	6,100,000	74.3
	Matagorda County Hospital[d]	4,126,692	2,461,132	59.6
	Navigation District #1	459,261	360,394	78.5
	Drainage District #3	288,179	249,859	86.7
	Palacios Seawall	499,121	411,000	82.3
	Coastal Plains Groundwater	137,930	45,264	32.8
	Total	**13,726,117**	**9,627,649**	**70.1**
2004	Matagorda County[d]	8,122,946	6,100,000	75.1
	Matagorda County Hospital[d]	5,254,940	2,526,807	48.1
	Navigation District #1	413,867	360,410	87.1
	Drainage District #3	287,909	249,869	86.8
	Palacios Seawall	433,674	411,018	94.8
	Coastal Plains Groundwater	136,040	45,266	33.3
	Total	**14,649,376**	**9,693,370**	**66.2**
2005	Matagorda County[d]	8,191,213	6,100,000	74.5
	Matagorda County Hospital[d]	5,613,566	2,343,558	41.7
	Navigation District #1	370,191	251,822	68.0
	Drainage District #3	254,311	203,684	80.1
	Palacios Seawall	329,155	223,926	68.0
	Coastal Plains Groundwater	141,239	31,628	22.4
	Total	**14,899,675**	**9,154,618**	**61.4**
2006	Matagorda County[d]	9,038,864	6,100,000	67.5
	Matagorda County Hospital[d]	5,753,331	2,567,253	44.6
	Navigation District #1	486,645	342,148	70.3

Year[a]	Taxing District	Property Tax Levy($) [b]	Total STP Payments($) [c]	Total STP % of Property Tax Levy
	Drainage District #3	242,142	200,299	82.7
	Palacios Seawall	327,813	230,162	70.2
	Coastal Plains Groundwater	153,850	39,422	25.6
	Total	**16,002,645**	**9,479,284**	**59.2**
2007	Matagorda County[d]	9,785,561	6,100,000	62.3
	Matagorda County Hospital[d]	6,236,490	2,600,000	41.7
	Navigation District #1	519,472	377,347	72.6
	Drainage District #3	229,254	190,125	82.9
	Palacios Seawall	276,122	200,131	72.5
	Coastal Plains Groundwater	166,556	45,019	27.0
	Total	**17,213,455**	**9,512,622**	**55.3**
2008	Matagorda County[d]	10,968,961	6,100,000	55.6
	Matagorda County Hospital[d]	7,035,468	2,600,000	37.0
	Navigation District #1	547,517	405,019	74.0
	Drainage District #3	246,398	202,883	82.3
	Palacios Seawall	276,565	203,844	73.7
	Coastal Plains Groundwater	187,828	48,454	25.8
	Total	**19,262,737**	**9,560,200**	**49.6**
	6-Year Total	**95,754,005**	**57,027,743**	**59.6**

[a] Year levy and rate are for the following budget year. STP, Units 1 and 2, owners pay the standard millage rate for the special districts.

[b] Total levies for 2003–2007 are from the Texas Comptroller of Public Accounts, Annual Property Tax Reports for Tax Years 2003, 2004, 2005, and 2006, as well as 2007 Property Tax Rates and Taxes. Total levies for 2008 are from the Matagorda County Tax Office.

[c] For 2003–2006, tax payments are based on estimates from the Matagorda County Tax Office. For 2007 and 2008, estimated payments are based on actual NRG property tax statements.

[d] Payments to Matagorda County and the Matagorda County Hospital District are based on an agreement between those entities and STPNOC, which sets a fixed amount to be paid each year.

Note: Totals may not add due to rounding.

Source: STPNOC 2010b

In addition to tax payments to the districts discussed above, STP pays taxes to other districts within Matagorda County for undeveloped portions of the STP plant site that lie within other taxing districts and for other STP-related property within the county. The receiving districts are the Port of Bay City Conservation and Reclamation District, Drainage Districts 1 and 2, and the City of Bay City. Per State of Texas tax law, STP also pays taxes to three of the five independent school districts (ISDs) in Matagorda County—Matagorda, Bay City, and Tidehaven. Table 2–24 shows these payments. These payments represent a small proportion of those districts' total levies in comparison to the percentages of the main district payments shown above.

Table 2–24. STP, Units 1 and 2, Owner Payments to Other Taxing Districts in Matagorda

	2007			2008		
Special District [(a)]	**STP Owner Payments ($)**	**District's Est. Total Levy, 2007 ($)**	**STP as % of Total**	**STP Owner Payments ($)**	**District's Est. Total Levy, 2008 ($)**	**STP as % of Total**
Port of Bay City	3,097	723,680	0.43	5,080	388,907	0.61
Conservation & Reclamation District	468	112,458	0.42	774	130,055	0.60
Matagorda ISD	74,943	2,525,549	2.97	75,038	2,677,920	2.80
Drainage District #1	6,419	1,607,005	0.40	6,179	1,681,062	0.37
Drainage District #2	2,000	342,514	0.58	6,278	419,134	1.50
Bay City ISD	0	12,840,989	-	1,942	14,265,846	0.01
Tidehaven ISD	22,837	5,029,792	0.45	79,465	6,541,043	1.21
City of Bay City	0	2,746,295	-	747	3,050,691	0.02
Total	**111,771**	**25,925,282**	**0.43**	**175,502**	**29,599,657**	**0.59**

[(a)] "Other" = Taxing districts (Special District) other than Matagorda County; Matagorda County Hospital; Navigation District #1; Palacios Seawall District; Coastal Plains Groundwater District; and Drainage District #3.

Source: STPNOC 2010b

STP is located in the Electric Reliability Council of Texas region, a deregulated area that is not set to change in the foreseeable future. As such, STPNOC's future taxation will continue to be based on the market value of the site and agreements with the county regarding service fees in lieu of property taxes (STPNOC 2010b).

2.2.10 Historic and Archaeological Resources

In accordance with 36 CFR 800.8(c), the NRC has elected to use the National Environmental Policy Act of 1969, as amended (NEPA), process to comply with the obligations under Section 106 of the National Historic Preservation Act (NHPA). In addition, NUREG-1555 (NRC 2000) provides guidance to staff on how to conduct historic and cultural resource analysis in its environmental reviews.

In the context of NHPA, the NRC has determined that the area of potential effect (APE) for a license renewal action is the area at the power plant site and its immediate environment that may be affected by post–license renewal and land-disturbing activities associated with the proposed action (NRC 2011e). The APE may extend beyond the immediate environs in instances where post–license renewal and land-disturbing activities or refurbishment activities specifically related to license renewal may potentially have an effect on historic properties (NRC 2011e).

Cultural Background. Substantial archaeological records indicate that there was prehistoric occupation of the STP area. During the Paleoindian era (pre-7800 B.C.), the earliest inhabitants of Texas were the Clovis and Folsom peoples, which are typically associated with the hunting of the extinct mammoth and bison, respectively. The Early Archaic era (7800 B.C. to 6000 B.C.) represents a time when inhabitants became more settled, and numerous distinctive triangular points and barbed specimens are noted from this era. The Middle Archaic period (6000 B.C. to 2500 B.C.) reflects a diversity of stone tools and shell middens, while the Late Archaic era (2500 B.C. to 700 B.C.) is marked by distinctive projectile points and stone tools. The Late Prehistoric era (700B.C. to 1500 A.D.) is noted for the introduction of the bow and arrow and pottery (NRC 2011b).

Hundreds of tribes inhabited Texas, and historians have a difficult time tracing their origin because there are few written records from this period (University of Texas at Austin 2011). The historic period can be traced to the 1500s, when the Spanish and French explored the Texas Coast. With the arrival of the Europeans, there were many changes for the native peoples. Diseases destroyed many populations, and several tribes fled to and from the area that makes up the State of Texas today. Matagorda County was created in 1837, soon after Texas gained its independence from Mexico (NRC 2011b). Today, there are three indigenous groups living within the Texas boarders that are listed among the Nation's many Federally recognized tribes—the Alabama–Coushatta Tribe in East Texas; the Ysleta del Sur Pueblo, or Tigua, in far West Texas; and the Kickapoo Traditional Tribe in southwest Texas along the Texas–Mexico border (THC 2011). Other recognized tribes maintain ties to their ancestors' homelands in the State of Texas and monitor sites throughout the State that are important to their tribe and their history (THC 2011). Further cultural background is documented in the NRC EIS (2011b) for the review of the STP, Units 3 and 4, combined license application.

Historic and Archaeological Resources at the STP Site. This section discusses the known historic and archaeological resources at the STP site and in the surrounding area. The following information was used to identify the historic and archaeological resources at the STP site:

- original construction FES (NRC 1975);
- original ER (HL&P 1975), which included the Texas Archaeological Survey Report (Hall and Ford 1973);
- original operation EIS (NRC 1986);
- STP, Units 3 and 4, ER, Revision 4 (STPNOC 2010d);
- STP, applicant's ER, operating license renewal stage, STP, Units 1 and 2 (STPNOC 2010b);
- EIS for COLs for STP, Units 3 and 4 (NRC 2011b);
- audit report regarding STP LRA—cultural resources (NRC 2011g);
- STP, RAI responses (STPNOC 2011g);
- consultation with THC (Texas Historical Commission); and
- consultation with tribes.

In the early 1970s, the Texas Archaeological Survey conducted cultural resources investigations of the STP site and surrounding area. The investigations included a literature review, a pedestrian survey, and limited subsurface testing (NRC 2011b; STPNOC 2010b, 2010d). The construction of STP, Units 1 and 2, was completed in the 1980s, and much of the site had been heavily disturbed by construction activities and the creation of the reservoir.

STP identified three cultural resource sites within 10 mi of the STP site. Cultural resources site 41MG48 is approximately 5 mi from the northeast boundary of the STP site and is described as a late 19th century artifact scatter associated with homesteading Artifacts consisted of ceramic, glass, and metal with manufacturing dates between 1890 and 1910. STP reported that a homestead was established in the 1890s and dissolved in 1946. Cultural resource investigations concluded that the site was not significant and that no further work on the site was needed.

The closest recorded site is 41MG49, and it is approximately 4 mi from the northeastern boundary of the STP site. Site 41MG49 was originally reported in the license renewal ER as having no site form record (STPNOC 2010b). In July 2011, STP revisited the information and discovered the missing site form record for site 41MG49 that described it as a shell midden with no associated artifacts(STPNOC 2011g). Cultural resource investigations concluded that the site was significant and should be studied further if the site were to be affected.

Site 41MG112 is approximately 5 mi from the northeastern boundary of the STP site and is described as a dismantled historic farmstead dating to the mid-20th century. Cultural resource investigations concluded that the site was not significant and that no further work on the site was needed (STPNOC 2011g). These three sites (41MG48, 41MG49, and 41MG112) are located outside of the. There are no recorded historic or archaeological resources on the STP site.

STP identified a potential historic gravesite in its ER (STPNOC 2010b) located on the southeast corner of the STP site. The NRC staff reviewed information during the environmental audit for cultural resources at the STP site and discussed the status and protection of the historic gravesite with STP environmental staff (NRC 2011g). STP staff had interviewed descendants of the former property owner and confirmed the presence of a historic grave from the late 1800s; however, this gravesite is not recorded and little is known about it (STPNOC 2011g).

2.3 Related Federal and State Activities

The NRC reviewed the possibility that activities of other Federal agencies might impact the renewal of the operating license for STP. There are no Federal projects that would make it necessary for another Federal agency to become a cooperating agency in the preparation of this draft Supplemental EIS. There are no known American Indian lands within 50 mi of STP. Federally owned facilities within 50 mi of STP include (NRC 2011b):

- Big Boggy—administered by the FWS—is a 5,000-ac national wildlife refuge that borders Matagorda Bay and is approximately 9 mi southeast of the STP site.
- San Bernard—administered by the FWS—is a 45,311-ac national wildlife refuge that contains coastal prairies and salt marshes in southern Matagorda and Brazoria Counties.

The NRC is required under Section 102(2)(C) of NEPA to consult with and obtain the comments from any Federal agency that has jurisdiction by law or special expertise with respect to any environmental impact involved in the subject matter of the EIS. For example, during the course of preparing this DSEIS, the NRC consulted with the FWS and the NMFS. A complete list of key consultation correspondences is listed in Appendix D.

Regarding Coastal Zone Management Act (CZMA) compliance status, pursuant to Section 506.11(13) of Texas Administrative Code, STP license renewal falls within the definition of Federal agency action:

> A federal license or permit that a federal agency may issue that represents the proposed federal authorization, approval, or certification needed by the applicant to begin an activity. An action to renew, amend, or modify an existing license or permit shall not be considered an action subject to the CMP [Coastal Management Program] if the action only extends the time period of the existing authorization without authorizing new or additional work or activities, would not increase pollutant loads to coastal waters or result in relocation of a wastewater outfall to a critical area, or is not otherwise directly relevant to the policies in §501.14 of this title (relating to Policies for Specific Activities and Coastal Natural Resource Areas).

In addition, in a letter dated January 29, 2010, the Coastal Coordination Council that administers the CZMA compliance in Texas explained:

> The project [STP] was undertaken before Texas had a federally approved [CMP] and based on information provided in the [STPNOC's] letter dated December 2, 2009, it has been determined that there are no significant unresolved consistency issues. Therefore, pursuant to Section 506.11(13), this project is consistent with the CMP goals and policies.

Hence, for license renewal purpose, STPNOC has obtained and maintained a consistency certification in accordance with the CZMA.

2.4 References

10 CFR Part 20. *Code of Federal Regulations*, Title 10, *Energy*, Part 20, "Standards for protection against radiation."

10 CFR Part 50. *Code of Federal Regulations*, Title 10, *Energy*, Part 50, "Domestic licensing of production and utilization facilities."

10 CFR Part 51. *Code of Federal Regulations*, Title 10, *Energy*, Part 51, "Environmental protection regulations for domestic licensing and related regulatory functions."

10 CFR Part 54. *Code of Federal Regulations*, Title 10, *Energy*, Part 54, "Requirements for renewal of operating licenses for nuclear power plants."

10 CFR Part 61. *Code of Federal Regulations*, Title 10, *Energy*, Part 61, "Licensing requirements for land disposal of radioactive waste."

10 CFR Part 71. *Code of Federal Regulations*, Title 10, *Energy*, Part 71, "Packaging and transportation of radioactive material."

30 TAC 1-307. Texas Administrative Code, Title 30, *Environmental Quality*, Part 1, "Texas Commission on Environmental Quality," Chapter 307, "Texas Surface Water Quality Standards."

31 TAC 10-356. Texas Administrative Code, Title 31, *Natural Resources and Conservation*, Part 10, "Texas Water Development Board," Chapter 356, "Groundwater Management."

36 CFR Part 800. *Code of Federal Regulations*. Title 36, *Parks, Forests, and Public Property*, Part 800, "Protection of historic properties."

40 CFR Part 81. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 81, “Designation of areas for air quality planning purposes.”

40 CFR Part 141. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 141, “National primary drinking water regulations.”

40 CFR Part 190. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 190, “Environmental radiation protection standards for nuclear power operations.”

50 CFR Part 10. *Code of Federal Regulations*, Title 50, *Wildlife and Fisheries*, Part 10, “General provisions.”

50 CFR Part 22. *Code of Federal Regulations*, Title 50, *Wildlife and Fisheries*, Part 22, “Eagle permits.”

52 FR 21059. U.S. Fish and Wildlife Service. Endangered and threatened wildlife and plants; reclassification of the American alligator to threatened due to similarity of appearance throughout the remainder of its range. *Federal Register* 52(107):21059–21064. June 4, 1987. Available at <http://ecos.fws.gov/docs/federal_register/fr1263.pdf> (accessed June 21, 2011).

66 FR 36038. U.S. Fish and Wildlife Service. Endangered and threatened wildlife and plants; final determination of critical habitat for wintering piping plovers. *Federal Register* 66(132):36038–36143. July 10, 2001.

69 FR 19975. National Oceanic and Atmospheric Administration. Endangered and threatened species; establishment of species of concern list, addition of species to species of concern list, description of factors for identifying species of concern, and revision of candidate species list under the Endangered Species Act. *Federal Register* 69(73):19975–19979. April 15, 2004. Available at <http://www.nmfs.noaa.gov/pr/pdfs/fr/fr69-19975.pdf> (accessed June 21, 2011).

75 FR 25174. National Marine Fisheries Service. Endangered and threatened wildlife and plants; proposed listing for the largetooth sawfish. *Federal Register* 75(88):25174–25184. May 7, 2010.

75 FR 9282. U.S. Fish and Wildlife Service. General provisions—revised list of migratory birds. *Federal Register* 75(39):9282–9314. March 1, 2010.

Aronson R, Bruckner A, Moore J, Precht B, Weil E. 2008. “Oculina varicosa.” Available at <http://www.iucnredlist.org/apps/redlist/details/133165/0> (accessed June 28, 2011).

[Audubon] Audubon Corkscrew Swamp Sanctuary. 2004. “American Alligator.” Available at <http://www.corkscrew.audubon.org/wildlife/alligators.html> (accessed June 21, 2011).

[Audubon] Audubon Society. 2011. “Christmas Bird Count Database for Matagorda County-Mad Island Marsh, 2009-2010.” Available at <http://audubon2.org/cbchist/count_table.html> (accessed September 16, 2011).

Baker WB, Green GN. 1989. *1987-1988 Special Ecological Study for the South Texas Project*. Houston, TX: Houston Light & Power Company. 46 p. ADAMS No. ML11256A057.

[BEG] Bureau of Economic Geology. 1996. “Physiographic Map of Texas.” The University of Texas at Austin. Available at <http://www.beg.utexas.edu/UTopia/images/pagesizemaps/physiography.pdf> (accessed September 20, 2011).

Campbell L. 2003. *Endangered and Threatened Animals of Texas: Their Life History and Management*. Austin, TX: Texas Parks and Wildlife Department. 127 p. Available at <http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_bk_w7000_0013.pdf> (accessed September 7, 2011).

Clean Air Act of 1963, as amended. 42 U.S.C. §7401 et seq.

Clean Water Act of 1972, as amended. 33 U.S.C. §1251 et seq.

[CPGCD] Coastal Plains Groundwater Conservation District. 2011. Operating Permit, Permit No. OP-04122805. Bay City, TX. ADAMS No. ML11256A058.

Croker R. 1962. Growth and food of the gray snapper, Lutjanus griseus, in the Everglades National Park. Transactions of the American Fisheries Society 91(4):379–383.

DeVries D, Grimes CB, Lang KL, White DB. 1990. Age and growth of king and Spanish mackerel larvae and juveniles from the Gulf of Mexico and U.S. South Atlantic Bight. Environmental Biology of Fishes 29(1990):135–143.

Ducks Unlimited. 2006. "Ducks Unlimited and Partners Conserve 35,000 Acres Along the Texas Gulf Coast." Available at <http://www.ducks.org/news-media/texas-prairie-wetlands-project> (accessed September 14, 2011).

Ducks Unlimited and [HLPC] Houston Power and Lighting Company. 1996. *Wetland Development Agreement for the Texas Prairie Wetland Project Gulf Coast Joint Venture*. October 23, 1996. ADAMS No. ML11256A057.

Endangered Species Act of 1973, as amended. 16 U.S.C. §1531 et seq.

[ENSR] ENSR Corporation. 2008a. *Aquatic Ecology—Main Cooling Reservoir and Circulating Water Intake Structure Study, Unit 3 and 4, Licensing Project*. Prepared for STP Nuclear Operating Company. Houston, TX: ENSR. 53 p. ADAMS No. ML11256A057.

[ENSR] ENSR Corporation. 2008b. *Ecological Survey Report—Threatened and Endangered Species*. Prepared for STP Nuclear Operating Company. Houston, TX: ENSR. 32 p. ADAMS No. ML080660150.

[ENSR] ENSR Corporation. 2008c. Aquatic Ecology – Colorado River Monitoring Report, Units 3 and 4 Licensing Project. Houston, Texas. ADAMS No. ML081750196.

[EOE] Encyclopedia of Earth. 2008. "Great Plains Ecoregion." Updated October 16, 2008. Available at <http://www.eoearth.org/article/Great_Plains_ecoregion_(CEC)> (accessed September 13, 2011).

[EPA] U.S. Environmental Protection Agency. 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. Washington, DC: EPA. Report 550/9-74-004. Available at <http://www.nonoise.org/library/levels74/levels74.htm.> (accessed May 9, 2011).

[EPA] U.S. Environmental Protection Agency. 2010a. "Office of Solid Waste." Available at <http://www.epa.gov/osw> (accessed December 2010).

[EPA] U.S. Environmental Protection Agency. 2010b. "Safe Drinking Water Information System (SDWIS), County Search, Brazoria and Matagorda County, Texas." Available at <http://iaspub.epa.gov/enviro/sdw_form_v2.create_page?state_abbr=TX.> (accessed June 2011).

[EPA] U.S. Environmental Protection Agency, 2010c, "Waste Environmental Management Systems," Available at <http://www.epa.gov/osw/inforesources/ems/index.htm> (accessed December 2010).

[EPA] U.S. Environmental Protection Agency. 2011. "Green Book: Currently Designated Non-attainment Areas for All Criteria Pollutants." August 30, 2011. Available at <http://epa.gov/oaqps001/greenbk/ancl.html> (accessed November 17, 2011).

[FMNH] Florida Museum of Natural History. 2009. "Ichthyology at the Florida Museum of Natural History, Education, Biological Profiles: King Mackerel." Available at <http://www.flmnh.ufl.edu/fish/gallery/descript/kingmackerel/kingmackerel.html> (accessed September 9, 2011). ADAMS No. ML100600370.

[HL&P] Houston Light & Power Company. 1975. *Final Environmental Report for Construction of STP, Units 1 & 2*.

[FWS] U.S. Fish and Wildlife Service. 2000. "Critical Habitat: What Is It?" May 2000. Available at <http://www.fws.gov/verobeach/images/pdflibrary/Critical%20Habitat%20Fact%20Sheet.pdf> (accessed June 21, 2011).

[FWS] U.S. Fish and Wildlife Service. 2009. *Piping Plover (Charadrius melodus) 5-Year Review: Summary and Evaluation*. Hadley, MA and Lansing, MI: FWS. September 2009. 214 p. Available at <http://www.fws.gov/midwest/endangered/recovery/5yr_rev/pdf/PipingPlover5yr2009.pdf> (accessed June 21, 2011).

[FWS] U.S. Fish and Wildlife Service. 2011a. "Find Endangered Species: Species By County Report for Bexar, Brazoria, Colorado. DeWitt, Fayette, Gonzales, Guadalupe, Jackson, Lavaca, Matagorda, Wharton, and Wilson Counties." Available at <http://www.fws.gov/endangered/> (accessed May 19, 2011).

[FWS] U.S. Fish and Wildlife Service. 2011b. Letter from AM Strand, Field Supervisor, to T Tran, Project Manager, NRC. Subject: Reply to request for species list for South Texas license renewal review. June 2, 2011. ADAMS No. ML11173A241.

[FWS] U.S. Fish and Wildlife Service. 2011c. "Big Boggy National Wildlife Refuge." Available at <http://www.fws.gov/refuges/profiles/index.cfm?id=21542> (accessed September 27, 2011).

[FWS] U.S. Fish and Wildlife Service. 2011d. "Piping Plover Fact Sheet." March 9, 2011. Available at <http://www.fws.gov/midwest/endangered/pipingplover/pipingpl.html> (accessed 21 June 2011).

[FWS] U.S. Fish and Wildlife Service. Undated. "Migratory Birds & Habitat Programs: Migratory Bird Treaty Act." Available at <http://www.fws.gov/pacific/migratorybirds/mbta.htm> (accessed May 19, 2011).

[GCBO] Gulf Coast Bird Observatory. 2011. "Clive Runnells Family Mad Island Marsh Preserve." Available at <http://www.gcbo.org/html/madisland.pdf> (accessed September 27, 2011).

[GMFMC] Gulf of Mexico Fishery Management Council. 2004. *Final Environmental Impact Statement for the Generic Essential Fish Habitat Amendment to the Following Fishery Management Plans of the Gulf of Mexico (GOM): Shrimp, Red Drum, Reef Fish, Stone Crab, Coral and Coral Reef, Spiny Lobster, and Coastal Migratory Pelagic Resources*. Tampa, FL: GMFMC. March 2004. 682 p. Available at <http://www.gulfcouncil.org/beta/gmfmcweb/downloads/Final%20EFH%20EIS.pdf> (accessed September 7, 2011).

Griffith G, Bryce S, Omernik J, Rogers A. 2007. *Ecoregions of Texas*. Project report to Texas Commission on Environmental Quality. Corvallis, OR: Dynamac Corporation. December 2007.

134 p. Available at <ftp://ftp.epa.gov/wed/ecoregions/tx/TXeco_Jan08_v8_Cmprsd.pdf> (accessed September 12, 2011).

Institute of Educational Science (IES). 2010. "College Opportunities Online Locator." Zip Code 77414. October 2010. Available at <http://nces.ed.gov/ipeds/cool/RefineSearch.aspx> (accessed January 2011).

[MACTEC] MACTEC Engineering and Consulting, Inc. 2009. *Conceptual Site Model for Units 1 and 2, Groundwater Protection Initiative, South Texas Project Electric Generating Station*. Wadsworth, TX: MACTEC Engineering and Consulting, Inc. Revision 1. May 20, 2009. ADAMS No. ML11256A058.

[Matagorda County EDC] Matagorda County Economic Development Corporation. 2007. "Community Profile." Available at <http://www.mcedc.net/index.php> (accessed April 2012).

McAden DC, Greene GN, Baker WB Jr. 1984. *Colorado River Entrainment and Impingement Monitoring Program Phase Two Studies. Report #1*. Prepared for STP Nuclear Operating Company. October 1984. 58 p. ADAMS No. ML11256A057.

McAden DC, Greene GN, Baker WB Jr. 1985. *Colorado River Entrainment and Impingement Monitoring Program Phase Two Studies. Report #2*. Prepared for STP Nuclear Operating Company. October 1984. 30 p. ADAMS No. ML11256A057.

Miller MP, Haig SM, Gratto-Trevor CL, Mullins TD. 2009. Molecular population genetic structure in the piping plover. U.S. Geological Survey Open File Report 2009–1032. 30 p. Available at <http://pubs.usgs.gov/of/2009/1032/pdf/OFR20091032.pdf> (accessed June 21, 2011).

Musick JA, Grubbs RD, Baum J, Cortés E. 2007. "Carcharhinus obscurus." Available at <http://www.iucnredlist.org/apps/redlist/details/3852/0> (accessed June 28, 2011).

National Environmental Policy Act of 1969, as amended. 42 U.S.C. §4321 et seq.

National Historic Preservation Act of 1966. 16 U.S.C. §470 et seq.

[NCES] National Center for Education Statistics. 2010. "Search for Public School Districts." Available at <http://www.nces.ed.gov/ccd/districtsearch/> (accessed June 2011).

[NMFS] National Marine Fisheries Service. 2009. "Species of Concern: Saltmarsh Topminnow." January16, 2009. Available at <http://www.nmfs.noaa.gov/pr/pdfs/species/saltmarshtopminnow_detailed.pdf> (accessed September 7, 2011).

[NMFS] National Marine Fisheries Service. 2010a. "Bottlenose Dolphin (Tursiops truncatus truncates): Northern Gulf of Mexico Bay, Sound, and Estuarine Stocks." November 2010. Available at <http://www.nmfs.noaa.gov/pr/pdfs/sars/ao2010dobn-gmxb.pdf> (accessed 27 June 2011).

[NMFS] National Marine Fisheries Service. 2010b. Letter from M Croom, Assistant Regional Administrator for Habitat Conservation, to Johnson, Rulemaking and Directives Branch Chief, NRC. Subject: Concurrence with EFH Assessment for STP, Units 3 and 4. ADAMS No. ML101190379.

[NMFS] National Marine Fisheries Service. 2010c. Memorandum from RE Crabtree, Southeast Regional Administrator, to J Lecky, Office of Protected Resources Director. Subject: Removal of night shark from species of concern list. July 22, 2010. Available at <http://www.nmfs.noaa.gov/pr/pdfs/species/night_shark_dm.pdf> (accessed June 28, 2011).

[NMFS] National Marine Fisheries Service. 2010d. "Species of Concern: Ivory Tree Coral." February 23, 2010. Available at <http://www.nmfs.noaa.gov/pr/pdfs/species/ivorytreecoral_detailed.pdf> (accessed June 28, 2011).

[NMFS] National Marine Fisheries Service. 2010e. "Species of Concern: Sand Tiger Shark." February 23, 2010. Available at http://www.nmfs.noaa.gov/pr/pdfs/species/sandtigershark_detailed.pdf (accessed August 12, 2012).

[NMFS] National Marine Fisheries Service. 2011a. "Bottlenose Dolphin (Tursiops truncatus)." Available at <http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/bottlenosedolphin.htm> (accessed June 27, 2011).

[NMFS] National Marine Fisheries Service. 2011b. "Cetaceans: Whales, Dolphins, and Porpoises." Available at <http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/> (accessed May 19, 2011).

[NMFS] National Marine Fisheries Service. 2011c. E-mail from T Mincey, Program Analyst, to T Tran, Project Manager, NRC. Subject: List of species under NMFS jurisdiction. March 3, 2011. ADAMS No. ML110690848.

[NMFS] National Marine Fisheries Service. 2011d. "Proactive Conservation Program: Species of Concern." January 20, 2011. Available at <http://www.nmfs.noaa.gov/pr/species/concern/> (accessed March 30, 2011).

[NMFS] National Marine Fisheries Service. 2011e. "Species of Concern List." Available at <http://www.nmfs.noaa.gov/pr/species/concern/#list> (accessed June 28, 2011).

[NRC] U.S. Nuclear Regulatory Commission. 1975. *Final Environmental Statement Related to the Proposed South Texas Project Units 1 & 2*. Washington, DC: NRC. NUREG-75/019.

[NRC] U.S. Nuclear Regulatory Commission. 1986. *Final Environmental Statement Related to the Operation of South Texas Project, Units 1 & 2*. Washington, DC: NRC. NUREG-1171. August 1986. ADAMS No. ML11172A080.

[NRC] U.S. Nuclear Regulatory Commission. 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. Washington, DC: NRC. NUREG-1437. May 1996. ADAMS Nos. ML040690705 and ML040690738.

[NRC] U.S. Nuclear Regulatory Commission. 1999. Section 6.3—Transportation, Table 9.1, Summary of findings on NEPA issues for license renewal of nuclear power plants. In: *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. Washington, DC: NRC. NUREG-1437, Volume 1, Addendum 1. August 1999. ADAMS No. ML04069720.

[NRC] U.S. Nuclear Regulatory Commission. 2000. *Environmental Standard Review Plan: Standard Review Plans for Environmental Reviews for Nuclear Power Plants*. Washington, DC: NRC. NUREG-1555.

[NRC] U.S. Nuclear Regulatory Commission. 2008. South Texas Project Units 3 and 4 COL Site Audit and Scoping Trip Report. February 3-8, 2008. ADAMS No. ML081010440.

[NRC] U.S. Nuclear Regulatory Commission. 2011a. E-mail from B Martin, THC, to TK O'Neil, PNNL. Subject: STP license renewal—SHPO meeting. May 2, 2011. ADAMS No. ML11259A029.

[NRC] U.S. Nuclear Regulatory Commission. 2011b. *Environmental Impact Statement for Combined Licenses (COLs) for South Texas Project Electric Generating Station, Units 3 and 4*.

Washington, DC: NRC. NUREG-1937, Volumes 1 and 2. ADAMS Nos. ML11049A000 and ML11049A001.

[NRC] U.S. Nuclear Regulatory Commission. 2011c. *Essential Fish Habitat Assessment for South Texas Project Electric Generating Station Units 3 and 4*. Washington, DC: NRC. Final Report. ADAMS No. ML11049A001.

[NRC] U.S. Nuclear Regulatory Commission. 2011d. Letter from BM Pham, NRC, to DL Klima, Advisory Council on Historic Preservation. Subject: South Texas Project, Units 1 and 2, license renewal application review. January 27, 2011. ADAMS No. ML110200002.

[NRC] U.S. Nuclear Regulatory Commission. 2011e. Letter from BM Pham, NRC, to M Wolfe, Texas Historical Commission. Subject: South Texas Project, Units 1 and 2, license renewal application review (track no. 201002271). February 17, 2011. ADAMS No. ML110190549.

[NRC] U.S. Nuclear Regulatory Commission. 2011f. Letter from D Wrona, Branch Chief, to M Orms M, FWS. Subject: Request for concurrence on list of Federally protected species. February 16, 2011. ADAMS No. ML110190429.

[NRC] U.S. Nuclear Regulatory Commission. 2011g. Letter from T Tran, NRC, to GT Powell, STPNOC. Subject: Audit report regarding South Texas Project license renewal application—cultural resources. July 18, 2011. ADAMS No. ML11173A304.

[NRCS] Natural Resources Conservation Service. 2011, “Web Soil Survey, Soil Map—Matagorda County, Texas, Map Unit Description–Matagorda County, Texas.” April 12, 2011. Available at <http://websoilsurvey.nrcs.usda.gov/app> (accessed October 9, 2011).

Patillo ME, Czapla TE, Nelson DM, Monaco ME. 1997. *Distribution and Abundance of Fishes and Invertebrates in Gulf of Mexico Estuaries*. Volume 2, Species Life History Summaries. ELMR Reort No. 11. Silver Spring, MD: NOAA/NOS Strategic Environmental Assessments Division.

Pollard D, Smith A. 2005. “Carcharias taurus.” Available at <http://www.iucnredlist.org/apps/redlist/details/3854/0> (accessed June 28, 2011).

Ryder, PD. 1996. *Ground Water Atlas of the United States, Oklahoma, Texas*. Washington, DC: U.S. Geological Survey. Available at <http://pubs.usgs.gov/ha/ha730/ch_e/index.html> (accessed August 31, 2011).

Ryder, PD, Ardis, AF. 2002. *Hydrology of the Texas Gulf Coast Aquifer Systems, Regional Aquifer-Systems Analysis-Gulf Coast Plain*. Reston, VA: U.S. Geological Survey. U.S. Geological Survey Professional Paper 1416-E.

Santana FM, Lessa R, Carlson J. 2006. “Carcharhinus signatus.” Available at <http://www.iucnredlist.org/apps/redlist/details/60219/0> (accessed June 28, 2011).

[STPNOC] South Texas Project Nuclear Operating Company. 2007. *2006 Annual Environmental Operating Report, South Texas Project Electric Generating Station*. Bay City, TX: STPNOC. April 2007. ADAMS No. ML071270211.

[STPNOC] South Texas Project Nuclear Operating Company. 2008. Letter from Gregory Gibson, STPNOC, to NRC Document Control Desk. Subject: Response to RAI. July 15, 2008, No. ML082040684.

[STPNOC] South Texas Project Nuclear Operating Company. 2009a. *Updated Final Safety Analysis Report Units 1 and 2*. Bay City, TX: STPNOC. Revision 15. ADAMS No. ML103220222.

[STPNOC] South Texas Project Nuclear Operating Company. 2009b. *Water Conservation Plan, STP Nuclear Operating Company, South Texas Project Electric Generating Station, Certificate of Adjudication 14-5437 A*. May 1, 2009. Revision 2. ADAMS No. ML11256A058.

[STPNOC] South Texas Project Nuclear Operating Company. 2010a. *2009 Annual Environmental Operating Report, South Texas Project Electric Generating Station*. Bay City, TX: STPNOC. April 2010. ADAMS No. ML101260530.

[STPNOC] South Texas Project Nuclear Operating Company. 2010b. *South Texas Project, Units 1 and 2, License Renewal Application*. Bay City, TX: STPNOC. Appendix E, "Environmental Report." September 2010. ADAMS No. ML103010263.

[STPNOC] South Texas Project Nuclear Operating Company. 2010c. *South Texas Project, Units 3 and 4, Combined License Application*. Bay City, TX: STPNOC. Part 2, "Final Safety Analysis Report," Revision 4. ADAMS No. ML102860517.

[STPNOC] STP Nuclear Operating Company. 2010d. South Texas Project, Units 3 and 4, Combined License Application. Bay City, TX: STPNOC. Part 3, "Environmental Report," Revision 4. ADAMS No. ML102860592.

[STPNOC] South Texas Project Nuclear Operating Company (STPNOC). 2010e. Letter from Mark McBurnett, STPNOC, to NRC Document Control Desk. Subject: Additional Information Regarding Draft Environmental Impact Statement. September 9, 2010. ADAMS No. ML102600127.

[STPNOC] South Texas Project Nuclear Operating Company. 2011a. 2010 Annual Environmental Operating Report, South Texas Project Electric Generating Station. Bay City, TX: STPNOC. April 2011. ADAMS Nos. ML111250423 and ML111250429.

[STPNOC] South Texas Project Nuclear Operating Company. 2011b. Letter from AW Harrison, Manager Licensing, to NRC Document Control Desk. Subject: Transmittal of documents to support review of the STP LRA. TAC Nos. ME 4938 and ME 5122. STP Letter No. NOC-AE-11002720. August 31, 2011. ADAMS Nos. ML11256A056 and ML11256A059.

[STPNOC] South Texas Project Nuclear Operating Company. 2011c. Letter from GT Powell, STPNOC, to NRC Document Control Desk. Subject: Response to RAI for the review of the STP LRA. July 5, 2011. ADAMS No. ML11193A016.

[STPNOC] South Texas Project Nuclear Operating Company. 2011d. Letter from GT Powell, Vice President, STPNOC, to NRC Document Control Desk. Subject: Response to RAI for the STP LRA. TAC Nos. ME4938 and ME5122. STP Letter No. NOC-AE-11002719. September 6, 2011. ADAMS No. ML11255A211.

[STPNOC] South Texas Project Nuclear Operating Company. 2011e. Letter from GT Powell, Vice President, STPNOC, NRC Document Control Desk. Subject: Response to RAI for the review of the STP LRA. TAC Nos. ME4938 and ME5122. STP Letter No. NOC-AE-11002723. September 12, 2011. ADAMS No. ML11259A014.

[STPNOC] South Texas Project Nuclear Operating Company. 2011f. Letter from GT Powell, STPNOC, to NRC Document Control Desk. Subject: Response to RAI for the review of the STP LRA. October 18, 2011. ADAMS No. ML11298A085.

[STPNOC] South Texas Project Nuclear Operating Company. 2011g. Letter from GT Powell, Vice President, STPNOC, NRC Document Control Desk. Subject: response to RAI for the review of the LRA. July 5, 2011. ADAMS No. ML11193A074.

[STPNOC] South Texas Project Nuclear Operating Company. 2012a. *South Texas Project, Units 1 and 2, Clarification of Information*. Bay City, TX: STPNOC. January 10, 2012. ADAMS No. ML12011A188.

[STPNOC] South Texas Project Nuclear Operating Company. 2012b. Letter from GT Powell, Vice President, STPNOC, NRC Document Control Desk. Subject: response to RAI for the review of the LRA. March 12, 2012. ADAMS No. ML12079A014.

[TCEQ] Texas Commission on Environmental Quality. 2005. STPNOC TPDES Permit No. WQOOO 1908000, Permit to Discharge Wastes. July 21, 2005. ADAMS No. ML11256A057.

[TCEQ] Texas Commission on Environmental Quality. 2009. Letter from L Lancaster, Team Leader Application Review and Processing Team, TCEQ, to SL Dannhardt, STPNOC. Subject: Declaration of Administrative Completeness, STPNOC, Permit No. WQ0001908000 (EPA ID No. TX0064947) (RN102395654), Type of Authorization: Renewal. July 13, 2009. ADAMS No. ML11255A211.

[TCEQ] Texas Commission on Environmental Quality. 2011. "Draft 2010 Texas Integrated Report for Clean Water Act Sections 305(b) and 303(d)." March 8, 2011. Available at <http://www.tceq.texas.gov/waterquality/ assessment/10twqi/10twqi> (accessed October 20, 2011).

Texas Historical Commission. 2011. "Celebrate Native American Heritage in November." Available at <http://www/thc/.state.tx.us/news/whatsnewstories/wnnamnth.shtml> (accessed October 28, 2011).

Texas Water Code, Title 2, *Water Administration*, Chapter 36, *Groundwater Conservation Districts*. Available at <http://www.twdb.state.tx.us/gwrd/gcd/gcdhome.htm> (accessed July 2012).

[TMMSN] Texas Marine Mammal Stranding Network. 2011. "The Gulf of Mexico's Marine Mammals." January 2, 2011. Available at <http://www.sci.tamucc.edu/tmmsn/29Species/marine.html> (accessed May 19, 2011).

[TPWD] Texas Parks and Wildlife Department. 2011a. "Brazos Bend State Park." Available at <http://www.tpwd.state.tx.us/spdest/findadest/parks/brazos_bend/> (accessed September 27, 2011).

[TPWD] Texas Parks and Wildlife Division. 2011b. "Jaguarundi." Available at <http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_bk_w7000_0013_jaguarundi.pdf> (accessed September 7, 2011).

[TPWD] Texas Parks and Wildlife Division. 2011c. Letter from A Turner, Wildlife Habitat Assessment Program, to B Pham, Branch Chief, NRC. Subject: Reply to request for species list for South Texas license renewal. April 20, 2011. ADAMS No. ML11119A009.

[TPWD] Texas Parks and Wildlife Department. 2011d. "Mad Island." Available at <http://www.tpwd.state.tx.us/huntwild/hunt/wma/find_a_wma/list/?id=39> (accessed September 27, 2011).

[TPWD] Texas Parks and Wildlife Division. 2011e. "Ocelot (Leopardus pardalis)." Available at <http://www.tpwd.state.tx.us/huntwild/wild/species/ocelot/> (accessed 7 September 2011).

[TPWD] Texas Parks and Wildlife Division. 2011f. "Rare, Threatened, and Endangered Species of Texas for Bexar, Brazoria, Colorado, DeWitt, Fayette, Gonzales, Guadalupe, Jackson, Lavaca, Matagorda, Wharton, and Wilson Counties." Available at

<http://gis.tpwd.state.tx.us/TpwEndangeredSpecies/DesktopDefault.aspx> (accessed May 19, 2011).

[TSHA] Texas State Historical Association. 2011. "Texas Almanac: Population History of Counties from 1850–2010." Available at <http://www.texasalmanac.com/topics/population> (accessed January 2011).

[TSWGW] Texas Saltwater and Fishing Guides Web. 2005. "King Mackerel (Kingfish)." Available at <http://www.txsaltwaterfishingguides.com/FishFacts/kingfish.htm> (accessed September 9, 2011). ADAMS No. ML100600370.

[TWDB] Texas Water Development Board. 2006. *Aquifers of the Gulf Coast of Texas*. Austin, TX: TWDB. Report 365. February 2006. Available at <http://www.twdb.state.tx.us/publications/reports/GroundWaterReports/GWReports/R365/AGCindex.htm> (accessed August 31, 2011).

[TWDB] Texas Water Development Board. 2007. *State Water Plan—Water for Texas 2007*. Austin, TX: TWDB Document No. GP-8-1. Volume 1. January 2007. Available at <http://www.twdb.state.tx.us/wrpi/swp/swp.asp> (accessed August 31, 2011).

[TXDOT] Texas Department of Transportation. 2011. "District Traffic Maps—2010." Available at <http://ftp.dot.state.tx.us/pub/txdot-info/tpp/traffic_counts/2010/ykm_base.pdf> (accessed April 2011).

University of Texas at Austin. 2011. "Texas Beyond History." Available at <http://www/texasbeyondhistory.net/faq/index.html#9> (accessed October 28, 2011).

[USACE] U.S. Army Corps of Engineers. 2009. Letter from K Jaynes, Compliance Section Chief, Galveston District, to R Kiesling, STPNOC. Subject: Jurisdictional wetlands on the South Texas site. May 14, 2009. ADAMS No. ML11256A057.

[USCB] U.S. Census Bureau. 2010. "American FactFinder, Census 2000 and 2006–2008, 3-Year Estimate, American Community Survey, State and County QuickFacts on Brazoria and Matagorada Counties. Housing Characteristics for 2000 and 2006-2008, 3-Year Estimate. Profile of Selected Economic Characteristics: 2000 and 2010." Available at <http://factfinder.census.gov and http://quickfacts.census.gov> (accessed January 2011).

[USDA NASS] U.S. Department of Agriculture National Agricultural Statistics Service. 2009. "2007 Census of Agriculture, Volume 1, Chapter 2, Table 1 and Table 7." December 2009. Available at <http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/Texas/index.asp> (accessed June 2011).

[USGS] U.S. Geological Survey. 2008. "Geologic Hazards Team Interactive Map Server, National Seismic Hazard Maps—2008." April 23, 2008. Available at <http://gldims.cr.usgs.gov> (accessed September 20, 2011).

[USGS] U.S. Geological Survey. 2011a. "Circular Area Earthquake Search, NEIC: Earthquake Search Results, U.S. Geological Survey Earthquake Database." (search parameters: Significant U.S. Earthquakes (1569–1989) Database, Latitude 28.7951 N, Longitude -96.04900 W, Radius 550 km). October 4, 2010. Available at <http://earthquake.usgs.gov/earthquakes/eqarchives/epic/epic_circ.php> (accessed September 20, 2011).

[USGS] U.S. Geological Survey. 2011b. "Circular Area Earthquake Search, NEIC: Earthquake Search Results, U.S. Geological Survey Earthquake Database." (search parameters: USGS/NEIC (PDE) 1973 Database, Latitude 28.7951 N, Longitude -96.04900 W, Radius

200 km). October 4, 2010. Available at <http://earthquake.usgs.gov/earthquakes/eqarchives/epic/epic_circ.php> (accessed September 20, 2011).

[USGS] U.S. Geological Survey. 2011c. “Texas Earthquake Information, Seismicity Map of Texas, Seismic Hazard Map of Texas.” Available at <http://earthquake.usgs.gov/earthquakes/states/index.php?regionID=43> (accessed September 20, 2011).

[USGS] U.S. Geological Survey. 2011d. “USGS Surface-Water Annual Statistics for the Nation, USGS 08162500, Colorado River Near Bay City, TX.” Available at <http://waterdata.usgs.gov/nwis/annual/?referred_module=sw&site_no=08162500&por_08162500_1=1460,00060,1,1948,2011&year_type=W&format=html_table&date_format=YYYY-MM-DD&rdb_compression=file&submitted_form=parameter_selection_list> (accessed August 31, 2011).

Wai CN, Huntsman G. 2006a. “Epinephelus drummondhayi.” Available at <http://www.iucnredlist.org/apps/redlist/details/7854/0> (accessed June 28, 2011).

Wai CN, Huntsman G. 2006b. “Hyporthodus nigritus.” Available at <http://www.iucnredlist.org/apps/redlist/details/7860/0> (accessed June 28, 2011).

[WEG] Wild Earth Guardians. Petition to list the saltmarsh topminnow (Fundulus jenkinsi) under the U.S. Endangered Species Act. September 3, 2010. Available at <http://sero.nmfs.noaa.gov/pr/esa/Candiate%20Spp/Saltmarsh%20Topminnow%20Petition-1.pdf> (accessed June 28, 2011).

Wiken E, Nava FJ, Griffith G. 2011. *North American Terrestrial Ecoregions—Level III*. Montreal, Canada: Commission for Environmental Cooperation. 149 p. Available at <ftp://ftp.epa.gov/wed/ecoregions/pubs/NA_TerrestrialEcoregionsLevel3_Final-2june11_CEC.pdf> (accessed September 12, 2011).

Wilber, D. 1989. Reproductive biology and distribution of stone crabs (Xanthidae, menippe) in the hybrid zone on the northeastern Gulf of Mexico. Marine Ecology Progress Series 52(1989):235-244.

Young, SC, Kelly, V, Budge, T, Deeds, N. 2007. *FINAL Development of the LSWP Groundwater Flow Model for the Chicot and Evangeline Aquifers in Colorado, Wharton, and Matagorda Counties*. Austin, TX: URS Corporation, INTERA, and Baer Engineering and Consulting. Available at <http://www.lcra.org/library/media/public/docs/lswp/findings/URS_Mitigation_report_final.pdf>. ADAMS No. ML100471604.

3.0 ENVIRONMENTAL IMPACTS OF REFURBISHMENT

Facility owners or operators may need to undertake or, for economic or safety reasons, may choose to perform refurbishment activities in anticipation of license renewal or during the license renewal term. The major refurbishment class of activities characterized in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) (NRC 1996) is intended to encompass actions that typically take place only once in the life of a nuclear plant, if at all. Examples of these activities include, but are not limited to, replacement of boiling-water reactor recirculation piping and pressurized-water reactor steam generators. These actions may have an impact on the environment beyond those activities occurring during normal operations for which the activities require evaluation, depending on the type of action and the plant-specific design. Table 3–1 lists the environmental issues associated with refurbishment that the U.S. Nuclear Regulatory Commission (NRC) staff (the staff) determined to be Category 1 issues in the GEIS.

Table 3–1. Category 1 Issues Related to Refurbishment

Issue	GEIS Section(s)
Surface water quality, hydrology, and use (for all plants)	
Impacts of refurbishment on surface water quality	3.4.1
Impacts of refurbishment on surface water use	3.4.1
Aquatic ecology (for all plants)	
Refurbishment	3.5
Groundwater use and quality	
Impacts of refurbishment on groundwater use and quality	3.4.2
Land use	
Onsite land use	3.2
Human health	
Radiation exposures to the public during refurbishment	3.8.1
Occupational radiation exposures during refurbishment	3.8.2
Socioeconomics	
Public services: public safety, social services, and tourism and recreation	3.7.4; 3.7.4.3; 3.7.4.4; 3.7.4.6
Aesthetic impacts (refurbishment)	3.7.8
Table source: Table B–1 in Appendix B, Subpart A, to 10 CFR Part 51	

Table 3–2 lists environmental issues related to refurbishment that the NRC staff determined to be plant-specific or inconclusive in the GEIS. These issues are Category 2 issues. The

definitions of Category 1 and 2 issues can be found in Section 1.4 of this supplemental environmental impact statement (SEIS).

Table 3–2. Category 2 Issues Related to Refurbishment

Issue	GEIS Section(s)	10 CFR 51.53(c)(3)(ii) Subparagraph
Terrestrial resources		
Refurbishment impacts	3.6	E
Threatened or endangered species (for all plants)		
Threatened or endangered species	3.9	E
Air quality		
Air quality during refurbishment (non-attainment and maintenance areas)	3.3	F
Socioeconomics		
Housing impacts	3.7.2	I
Public services: public utilities	3.7.4.5	I
Public services: education (refurbishment)	3.7.4.1	I
Offsite land use (refurbishment)	3.7.5	I
Public services, transportation	3.7.4.2	J
Historic and archaeological resources	3.7.7	K
Environmental justice		
Environmental justice[(a)]	Not addressed	Not addressed

[(a)] Guidance related to environmental justice was not in place at the time the NRC prepared the GEIS and the associated revision to 10 CFR Part 51. If an applicant plans to undertake refurbishment activities for license renewal, the applicant's Environmental Report (ER) and the staff's SEIS must address environmental justice.

Table source: Table B–1 in Appendix B, Subpart A, to 10 CFR Part 51

Table B.2 of the GEIS identifies systems, structures, and components (SSCs) that are subject to aging and might require refurbishment to support continued operation during the license renewal period of a nuclear facility. In preparation for its license renewal application, South Texas Project Nuclear Operating Company (STPNOC) performed an evaluation of these SSCs pursuant to Section 54.21 of Title 10, *Energy*, of the *Code of Federal Regulation* (10 CFR 54.21) to identify the need to undertake any major refurbishment activities that would be necessary to support the continued operation of South Texas Project (STP) during the proposed 20-year period of extended operation.

In the ER, STPNOC indicated that, in accordance with 10 CFR Part 54, STPNOC has submitted an integrated plant assessment (IPA) addressing the aging management of SSC for license renewal. The IPA does not identify the need to undertake any major refurbishment activities that are necessary to support continued operation of STP during the period of extended operation (STPNOC 2010). Furthermore, STPNOC indicated that it has replaced the steam generator and reactor heads to meet the operational needs under the current license. Therefore, the staff does not assess refurbishment activities in this SEIS.

3.1 References

10 CFR Part 51. *Code of Federal Regulations*, Title 10, *Energy*, Part 51, "Environmental protection regulations for domestic licensing and related regulatory functions."

10 CFR Part 54. *Code of Federal Regulations*, Title 10, *Energy*, Part 54, "Requirements for renewal of operating licenses for nuclear power plants."

[NRC] U.S. Nuclear Regulatory Commission. 1975. *Final Environmental Statement Related to The Proposed South Texas Project, Units 1 and 2*. Washington, DC: NRC. NUREG-75/019. March 1975. ADAMS No. ML11174A118

[NRC] U.S. Nuclear Regulatory Commission. 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. Washington, DC: NRC. NUREG-1437. May 1996. ADAMS Nos. ML040690705 and ML040690738.

[NRC] U.S. Nuclear Regulatory Commission. 1999. Section 6.3, Transportation, Table 9.1, Summary of findings on NEPA issues for license renewal of nuclear power plants. In: *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. Washington, DC: NRC. NUREG-1437, Volume 1, Addendum 1. August 1999. ADAMS No. ML04069720.

[STPNOC] South Texas Plant Nuclear Operating Company. 2010b. "South Texas Project, Applicant's Environmental Report—Operating License Renewal Stage, South Texas Project Units 1 & 2." September 2010. ADAMS No. ML103010263.

4.0 ENVIRONMENTAL IMPACTS OF OPERATION

This chapter addresses potential environmental impacts related to the period of extended operation of South Texas Project (STP). These impacts are grouped and presented according to resource. Generic issues (Category 1) rely on the analysis presented in the *Generic Environmental Impact Statement* (GEIS) *for License Renewal of Nuclear Plants* (NRC 1996, 1999). Site-specific issues (Category 2) have been analyzed for STP. However, some issues are not applicable to STP because of site characteristics or plant features. Section 1.4 of this supplemental environmental impact statement (SEIS) provides an explanation of the criteria for Category 1 and Category 2 issues, as well as the definitions of SMALL, MODERATE, and LARGE.

4.1 Land Use

Onsite land use issues that could be affected by license renewal are listed in Table 4–1. As discussed in the GEIS, onsite land use and powerline right-of-way conditions are expected to remain unchanged during the license renewal term at all nuclear plants; thus, impacts would be SMALL. These issues, therefore, were classified as Category 1 issues. Section 2.2.1 of this SEIS describes the land use conditions at STP.

The NRC staff reviewed and evaluated South Texas Project Nuclear Operating Company's (STPNOC's) Environmental Report (ER) (STPNOC 2010b), scoping comments, and other available data on STP, Units 1 and 2, were reviewed and evaluated for new and significant information. The review included an audit conducted by the NRC staff at the STP site. No new and significant information was identified during this review that would change the conclusions presented in the GEIS. Therefore, for these Category 1 issues, impacts during the renewal term are not expected to exceed those discussed in the GEIS.

Table 4–1. Land Use Issues

Issue	GEIS Section	Category
Onsite land use	4.5.3	1
Powerline right-of-way	4.5.3	1

Source: Table B–1 in Appendix B, Subpart A, to 10 CFR Part 51

4.2 Air Quality

Section 2.2.2 of this SEIS describes the meteorology and air quality in the vicinity of the STP site.

The air quality issue applicable to STP during the renewal term is discussed below and listed in Table 4–2. The GEIS did not identify any Category 2 issues related to air quality. The NRC staff did not identify any new and significant information during the review of the applicant's ER (STPNOC 2010), the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, there are no impacts related to these issues beyond those discussed in the GEIS. For these issues, the GEIS concluded that the impacts are SMALL, and additional site-specific mitigation measures are unlikely to be sufficiently beneficial to warrant implementation.

Table 4–2. Air Quality Issues

Issue	GEIS Section	Category
Air quality effects of transmission lines	4.5.2	1

Source: Table B–1 in Appendix B, Subpart A, to 10 CFR Part 51

4.3 Surface Water Resources

The surface water use, hydrology, and surface water quality issues potentially applicable to STP, Units 1 and 2, are discussed in the following sections and listed in Table 4–3. Surface water-related aspects and conditions relevant to STP, Units 1 and 2, are described in Sections 2.1.7.1 and 2.2.4 of this SEIS.

Table 4–3. Surface Water Resources Issues

Issues	GEIS Section	Category
Altered current patterns at intake & discharge structures	4.2.1.2.1	1
Altered salinity gradients	4.2.1.2.2	1
Discharge of chlorine or other biocides	4.2.1.2.4	1
Discharge of sanitary wastes & minor chemical spills	4.2.1.2.4	1
Discharge of other metals in wastewater	4.2.1.2.4	1
Water use conflicts (plants with cooling towers & cooling ponds using makeup water from a small river with low flow)	4.3.2.1	2

Source: STPNOC 2010b, 2011b and Table B–1 in Appendix B, Subpart A, to 10 CFR Part 51

4.3.1 Generic Surface Water Issues

NRC did not identify any new and significant information with regard to Category 1 (generic) surface water issues based on review of the ER (STPNOC 2010b), the public scoping process, or as a result of the environmental site audit. The NRC staff also reviewed other sources of information such as various permits and data reports. As a result, no information or impacts related to these issues were identified that would change the conclusions presented in the GEIS. Therefore, it is expected that there would be no impacts related to these Category 1 issues during the renewal term beyond those discussed in the GEIS. For these surface water issues, the GEIS concludes that the impacts are SMALL.

4.3.2 Surface Water Use Conflicts—Plants Using Makeup Water from a Small River with Low Flow

For nuclear power plants using cooling towers or cooling ponds that are supplied with makeup water from a small river, the potential impact on the flow of the river and related impacts on instream and riparian ecological communities is considered a Category 2 issue; thus, it requires a plant-specific assessment. The requirement for this assessment is specified by 10 CFR 51.53(c)(3)(ii)(A), which also defines a small river as one whose annual flow rate is less than 3.15×10^{12} ft^3/yr (9×10^{10} m^3/yr) or 100,000 cfs (2,820 m^3/s). STP, Units 1 and 2, has a closed-cycle heat-dissipation system that uses a cooling pond, the main cooling reservoir (MCR), with makeup water supplied from a small river, the lower Colorado River, with a mean annual discharge equivalent to 82.6×10^9 ft^3/yr (23.4×10^8 m^3/yr) or 2,620 cfs (74.1 m^3/s). Therefore, an assessment of the impact of the proposed action on the flow of the river is required.

In the State of Texas, water use is regulated by the Texas Water Code. Surface water belongs to the State (Water Code, Title 2, Subtitle B, Chapter 11, Section 11.021). The right to use surface waters of the State can be acquired in accordance with the provisions of the Texas Water Code, Chapter 11. Because the Colorado River Basin is currently heavily appropriated (used or obligated for use), future water users in this basin would likely obtain surface water by purchasing or leasing existing appropriations. The Texas Water Development Board (TWDB) uses 16 planning regions, the Regional Water Planning Areas (or regions), to plan and finance water supply projects. The regions prepare plans within their areas that are compiled into the State Water Plan. The most recent plan was adopted by the TWDB in November 2006 (TWDB 2007). For this SEIS, the staff reviewed the best available information for its analysis. Currently, the State of Texas is in the 2011 to 2016 planning cycle. The regions have compiled the 2011 Regional Water Plans. The 2012 State Water Plan has been released for public comment (TWDB 2011). The STP site is located in the Lower Colorado Regional Water Planning Group (LCRWPG), or Region K.

STPNOC owns water rights from the lower Colorado River to operate power reactors on the STP site. The waters of the Colorado River for STPNOC's use are adjudicated (administered or allotted) via a water right secured in 1989 (STPNOC 2010b). An agreement between the Lower Colorado River Authority (LCRA) and STPNOC specifies the conditions related to STPNOC's withdrawal (diversion) of water from the Colorado River. STPNOC is allowed to withdraw 102,000 ac-ft/yr (126 million m^3/yr) from the Colorado River at a maximum withdrawal rate of 1,200 cfs (34.4 m^3/s) or 540,000 gpm. However, STPNOC is limited to withdrawing 55 percent of the river flow that exceeds 300 cfs (8.5 m^3/s) or 135,000 gpm (STPNOC 2009a; TCEQ 2009a). In other words, STPNOC is limited in its ability to withdraw water from the Colorado River during low flow conditions (i.e., 55 percent of the river flow at the volumetric flow rate that exceeds 300 cfs).

STPNOC's historical withdrawals of surface water from the Colorado River for plant operations are summarized in Table 4–4.

Table 4–4. Surface Water Withdrawals and Usage for Calendar Years 2003–2010 for STP, Units 1 and 2

Calendar Year	Water Withdrawal (ac-ft) [(a)]	Water Use (ac-ft)
2003	0	27,800
2004	62,374	37,963
2005	5,694	35,383
2006	50,012	37,912
2007	58,740	39,403
2008	10,303	38,186
2009	72,464	38,008
2010	43,213	37,893

[(a)] To convert ac-ft to m^3, multiply by 1,233.5. To convert ac-ft to gal, multiply by 325,851.

Source: STPNOC 2010b, 2011b

Between 2003 and 2010, STPNOC withdrew an average of 37,850 ac-ft/yr (46.7 million m^3/yr) from the Colorado River and consumed an average of 36,569 ac-ft/yr (45.1 million m^3/yr) to support the operations of STP, Units 1 and 2. For a given year, withdrawals from the lower Colorado River can be significantly less or more than corresponding water use because of rules for water withdrawal specified in the LCRA–STPNOC contract (right to purchase or use), which are based on river flow and meteorological conditions that affect evaporation from the MCR. In 2003, STPNOC withdrew no water from the Colorado River but consumptively used 27,800 ac-ft (34.3 million m^3). The following year, STPNOC had to withdraw 62,374 ac-ft (76.9 million m^3) of river water to cover the 37,963 ac-ft (46.8 million m^3) of consumption and to replenish the MCR storage (the MCR functions and specifications are described in Section 2.1.6). The average, minimum, and maximum yearly withdrawals from the lower Colorado River over the 2003 to 2010 period are 36, 0, and 71 percent of the STPNOC annual water rights of 102,000 ac-ft (126 million m^3).

The LCRWPG adopted its 2011 Region Plan in July 2010 (LCRWPG 2010). The LCRWPG estimated that the total water demand in Region K would increase from 1,086,692 ac-ft/yr (1.34 billion m^3/yr) in 2010 to 1,382,534 ac-ft/yr (1.71 billion m^3/yr) in 2060, mainly due to a projected doubling of the population of Region K over the timeframe. The LCRWPG estimated that the water available to Region K would decline from 1,331,715 ac-ft/yr (1.64 billion m^3/yr) in 2010 to 1,289,453 ac-ft/yr (1.59 billion m^3/yr) in 2060. The LCRWPG estimated that region-wide water shortages would be 297,000 and 367,000 ac-ft/yr (366 and 453 million m^3/yr) in 2030 and 2060, respectively (LCRWPG 2010). To estimate shortages, the LCRWPG used the following conservative assumptions:

- Available water would be that during a historical drought of record.
- All water rights would be used fully and simultaneously.
- Interruptible water from LCRA and municipal return flows to the Colorado River would not be available.

These assumptions are conservative because they minimize water availability and maximize water use, thereby maximizing potential shortages.

The region plans to address shortages by using a variety of strategies. These water management strategies include use of municipal return flows, conservation, reuse, new water storage facilities, aquifer storage of surface water, new groundwater supply development, saltwater desalination, and intra-region transfer of water from areas with surplus. The LCRWPG estimated that the implementation of all water management strategies could yield an additional 349,862 to 610,750 ac-ft/yr (432 to 754 million m^3/yr) to meet the estimated shortages (LCRWPG 2010).

During the past 5 years, withdrawals from the lower Colorado River to support the operations of STP, Units 1 and 2, have averaged 46,946 ac-ft/yr (57.9 million m^3/yr), which is equivalent to 2.5 percent of the mean annual discharge of 2,620 cfs (74.1 m^3/s) or approximately 1.89 million ac-ft/yr (2.3 billion m^3/yr) for the river. The average withdrawal for STP, Units 1 and 2, is 3.5 and 3.6 percent of the water available to Region K in 2010 and 2060, respectively. The 2060 projection is based on the assumption that no implementation of any strategies to augment (or to change) regional water supply would have taken place. STPNOC's water right of 102,000 ac-ft/yr (126 million m^3/yr) is accounted for in the Region K plan. The LCRWPG has evaluated several strategies that can be used to meet shortages that may occur during conditions similar to the drought of record when all existing water rights are fully and simultaneously used. Therefore, NRC concludes that continued operation of STP, Units 1 and 2, as supported by the currently held water rights, would have no substantial effect on water supplies in the region. NRC further concludes that the impact on surface water resources and downstream water availability in the lower Colorado River from continued withdrawals during the license renewal term would be SMALL.

4.4 Groundwater Resources

The groundwater use and quality issues applicable to STP, Units 1 and 2, are discussed in the following sections and listed in Table 4–5 for Category 1 (generic) and Category 2 (site-specific) issues. Groundwater resources-related aspects and conditions relevant to STP, Units 1 and 2, are described in Sections 2.1.7.2 and 2.2.5 of this SEIS.

Table 4–5. Groundwater Resources Issues

Issues	GEIS Section	Category
Groundwater use conflicts (potable and service water & dewatering; plants that use >100 gpm)	4.8.1.1, 4.8.1.2	2
Groundwater use conflicts (plants using cooling towers withdrawing makeup water from a small river)	4.8.1.3	2
Groundwater quality degradation (saltwater intrusion)	4.8.2.1	1
Groundwater quality degradation (cooling ponds in salt marshes)	4.8.3	1

4.4.1 Generic Groundwater Issues

Section 2.2.5 of this SEIS discusses groundwater use and quality at STP. NRC did not identify any new and significant information with regard to Category 1 (generic) groundwater issues based on review of the ER (STPNOC 2010b), the public scoping process, or as a result of the environmental site audit. The NRC staff also reviewed other sources of information, such as applicable permits and data reports, as listed in the reference section of this SEIS chapter. The staff provides a list of STP permits for operation (status of compliance) in Appendix C. As a result, no information or impacts related to these issues were identified that would change the conclusions presented in the GEIS. Therefore, it is expected that there would be no impacts related to these Category 1 issues during the renewal term beyond those discussed in the GEIS. For these groundwater issues, the GEIS concludes that the impacts are SMALL.

4.4.2 Groundwater Use Conflicts

This section presents the NRC staff's review of plant-specific (Category 2) groundwater use conflict issues, as listed in Table 4–5.

4.4.2.1 Plants Using Greater Than 100 gpm of Groundwater

For nuclear power plants that pump more than 100 gpm (380 L/min) of groundwater from onsite wells, the potential groundwater use conflict with nearby groundwater users is considered a Category 2 issue that requires a plant-specific assessment, as specified in 10 CFR 51.53(c)(3)(ii)(C).

As described in Section 2.1.7.2, onsite groundwater production at STP has averaged 768 gpm (2,910 L/min) or 1,239 ac-ft/yr (1.5 million m^3/yr) annually over the 10-year period from 2001 through 2010. STP has a permit for five production wells completed in the Deep Chicot Aquifer to withdraw at a combined rate of approximately 1,860 gpm (7,040 L/min) or 3,000 ac-ft/yr (3.7 million m^3/yr). Of the five production wells, wells 5, 6, and 7 (as described in Section 2.1.7.2) feed a common header (a single collection point) that delivers water to be chlorinated, filtered, and stored for use by the service water system and the fire protection system. Each of these three wells has a design capacity of 500 gpm (1,890 L/min) at a depth of 700 ft (210 m). The service water system includes the demineralizer system and the potable water supply for the plant. The common header supplied by the three production wells is also the primary source for makeup water to the essential cooling pond (ECP). Well 8, with a design capacity of 250 gpm (950 L/min) at a depth of 600 ft (180 m), supplies the Nuclear Support Center chill water for the building cooling tower. The Nuclear Training Facility (NTF) well, with a design capacity of 200 gpm (760 L/min) and a depth of 600 ft (180 m), provides fire protection water to the NTF (STPNOC 2010b).

Because the annual average withdrawal rate from these sources for service water and fire protection water is greater than 100 gpm (380 L/min), this is a Category 2 issue for the STP site. All five STP production wells (5, 6, 7, 8, and NTF) are located relatively near the STP site boundary, as shown in Figure 2–1. Coastal Plains Groundwater Conservation District (CPGCD) rules require that wells of 7-in. (18-cm) diameter or greater completed on adjacent lands with different owners must be spaced a minimum of 2,500 ft (760 m) from any other permitted or registered well (CPGCD 2010). Therefore, drawdown at 2,500 ft (760 m) well spacing is relevant to the evaluation of potential conflicts with neighboring wells.

The applicant performed an analysis of drawdown using the Theis non-equilibrium well equations (E.E. Johnson, Inc. 1966). Using representative hydraulic properties, the applicant calculated drawdowns of 20.0 and 20.7 ft (6.1 and 6.3 m) in the Deep Chicot Aquifer after 40 and 60 years, respectively, for a neighboring well located 2,500 ft (760 m) from an STP production well pumped at 500 gpm (1,890 L/min) (STPNOC 2011c). The projected change in drawdown during the additional 20 years of operation is less than 1 ft (0.3 m). The NRC staff checked and confirmed the applicant's drawdown estimates, as presented in Table 4–6. To more completely evaluate the potential change in drawdown, the NRC staff also calculated drawdown at distances of 1 and 5 mi (1.6 and 8 km).

Table 4–6. Projected Drawdown and Change in Drawdown in Feet for the Deep Chicot Aquifer for Selected Distances

Distance [(a)]	Aquifer Drawdown ft (m)		Change in Drawdown ft (m)
	40 years	60 years	
2,500 ft (760 m)	20 ft (6.1 m) [(b)]	20.7 ft (6.3 m) [(b)]	0.7 ft (0.2 m)
1 mi (1.6 km)	17.4 ft (5.3 m)	18.1 ft (5.5 m)	0.7 ft (0.2 m)
5 mi (8 km)	11.8 ft (3.6 m)	12.5 ft (3.8 m)	0.7 ft (0.2 m)

[(a)] All projections assume a saturated hydraulic conductivity of 33,245 gallons per day per foot (gpd/ft), coefficient of storage of 0.00022 (dimensionless), and a pumping rate of 500 gpm (1,890 L/min).

[(b)] This is based on STPNOC 2011c. Remaining drawdown values are based on NRC staff analyses.

The STP ER for proposed Units 3 and 4 reproduced a map showing the potentiometric surface (the water level that would rise in a well) in the Deep Aquifer in Matagorda County in 1967 (STPNOC 2010c). It shows the potentiometric head (hydraulic pressure) to be between 0 and 10 ft (3 m) below mean sea level (MSL) at the STP site. The Deep Aquifer potentiometric surface in 2005 reveals the potentiometric head on the site boundary near wells 5 and 6 to be as great as 55 ft (17 m) below MSL. Well 5 was completed in 1975, and well 6 was completed in 1977. By 2005, these wells had been in service for approximately 30 years, and drawdown was approximately 50 ft (15 m) below MSL. Piezometers completed in the Deep Chicot Aquifer at the site (STPNOC 2010c) indicate a steady response pumping activity since the late 1990s, with one piezometer relatively near production well 5 showing a near constant piezometric head of 50 ft (15 m) below MSL. The elevation of the upper surface of the Deep Chicot Aquifer is between 250 to 300 ft (76 to 91 m) below ground surface or approximately 220 to 270 ft (67 to 83 m) below MSL. Thus, the steady drawdown observed at the site ensures ample confining pressure remains in the Deep Chicot Aquifer. The drawdown observed suggests that a well located near the STP site boundary and one of the STP production wells could require a pumping lift (differential pressure applied by a pump) of approximately 50 ft (15 m) over conditions in 1967. This is the additional vertical distance that water would have to be pumped to the surface. However, the majority of this drawdown and associated pumping lift has been identified as regional drawdown resulting from groundwater development to the north of the STP site, as reflected in historical well and piezometer water well mapping (STPNOC 2009c).

The NRC staff's analysis of drawdown using representative hydraulic properties and review of field data reveals that drawdown near STP production wells could influence the pumping lift of groundwater wells on neighboring properties. However, the drawdown at STP production wells from 40 years of pumping is estimated to be approximately 20 ft (6.1 m), and continued operation for an additional 20 years beyond the current license period would increase drawdown by less than 1 ft (0.3 m). This finding is influenced by local and regional groundwater use regulation as discussed above and in Section 2.2.5. The projected increase in drawdown of less than 1 ft (0.3 m) is a negligible impact on neighboring wells and landowners. Therefore, the NRC staff concludes that groundwater use conflicts from STP groundwater withdrawals during the license renewal term would be SMALL.

4.4.2.2 Plants Using Cooling Towers or Cooling Ponds and Withdrawing Makeup Water from a Small River

Nuclear power plants using cooling towers or cooling ponds that are supplied with makeup water from a small river (as defined in Section 4.3.2) require a plant-specific assessment due to the potential impact on alluvial aquifers. The requirement for this assessment is specified by

10 CFR 51.53(c)(3)(ii)(A). This potential impact to groundwater is considered a Category 2 issue. The GEIS established this groundwater aspect as Category 2 because consumptive use of water withdrawn from a small river could adversely affect groundwater aquifer recharge. Low river flow conditions are of particular interest.

STP, Units 1 and 2, is dependent on the lower Colorado River as the primary water source for the 7,000-ac (2,830-ha) MCR. Systems that have a groundwater source (e.g., service water, fire protection) also discharge to the MCR. The lower Colorado River meets the NRC definition of a small river. As noted in Section 2.2.5.1, the Shallow Chicot Aquifer discharges to the Colorado River southeast of the STP site. There is a relatively narrow band of an alluvial aquifer separating the Shallow Chicot Aquifer from the Colorado River. With the rise and fall of the Colorado River, the alluvial aquifer experiences bank storage. This refers to a condition such that when groundwater in the alluvial aquifer is higher than the river stage, the alluvial aquifer discharges to the river. Similarly, when river stage is higher than groundwater in the alluvial aquifer, the alluvial aquifer is recharged by the river. In general, the lower Colorado River is a gaining stream (sustained by groundwater discharges) near the STP site. This is because the Shallow Chicot Aquifer discharges to the alluvial aquifer, and the alluvial aquifer discharges to the Colorado River. During high river stage and local to the river shore, the groundwater elevation would increase in the alluvial and Shallow Chicot Aquifer, resulting in recharge to the aquifers. During low river stage, the Shallow Chicot Aquifer and the alluvial aquifer would resume discharging to the river.

Near the STP site, the Shallow Chicot Aquifer is used primarily for livestock watering because of its low yields to wells and relatively poor quality. The Deep Chicot Aquifer is separated hydraulically from the Shallow Chicot Aquifer by a 100- to 150-ft (30- to 46-m) thick confining unit, and it is the primary source of groundwater for the region due to high aquifer yields and good quality.

STPNOC is limited in its ability to divert water from the lower Colorado River during periods of low flow and can do so only after confirming the Colorado River flow at the U.S. Geological Survey (USGS) Bay City gaging station supports the withdrawal of surface water in accordance with STPNOC's Certificate of Adjudication for water use, as discussed in Section 2.1.7.1 and Section 4.3.2 (STPNOC 2009d, 2010b).

In summary, the following staff findings are relevant to the issue of groundwater use conflicts on alluvial aquifers from STP continued operations:

- The alluvial aquifer is limited to a relatively narrow band between the Colorado River and the Shallow Chicot Aquifer.
- The Colorado River is normally a gaining stream with the alluvial aquifer and Shallow Chicot Aquifer discharging to the river. During periods of low river flow, the alluvial aquifer and Shallow Chicot Aquifer would discharge to the river (the normal situation for a gaining stream).
- The Shallow Chicot Aquifer is used for watering livestock and other low-yield, poor-quality applications and would not be substantially influenced by the bank storage effects of alluvial aquifer recharge and discharge.
- The Deep Chicot Aquifer is the primary groundwater supply in the region, and it discharges to the lower Colorado River estuary and Matagorda Bay approximately 5 mi (8 km) downstream of STP (discussed in Section 2.2.5).

- STP is limited through its Certificate of Adjudication and management plan regarding diversion of lower Colorado River water during low flow (discussed in Section 2.1.7.1 and Section 4.3.2).

Based on the information above, the NRC staff concludes that continued withdrawals of surface water (the Colorado River) for the operation of STP, Units 1 and 2, during low-flow periods would have a SMALL impact on recharge to the alluvial aquifer during the license renewal term.

4.4.3 Groundwater Quality

As described in Section 4.4.1, the NRC staff did not identify any new and significant information with regard to Category 1 (generic) groundwater issues. As part of its assessment, the staff specifically reviewed information relating to the current state of knowledge regarding groundwater quality downgradient of the MCR and underlying the STP protected area, as summarized below.

Elevated concentrations of tritium have been observed in groundwater adjacent to the MCR and in groundwater underlying the protected area of STP, Units 1 and 2, as described in Section 2.2.5.2. The MCR is unlined and water from the reservoir seeps into the Upper Shallow Aquifer. Systems within the protected area have released liquids containing tritium to groundwater.

Regarding non-radioactive contaminants in the MCR, total dissolved solids (TDS) is an indicator contaminant. The NRC staff anticipates that seepage from the MCR to the Upper Shallow Aquifer would initially have the same TDS concentration as the MCR. STPNOC's estimate of the median TDS concentration in the MCR from operation of STP, Units 1 and 2, is approximately 2,000 mg/L (NRC 2011b). Locally, groundwater from the Shallow Aquifer is described as being slightly saline because TDS concentrations are above 1,000 mg/L (i.e., slightly saline waters have TDS ranges of 1,000 to 3,000 mg/L). Onsite wells completed in the Shallow Chicot Aquifer have an average TDS concentration of 1,200 mg/L (STPNOC 2010c). Accordingly, the Shallow Aquifer is used locally to water livestock, and it is not a freshwater supply. The NRC staff concludes that given a long-term local increase of TDS concentration to 2,000 mg/L, the groundwater TDS concentration would remain in the range associated with slightly saline waters. Thus, the potential future TDS level is consistent with the existing groundwater quality and its current use as a source of water for livestock. Any impacts from this change in groundwater quality would be localized because the groundwater plumes originating from the MCR are local to the STP site and the region immediately downgradient of the site to the lower Colorado River.

Regarding radioactive contaminants in the MCR, tritium is an indicator contaminant. Tritium releases occur to the Upper Shallow Chicot Aquifer from the MCR via seepage through the reservoir floor. Historical monitoring data for the MCR water (inside the MCR) show a peak tritium concentration of 17,410 picocuries per liter (pCi/L) in 1996 and values less than 14,000 pCi/L since then (STPNOC 2010b, 2010c). A relief well monitored since 1995 showed a peak tritium concentration of 7,672 pCi/L in 1998 and values less than 7,000 pCi/L since then. Tritium activity in an onsite monitoring well completed in the Shallow Chicot Aquifer shows a peak in year 2000 of approximately 8,000 pCi/L and lower values before and after (NRC 2011b). Monitoring shows that levels of tritium in the Shallow Chicot Aquifer around the MCR originate from the liquids discharged to the MCR and are below the EPA primary drinking water standard (DWS) of 20,000 pCi/L (40 CFR Part 141). The staff also concludes that tritium concentrations in the Shallow Chicot Aquifer, resulting from seepage from the MCR, are bounded by the tritium concentration in the MCR waters. Thus, the observed peak tritium concentration of

17,410 pCi/L, and more recent levels of 14,000 pCi/L, ensures that tritium concentrations in groundwater downgradient of the MCR will be below the EPA primary DWS. Further, as noted in Section 2.2.5.2, the Deep Chicot Aquifer is separated from the Shallow Chicot Aquifer by a zone of predominantly clay material 100 to 150 ft (30 to 46 m) thick. The Deep Chicot Aquifer is the primary source of groundwater for the region, and tritium has not been detected in the Deep Chicot Aquifer (MACTEC 2009).

As a result of STPNOC's participation in the Nuclear Energy Institute's (NEI) Groundwater Protection Initiative (NEI 2007), data exist on tritium levels in groundwater, and a report was issued that compiled all information about groundwater and releases to groundwater in the STP, Units 1 and 2, protected area (MACTEC 2009). A peak tritium concentration around 15,000 pCi/L was observed in the Upper Shallow Chicot Aquifer beneath the protected area in 2006. Sampling at the location of that peak concentration has shown a continuous decline in tritium concentration with a concentration of 1,500 pCi/L observed in 2010. All measured tritium levels in groundwater within the protected area are below the EPA primary DWS (i.e., 20,000 pCi/L) (see Section 2.2.5.2).

Three possible sources of tritium in groundwater within the protected area have been identified as seepage from the MCR, leaks of the TDS pipeline system, and discharge to the ground from the turbine steam trap drains or steam condensate lines. Tritium levels in groundwater originating in the MCR are bounded, as described above, and will be less than the EPA primary DWS. STPNOC has noted that the TDS pipeline system and the steam condensate line releases could have a maximum tritium concentration of less than 90,000 pCi/L (STPNOC 2011c). Releases to groundwater in the vicinity of the Units 1 and 2 reactors move downward from the Upper into the Lower Shallow Chicot Aquifer and then laterally to the east and southeast in the Lower Shallow Chicot Aquifer to the STP site boundary (NRC 2011b). As described in Section 2.2.5.2, the groundwater travel time from the protected area to the STP site boundary east of the protected area is approximately 100 years. This represents over 8 half-lives of tritium decay; therefore, releases at the maximum level would decay to concentrations below the EPA primary DWS before leaving the STP site. The NRC staff has evaluated the releases inside the protected area, as well as relevant groundwater monitoring data. The staff concludes that no release is occurring from an unidentified pathway (based on accounting of releases from available records), and there is no substantial adverse impact on drinking water (the staff evaluates human health issues in Section 4.8).

In addition to the foregoing, the following staff findings are relevant to the issue of groundwater quality impacts:

- Groundwater in the Shallow Chicot Aquifer will remain slightly saline and suitable to its current use for watering livestock.
- Tritium levels in the Shallow Chicot Aquifer resulting from seepage from the MCR will not exceed the EPA primary DWS.
- Tritium has not been detected in the Deep Chicot Aquifer, which is the primary groundwater source in the region.
- Tritium levels in the Shallow Chicot Aquifer resulting from leaks and discharges inside the STP protected area are currently below the EPA DWS, and long-term tritium levels leaving the STP site from such releases would be below the EPA DWS.

In conclusion, based on this information—including the staff's review of seepage from the MCR and the review of releases of liquids containing tritium within the protected area of STP, Units 1 and 2—the NRC staff concludes that groundwater contaminant plumes have not altered current groundwater use in the region downgradient of the STP site. The staff further concludes that groundwater-quality impacts would remain SMALL during the license renewal term.

4.5 Aquatic Resources

Sections 2.1.6 and 2.2.5 describe the STP cooling system and aquatic environment. Section 2.2.7.1 describes the protected aquatic resources that could occur in the vicinity of STP and associated transmission lines. Category 1 and Category 2 issues related to aquatic resources applicable to STP are discussed below and listed in Table 4–7.

Table 4–7. Aquatic Resource Issues

Issues	GEIS Section	Category
For all plants		
Accumulation of contaminants in sediments or biota	4.2.1.2.4	1
Entrainment of phytoplankton & zooplankton	4.2.2.1.1	1
Cold shock	4.2.2.1.5	1
Thermal plume barrier to migrating fish	4.2.2.1.6	1
Distribution of aquatic organisms	4.2.2.1.6	1
Premature emergence of aquatic insects	4.2.2.1.7	1
Gas supersaturation (gas bubble disease)	4.2.2.1.8	1
Low dissolved oxygen in the discharge	4.2.2.1.9	1
Losses from predation, parasitism, & disease among organisms exposed to sublethal stresses	4.2.2.1.10	1
Stimulation of nuisance organisms	4.2.2.1.11	1
For Plants with Cooling Pond Heat-Dissipation Systems		
Entrainment of fish & shellfish in early life stages	4.1.2	2
Impingement of fish & shellfish	4.1.3	2
Heat shock	4.1.4	2

4.5.1 Generic Aquatic Ecology Issues

The NRC staff did not identify any new and significant information related to the Category 1 issues listed above during the review of STPNOC's ER, the site audit, or the scoping process that would change the conclusions presented in the GEIS (the NRC staff also reviewed other sources of information, such as applicable permits and data reports, as listed in the reference section of this SEIS chapter). Therefore, there is no impact related to these issues beyond those discussed in the GEIS. For these issues, the GEIS concluded that the impacts are SMALL. Additional site-specific mitigation measures are unlikely to be sufficiently beneficial to warrant implementation.

4.5.2 Entrainment and Impingement

Entrainment and impingement of aquatic organisms are site-specific (Category 2) issues for assessing the impacts of license renewal at plants with cooling pond heat-dissipation systems. Entrainment is the taking in of organisms with a plant's cooling water intake. The organisms involved are generally of small size, dependent on the screen mesh size, and include phyto- and zooplankton, fish eggs and larvae, shellfish larvae, and many other forms of aquatic life. Impingement is the entrapment of organisms against the cooling water intake screens.

A particular species can be subject to both impingement and entrainment if some individuals are impinged on screens while others pass through and are entrained (EPA 1977). Section 316(b) of the Clean Water Act (CWA) (33 *United States Code* (U.S.C.) §1326(b)) requires that "[a]ny standard established pursuant to Section 1311 of this title or Section 1316 of this title and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact."

At STP, organisms maybe impinged or entrained at two locations. Organisms that inhabit the lower Colorado River may be impinged or entrained when water is drawn through the reservoir makeup pumping facility (RMPF) from the Colorado River into the MCR. Organisms that inhabit the MCR may be impinged or entrained when water is drawn through the cooling water intake structure (CWIS) from the MCR to the cooling water system.

The adverse environmental impacts of cooling water intakes occur through both impingement and entrainment. Heat, physical stress, or chemicals used to clean the cooling system may kill or injure the entrained organisms. Exhaustion, starvation, asphyxiation, descaling, and physical stresses may kill or injure impinged organisms. STPNOC survey data in the MCR indicate that entrained organisms from the lower Colorado River can survive the stresses of the intake system at the RMPF and colonize the MCR (ENSR 2008a, 2008b). However, entrainment and colonization of the MCR removes these organisms from the rest of the ecosystem in the region. Entrained organisms that pass through the CWIS into the plant's cooling system are subject to mechanical, thermal, and toxic stresses. Therefore, survival is unlikely.

Because impingement and entrainment are fundamentally linked, the NRC staff determined that effects of each should be assessed using an integrated approach. The NRC staff employed a weights-of-evidence (WOE) approach to evaluate the effects of impingement and entrainment on the aquatic resources in the lower Colorado River and the MCR. NRC employed this approach because EPA recommends a WOE approach for ecological risk assessments (EPA 1998). WOE is a useful tool due to the complex nature of assessing risk (or impact), and NRC has employed this approach in other evaluations of the effects of nuclear power plant cooling systems on aquatic communities (NRC 2010, 2011i).

Menzie et al. (1996) defines WOE as "the process by which multiple measurement endpoints are related to an assessment endpoint to evaluate whether significant risk of harm is posed to the environment." In this modified WOE approach, the NRC staff examined five lines of evidence to determine if operation of the STP cooling system has the potential to cause adverse impacts to fish and shellfish near STP. The first line of evidence is impingement and entrainment studies at the RMPF during the initial filling and subsequent intermittent withdraw of water from the Colorado River to the MCR (McAden 1984, 1985). The second line of evidence is impingement and entrainment studies at the CWIS from 2007 through 2008 during the withdraw of water from the MCR through the circulating water system for STP, Units 1 and 2 (ENSR 2008a). The third line of evidence includes engineering designs and operational procedures to limit impingement and entrainment. The fourth line of evidence includes reviews by other regulatory agencies, such as EPA and the Texas Commission on Environmental Quality (TCEQ). The fifth line of evidence includes survey data of fish and shellfish populations prior to and during operations within the Colorado River.

Line of Evidence Number 1: Impingement and Entrainment Studies on the Colorado River

The NRC staff evaluated the potential impacts from impingement and entrainment during water withdrawal from the Colorado River by examining impingement and entrainment studies from 1983 to 1984. McAden et al. (1984, 1985) conducted studies at the RMPF when STPNOC initially filled the MCR with Colorado River water. NRC (1986) assessed the environmental impacts of impingement and entrainment for the initial operating license for STP, Units 1 and 2.

McAden et al. (1984, 1985) conducted studies to estimate entrainment impacts by collecting surface plankton samples in front of the RMPF. McAden used a hand-towed 0.5-m (20-in. mouth diameter) ichthyoplankton net with 0.5-mm (0.02-in.) square mesh and swept the hand tow parallel to the front wall of the pump structure. The most commonly collected species included the zoeae and juveniles of Harris mud crabs (*Rhithropanopeus harrisii*), river shrimp (*Macrobrachium ohione*), and white shrimp (*Litopenaeus setiferus),* as shown in Table 4–8. McAden collected the eggs and larvae of two fish species—bay anchovy (*Anchoa mitchilli*) and mosquito fish (*Gambusia affinis*). McAden also conducted plankton tows in the Colorado River near the RMPF. The most commonly collected species of fish eggs and larvae included bay anchovy, Gulf menhaden (*Brevoortia patronus*), and Atlantic croaker (*Micropogonias undulatus*). Section 2.2.5.1 provides addition details regarding fish egg and larvae sampling in the Colorado River.

Based on the entrainment study by McAden et al. (1984, 1985), NRC (1986) estimated that entrainment losses would be approximately 10 percent of the organisms passing the RMPF. This value represents the loss of organisms in the influence of the tidal flow in the river and does not represent the entire populations of those species in the lower Colorado River.

NRC (1986) determined that the systems along the Texas Gulf coasts and the area influenced by the RMPF are not unique. In addition, NRC (1986) determined that species commonly caught in near the RMPF by McAden are ubiquitous (widespread or common) and abundant along the Texas and Gulf coasts. The reproductive potential (fecundity) for these species is high; therefore, the larvae entrained are a small portion of the total larvae produced by adult females for most species (NRC 2011b). In addition, most makeup water withdrawal would occur during high river flow conditions, which is when the salinity and concentrations of estuarine and marine organisms would be lowest. Therefore, NRC (1986) concluded that entrainment losses for the species collected by McAden (1984, 1985) would not constitute a significant impact to their respective populations.

ENSR Corporation (2008a) indicates that many individuals of numerous species survived entrainment at the RMPF and inhabit the MCR. While these organisms survived entrainment, the entrainment, overall, has led to a loss of the organisms in the Colorado River, and these organisms no longer contribute to the riverine ecosystem.

Table 4–8. Number (per 100 m^3) of Macrozooplankton and Ichthyoplankton Collected in Plankton Samples in Front of the RMPF from 1984 and 1985

Common Name	Scientific Name	Aug-83[(a)]	Sept-83[(b)]	Sept-84[(c)]	Total	% of Total
bay anchovy	*Anchoa mitchilli*	51.3	0	0	51.3	1
bivalves-juveniles	Pelecypoda	10.3	28.3	0	38.6	1
blue crab-juvenile	*Callinectes sapidus*	62.8	14.1	0	76.9	2
crabs-megalopa	*Callinectes spp.*	115	0	0	115	3
glass shrimp	*Palaemonetes paludosus*	0	14.9	0	14.9	<1
Harris mud crab	*Rhithropanopeus harrisii*	184.9	1,461.4	695.9	2,342.2	60
mosquito fish	*Gambusia affinis*	23.3	14.9	0	38.2	1
ghost shrimp	*Callianassa spp.*	0	0	51.4	51.4	1
river shrimp	*Macrobrachium ohione*	609.3	29	0	638.3	16
white shrimp	*Litopenaeus setiferus*	222.2	312.8	0	535	14
unidentified fish spp.		0	0	12.9	12.9	<1
Total		**1,279.1**	**1,875.4**	**760.2**	**3,914.7**	

[(a)] Samples collected on August 9–10, 1983, at 1100, 1640, 2230, and 0450
[(b)] Samples collected on September 15–16, 1983, at 1100, 1705, 2250, and 0545
[(c)] Samples collected on September 6, 1984, at 0020, 0500, 1030, and 1615

Source: McAden 1984, 1985

McAden et al. (1984, 1985) also conducted impingement studies by washing all organisms off two intake screen and filtering them through a dip net with a 0.25-in (6.4-mm) mesh. Each sample period was 30 minutes. McAden (1984, 1985) collected three samples within 24 hours during each week that pumping occurred. The most commonly impinged species included blue crab (61 percent), river shrimp (18 percent), and white shrimp (10 percent), as shown in Table 4–9. Impinged fish included one crevalle jack (*Caranx hippos*), one green sunfish (*Lepomis cyanellus*), and one inland silverside (*Menidia beryllina*). Because the impingement study collected so few fish, NRC (1986) predicted the most likely fish to be impinged based on size (which is related to swim speed) and the density and abundance of the species near the RMPF. NRC (1986) predicted Gulf menhaden to be the most commonly impinged species (65 percent), followed by Atlantic croaker (16 percent), bay anchovy (10 percent), and striped mullet (8 percent). NRC (1986) concluded that impingement losses would have a minor effect on the biota of the Colorado River because the commonly impinged species are ubiquitous, abundant habitat for these species occurs along the Texas and Gulf coasts, and the design elements of the RMPF would reduce impingement losses.

STPNOC has not conducted impingement and entrainments studies on the Colorado River since its 1983 to 1984 study (STPNOC 2010b, 2010c). Since 1984, the U.S. Army Corps of Engineers (USACE) completed the mouth of the Colorado River project, increasing the flow between the Colorado River and Matagorda Bay (USACE 2005; Wilber and Bass 1998). As discussed below in the aquatic survey section (line of evidence number 5), the diversity of aquatic species and the presence of estuarine-marine species has increased since the 1970s.

However, ENSR (2008b) found that the majority of the species most likely to be impinged (e.g., Gulf menhaden, Atlantic croaker, and striped mullet) continue to be the most common species of fish collected around the RMPF and would likely continue to be the most common species impinged during the license renewal term.

Table 4–9. Invertebrates and Fish Impinged at the RMPF during 1983–1984 Studies

Common Name	Scientific Name	July-83[a]	Aug-83[b]	Sept-83[c]	Sept-84[d]	Total	% of Total
blue crab	*Callinectes sapidus*	69	44	4	6	123	61
crevalle jack	*Caranx hippos*	1	0	0	0	1	<1
glass shrimp	*Palaemonetes paludosus*	14	1	0	0	15	7
grass shrimp	*Palaemonetes kadiakensis*	1	1	0	0	2	1
green sunfish	*Lepomis cyanellus*	1	0	0	0	1	<1
inland silverside	*Menidia beryllina*	1	0	0	0	1	<1
pink shrimp	*Farfantepenaeus brasiliensis*	0	0	0	1	1	<1
Palaemonidae shrimp	Palaemonidae spp.	2	0	0	0	2	1
river shrimp	*Macrobrachium ohione*	28	4	1	4	37	18
white shrimp	*Litopenaeus setiferus*	0	3	13	4	20	10
Total		**117**	**53**	**18**	**15**	**203**	

(a) Samples collected on July 13–14, 1983, at 1329, 2100, and 0511; July 21–22, 1983, at 1315, 2110, 0505; and July 27–28, 1983, at 1400, 2230, and 0626.

(b) Samples collected on August 9–10, 1983, at 1300, 2100, and 0500.

(c) Samples collected on September 15–16, 1983, at 1414, 2205, and 0615.

(d) Samples collected on September 5–6, 1984, at 1910, 0300, and 1104.

Source: McAden 1984, 1985

Line of Evidence Number 2: Impingement and Entrainment Studies on the Main Cooling Reservoir

STP conducted impingement and entrainment studies at the CWIS on the MCR in May 2007 through April 2008 (ENSR 2008a). The objective of the study was “to characterize the aquatic species within the MCR, and to evaluate impingement and entrainment impacts to establish, to the extent possible, relationships between the presence of aquatic organisms and the current (STP, Units 1 and 2) intake design and operating parameters” (ENSR 2008a).

ENSR (2008a) collected entrainment samples over a 24-hour period, twice per month from May through September and once per month from October through April. ENSR collected entrainment samples by placing 0.363-mm (0.014-in.) plankton nets behind the trash bars at the CWIS. ENSR pumped water from a depth of approximately 12 ft (3.7 m) through a buffering chamber at flows up to 10,800 gallons per hour or 180 gpm. ENSR operated the pumps four times per day, for approximately 2 hours per event, for a volume of 100 m^3 (3,500 ft^3) of water per 24-hour period.

ENSR (2008a) collected 207,696 organisms representing nine different fish families and 12 different classes of invertebrates (Table 4–10). The most commonly impinged taxa included Harris mud crab (68 percent) and unidentified decapod zoea (or free swimming larvae) (15 percent). Ichthyoplankton, or fish eggs and larvae, comprised less than 1 percent of all entrained organisms. ENSR reported the highest entrainment rates from April through June and the lowest from December through March. Entrainment of threadfin shad and mud crabs was highest in late spring and summer, and entrainment of silversides was highest in summer.

Table 4–10. Aquatic Species Collected during Entrainment Sampling in the MCR's CWIS for Units 1 and 2, 2007–2008

Common Name	Taxon	Total Number	% of Total
Finfish			
anchovy	*Anchoa* spp.	30	<1
clupeid	Clupeidae	544	<1
fish egg		418	<1
goby	Gobiidae	61	<1
perch-like fish	Perciformes	6	<1
naked goby	*Gobiosoma bosc*	5	<1
needlefish	Belonidae	3	<1
silversides	Atherinidae	201	<1
wrasse	Labridae	3	<1
Invertebrates			
amphipod	Amphipoda	145	<1
bivalve	Mollusca	1	<1
brachyuran decapod (zoea)	Brachyura	353	<1
copepod	Copepoda	6,588	3
decapod (mud crabs)	Panopeidae	10,798	5
decapod (zoea)	Decapoda	31,919	15
fish lice	Copepoda	399	<1
harpacticoid copepod	Copepoda	12,212	6
Harris mud crab	*Rhithropanopeus harrisii*	140,192	68
insect	Insecta	24	<1
midge	Diptera	110	<1
mite or ticks	Acari	12	<1
mysid shrimp	Mysida	2,660	1
polychaete	Annelida	4	<1
seed shrimp	Ostracoda	78	<1

Common Name	Taxon	Total Number	% of Total
shrimp	Caridea	1	<1
tongue biters	Isopoda	16	<1
water flea	Cladocera	800	<1
unidentified		113	<1
Total		**207,696**	

Source: ENSR 2008a

ENSR (2008a) collected impingement samples over a 24-hour period, twice per month from May through September and once per month from October through April. ENSR collected samples by placing a metal-framed net fitted with a 0.25-in. (6.4-mm) nylon mesh net within the sluiceway that connects the CWIS screen wash system and the debris basket.

ENSR (2008a) collected a total of 3,982 organisms representing 25 finfish and 7 invertebrate species (Table 4–11). The most commonly impinged species includes threadfin shad (*Dorosoma petenense*) (42 percent), blue crab (24 percent), mud crab (24 percent), Atlantic croaker (5 percent), and white shrimp (3 percent). Blue crab impingement was highest during the months of May, June, and July, and threadfin shad impingement was highest during the months of January and March. ENSR did not report any other temporal trends for individual species or all species combined.

Table 4–11. Aquatic Species Collected during Impingement Sampling in the MCR's CWIS for Units 1 and 2, 2007–2008

Common Name	Scientific Name	Total Number	% of Total
Finfish			
American eel	*Anguilla rostrata*	1	<1
Atlantic croaker	*Micropogonias undulatus*	182	5
bay anchovy	*Anchoa mitchilli*	3	<1
bay whiff	*Citharichthys spilopterus*	2	<1
black drum	*Pogonias cromis*	2	<1
blue catfish	*Ictalurus furcatus*	6	<1
bluegill	*Lepomis macrochirus*	9	<1
channel catfish	*Ictalurus punctatus*	4	<1
common carp	*Cyprinus carpio carpio*	2	<1
freshwater drum	*Aplodinotus grunniens*	5	<1
freshwater goby	*Ctenogobius shufeldti*	2	<1
gizzard shad	*Dorosoma cepedianum*	2	<1
goby	*Gobiidae spp.*	8	<1
Gulf menhaden	*Brevoortia patronus*	2	<1

Common Name	Scientific Name	Total Number	% of Total
inland silverside	*Menidia beryllina*	5	<1
ladyfish	*Elops saurus*	1	<1
naked goby	*Gobiosoma bosc*	13	<1
needlefish	*Strongylura exilis*	2	<1
rough silverside	*Membras martinica*	2	<1
sand seatrout	*Cynoscion arenarius*	3	<1
sharptail goby	*Oligolepis acutipennis*	2	<1
sheepshead	*Archosargus probatocephalus*	1	<1
speckled worm eel	*Myrophis punctatus*	1	<1
spot croaker	*Leiostomus xanthurus*	1	<1
threadfin shad	*Dorosoma petenense*	1,668	42
Invertebrates			
blue crab	*Callinectes sapidus*	944	24
brown shrimp	*Farfantepenaeus aztecus*	10	<1
grass shrimp	*Paleemonetes pugio*	33	<1
lesser blue crab	*Callinectes similis*	3	<1
Harris mud crab	*Rhithropanopeus harrisii*	953	24
river shrimp	*Macrobrachium ohione*	3	<1
white shrimp	*Litopenaeus setiferus*	106	3
Other			
flat-headed snake	*Tantilla gracilis*	1	<1
Total		**3,982**	

Source: ENSR 2008a

Line of Evidence Number 3: Engineered Design and Operational Conditions

EPA recently published a proposed rule that describes multiple approaches to reduce impingement and entrainment mortality at existing cooling water intake structures. These approaches include flow reduction, or reducing the total amount of water withdrawn; intake velocity; technologies to exclude organisms and to collect and return organisms to the water body; and intake location and timing of withdrawals (76 FR 22174). The RMPF on the Colorado River and the CWIS on the MCR incorporate several of these approaches.

Flow Reduction. Reducing the intake flow reduces the amount of water withdrawn from water bodies to be cycled through the cooling system, which likely reduces the amount of aquatic organisms that would be drawn through the intake structure and subject to impingement and entrainment. STP uses a cooling pond-based heat-dissipation system that withdraws and discharges cooling water to the MCR. The MCR is similar to a closed-cycle cooling system since the water in the reservoir continues to circulate from the MCR, into the plant, and back again. STP intermittently draws water from the Colorado River to compensate for water loss from evaporation and seepage from the MCR. Depending on the quality of the makeup water, closed-cycle recirculating cooling water systems can reduce consumptive water use by 96 to 98 percent of the amount that the facility would use if it employed a once-through cooling system (69 FR 41576).

Reduced Intake Velocity. Water velocity associated with the intake structure greatly influences the rate of impingement and entrainment. The higher the approach or through-screen velocity or both, the greater the number of organisms impinged or entrained. At an approach velocity of 0.5 ft/s (0.15 m/s) or less, most fish can swim away and escape from the intake current (66 FR 65274). The maximum design approach velocity in front of the traveling screens at the RMPF is approximately 0.5 ft/s, based on a maximum pumping rate of approximately 538,000 gpm (2,040 m^3/min) (STPNOC 2008a, 2008c, 2010c).

Technologies to exclude organisms and to collect and return organisms to the water body. The RMPF has several technologies that help exclude organisms from becoming impinged or entrained. The RMPF has coarse trash racks with 4-in. (10-cm) spacing between bars, which would impede larger organisms from entering the intake system (STPNOC 2010c). After passing through trash racks, water flows through traveling screens with a 3/8 in. (9.5 mm) mesh (STPNOC 2010c). The space between the trash racks and the traveling screens allow fish to swim downstream and exit the intake structure (STPNOC 2010c). Fish collected or washed from the traveling screens can also return to the river via a sluice and fish bypass pipe. The discharge point of the fish bypass system is at the downstream end of the intake structure, approximately 2 ft (0.6 m) below normal water elevation (STPNOC 2010c).

During high-flow conditions, the accumulation of debris on the traveling screens is too high to open the fish bypass system, and screenwash discharge is directed to the sluice trench catch baskets rather than back to the river. Generally, the fish bypass system is closed when river flows are greater than 4,000 cfs (100 m^3/s), and the system is occasionally closed when flows are greater than 2,000 cfs (60 m^3/s), which has occurred from 2001 to 2006, 7 percent of the time (STPNOC 2008a, 2008c, 2010c). Operators at the RMPF are required to monitor for increased impingement rates on the traveling screens, and operators evaluate relevant factors—such as river flow, salinity, and observations of impingement—to determine whether pumping should continue (STPNOC 2008a, 2008c, 2010c).

Intake Location and Time of Withdrawals. Location of the intake system is another design factor that can affect impingement and entrainment because water drawn from areas with lower biological productively is less likely to include organisms that could be impinged or entrained. The RMPF is located on the Colorado River, which is designated as a tidal stream and includes essential fish habitat (EFH) for Federally managed fish and shellfish species (GMFMC 2004). Locating intake systems in such areas with sensitive biological productivity can negatively affect aquatic life (69 FR 41576). However, the area of the river where the RMPF is situated has fewer organisms and less species richness than the downstream segment of the river, closer to the GIWW (ENSR 2008b).

STPNOC designed the RMPF to position the traveling intake screens parallel to the flow in the river, or “flush” to the river bank with no projecting structures that create eddies and countercurrents that would cause entrapment (NRC 1986; STPNOC 2010c). Most organisms likely to be entrained or entrapped would occur in higher densities in the main river channel. They are less likely to be removed from the river by an intake facility sited on the shoreline (NRC 2011b). Entrapment of aquatic organisms in a restricted area (e.g., in the sedimentation basin between the RMPF intake screens and the pumps and in the MCR) can lead to congregation of the organisms, and, if environmental conditions change, the organisms may be harmed. Under such conditions, entrapment can increase impingement of aquatic organisms.

Operational procedures for the RMPF also minimize impingement and entrainment because STPNOC intermittently draws water from the Colorado River for Units 1 and 2, and pumping occurs during periods of lower biological productivity. For example, STPNOC (2010b) noted that most withdrawals would occur during periods of high river flow. Pumping at high-flow conditions minimizes impacts to aquatic organisms in the water column because the organisms are likely to remain in the river flow and unlikely to be caught in the influence of the water being pumped into the RMPF located on the shoreline (STPNOC 2008a, 2008c, 2010b, 2010c). In addition, periods of high river flow (fall through spring) generally correlate with lower biological productivity when less young and estuarine-marine organisms are present (NRC 1986; STPNOC 2010b). During the 2007 to 2008 aquatic ecology studies in the Colorado River, fish density (as expressed in the catch per unit effort) was lowest during high river flow conditions and when salinity was lowest (ENSR 2008b; STPNOC 2008a, 2008c). Salinity can be an indicator of an influx of estuarine species moving up the river from the GIWW.

Line of Evidence 4: Other Regulatory Reviews

Section 316(b) of the CWA requires that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impacts. As part of STPNOC's original National Pollutant Discharge Elimination System (NPDES) permit application, in a letter dated June 28, 1982, STPNOC provided EPA with detailed information on the design and operation of the RMPF (STPNOC 2010b). Based on this information, EPA concluded that "the intake structure is approved by Best Available Technology in accordance with Section 316(b) of the CWA" (EPA 1985).

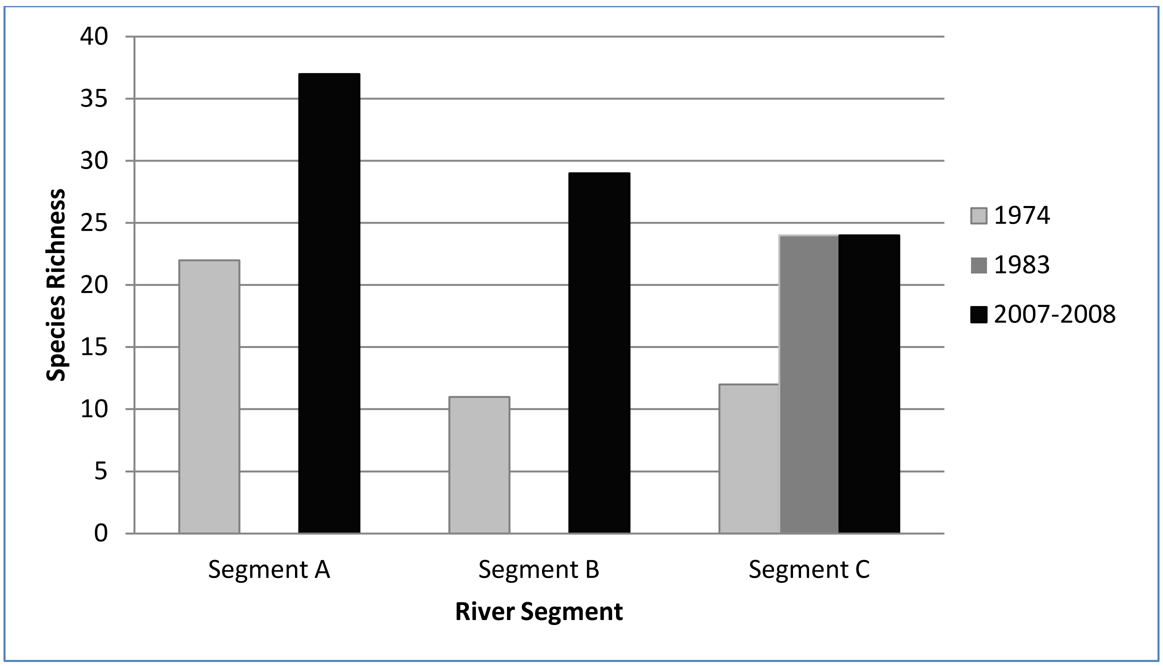
TCEQ has administered STPNOC's Texas Pollutant Discharge Elimination System (TPDES) permit since 1998, when EPA delegated authority to the State of Texas to administer the State's permit program. STPNOC submitted a TPDES permit renewal application by letter dated May 24, 2007. Included in this application was a description of how the cooling water system is a closed-cycle recirculating system and, as such, meets the best available technology standard for minimizing adverse environmental impacts (STPNOC 2010b). For example, STPNOC noted that the MCR recycles water for heat-dissipation and is not a water of the U.S. or a water of the State. TCEQ Water Quality Division concurred that the STP cooling system operates as a closed-cycle recirculating system and that the MCR is not a water of the State (TCEQ 2007). Neither EPA nor the State of Texas has requested additional studies from STPNOC in regards to a 316(b) determination (STPNOC 2010b).

Line of Evidence Number 5: STP Survey Data on the Colorado River

Impingement and entrainment from current operations of the RMPF have removed individuals from the Colorado River ecosystem. One method to determine the impacts to aquatic resources from operation of the RMPF is to compare the species abundance and diversity prior to and during operations. ENSR (2008b) compared the aquatic community in the Colorado River using the results of field studies from 1974 (HPLC 1974), 1983 and 1984 (McAden 1984, 1985), and 2007 through 2008 (ENSR 2008b). The 1970s studies were conducted in support of the construction permit for STP, Units 1 and 2. McAden (1984, 1985) conducted studies in support of the operating license for STP, Units 1 and 2. ENSR (2008b) sampled portions of the Colorado River in support of the combined license (COL) for proposed Units 3 and 4. Section 2.2.5.1 provides additional details of these studies. Because the sampling locations and gear types varied with each study, it can be difficult to determine whether changes over time are due to plant operations, other anthropogenic or environmental changes, or study methods.

ENSR (2008b) compared species richness from trawl surveys conducted in 1974, 1983, and 2007 through 2008. Species richness was generally higher in 2007 through 2008 compared to earlier surveys (ENSR 2008b), as shown in Figure 4–1. For example, species richness in Segment C, which is closest to the RMPF, increased from 12 in the 1974 study to 24 in 2007 through 2008 study. Because STPNOC gathered data for only 2 or 3 years in each segment of the river, it is unclear whether the change in diversity is part of a long-term temporal change or whether the physical conditions in the river (e.g., lower salinity in the 1970s), or another variable, contributed to the different levels of diversity in 1974 compared to 2007 and 2008.

Figure 4–1. Species Richness of Aquatic Species Captured in Trawl Surveys from 1974, 1983, and 2007 through 2008



ENSR (2008b) calculated the Jaccard coefficients of community similarity to determine similarities between the samples collected over time in similar reaches of the lower Colorado River based on the presence or absence of taxa. For this measure, as the coefficient approaches 1.0, the more taxa in the two samples are the same. Conversely, as the coefficient approaches 0, the samples have fewer taxa in common. For samples collected in the area closest to the RMPF (Segment C), the Jaccard coefficient was 0.36, when comparing 2007 to 2008 samples to 1974 samples, and 0.37, when comparing 2007 to 2008 samples to 1983 to 1984 samples. Similar comparisons with seine data resulted in coefficient values of 0.31 (for 1974) and 0.33 (for 1983 to 1984). ENSR (2008b) also compared trawl data throughout all river segments for 1974 and 2007 to 2008 data, which resulted in a Jaccard coefficient of 0.44. These results suggest low to moderate similarity of the species collected in 1974 and 1983 through 1984 compared to 2007 through 2008.

The results of ENSR (2008b) suggest that the current aquatic community is different and may be slightly more diverse than the aquatic community inhabiting the Colorado River during the start of operations for STP, Units 1 and 2. ENSR (2008b) observed changes in diversity near the RMPF as well as further downstream, which would be less likely to be impacted by STP operations. The increase in flow between the Colorado River and Matagorda Bay has likely contributed to the changes in community structure and the increase in species diversity of aquatic species by providing passage for saltwater and estuarine species from the lower Colorado River to Matagorda Bay (NRC 2011b). Based on the information from the latest survey data and what is known about the design of the RMPF, the operation of the RMPF does not appear to have noticeably altered populations of the species currently found in the river.

Conclusion

The NRC staff examined five lines of evidence to determine if impingement and entrainment have the potential to cause adverse impacts to fish and shellfish near STP. The first line of evidence includes impingement and entrainment studies at the RMPF during the initial filling and subsequent intermittent withdraw of water from the Colorado River to the MCR (McAden 1984, 1985). The second line of evidence includes impingement and entrainment studies at the CWIS from 2007 through 2008 during the withdraw of water from the MCR through the circulating water system (ENSR 2008a). The third line of evidence includes engineering designs and operational procedures to limit impingement and entrainment. The fourth line of evidence includes reviews by other regulatory agencies, such as EPA and the TCEQ. The fifth line of evidence includes survey data of fish and shellfish populations prior to and during operations within the Colorado River.

STPNOC conducted limited studies of impingement, entrainment, and aquatic monitoring at the RMPF in the lower Colorado River. However, in considering the best available information for the staff's analysis, the results and conclusions of earlier impingement and entrainment studies and evaluations, such as McAden (1983, 1984) and NRC (1986), are likely still applicable because the most commonly impinged species are still common in the area near the RMPF (ENSR 2008b). Additionally, the design features of the RMPF that minimize losses of organisms would not change during the period of extended operations. In addition, EPA (1985) has concluded that the design of the RMPF reflects best available technology for minimizing adverse environmental impacts. Based on the information from current and historical surveys, impingement and entrainment studies, and the design of the RMPF and the cooling system, operation of the STP cooling system does not appear to have noticeably altered populations of the species currently found in the river. Therefore, the NRC staff concludes that the impact from entrainment and impingement by the STP cooling water system on aquatic resources is SMALL.

4.5.3 Thermal Shock

For plants with cooling pond heat-dissipation systems, NRC's GEIS (1996) lists the effects of heat shock as an issue requiring plant-specific, Category 2, evaluation before license renewal. The NRC (1996) made impacts on fish and shellfish resources resulting from heat shock a site-specific issue because of continuing concerns about thermal discharge effects and the possible need to modify thermal discharges in the future in response to changing environmental conditions.

Information considered in this analysis includes STPNOC's TDPES permit, modeling of the thermal plume, the type of cooling system (cooling pond heat-dissipation system in this case), and other information. To perform this evaluation, the NRC staff (a) reviewed the STPNOC's

ER (STPNOC 2010b), STPNOC's TPDES permit (TCEQ 2005), and thermal plume modeling results (NRC 2011b) and (b) performed an audit at the STP site.

As described in Section 2.2.3, STP discharge to the Colorado River is permitted under its TPDES permit (TCEQ 2005). The permit allows the average daily discharge to be 144 million gallons per day (gpd). The TPDES permit also limits the daily average temperature to 95 °F and the daily maximum temperature to 97 °F. TCEQ based these limits on site-specific (or segment-specific) TCEQ water quality rise standards for Segment 1401, Colorado River Tidal, at Title 30, Chapter 307.10, Appendix A, pursuant to the Texas Administrative Code. The TPDES permit also prohibits discharges that would exceed 12.5 percent of the flow of the Colorado River at the discharge point or when the flow in the Colorado River adjacent to STP is less than 800 cfs. An EPA online database indicated that STP has had no CWA formal enforcement actions or violations related to discharge temperature in the last 5 years (STPNOC 2011c). Neither EPA nor TCEQ has required STPNOC to seek a 316(a) variance or conduct studies in support of a 316(a) variance (STPNOC 2010b).

STPNOC operating procedures limit the blowdown flow rates and the number of discharge ports to be used during discharge events (STPNOC 2010b). For example, operators may open two to seven blowdown valves, depending on the blowdown rate (STPNOC 2010b). STPNOC procedures prescribe a range of allowable blowdown rates, from 80 to 308 cfs, depending on the Colorado River flow (STPNOC 2010b).

NRC (2011b) modeled the potential thermal plume from discharges to the Colorado River based on the continued operations of STP, Units 1 and 2, as well as the operation of proposed Units 3 and 4. While this SEIS solely pertains to continued operation of STP, Units 1 and 2, the results of NRC's (2011b) modeling study are presented for the following reasons:

- During operations of Units 3 and 4, discharge from all four units would mix in the MCR, and STPNOC would operate a single outfall to discharge water from the MCR (STPNOC 2010c).
- The same TPDES permit would cover Units 1 through 4 (STPNOC 2010c).
- Modeling the thermal plume based on four-unit operation bounds the potential impacts from continued operations of STP, Units 1 and 2.

NRC (2011b) determined that the maximum thermal plume dimensions would occur during the greatest difference in temperatures between the MCR water and the water in the river (20.4 °F), highest MCR discharge rate through seven ports (44 cfs per port, for a total of 308 cfs discharge rate), and the minimal flow in the Colorado River where the discharge would be equal to 12.5 percent of the total flow in the river (2,464 cfs). NRC (2011b) modeled these conditions using a CORMIX (U.S. EPA computer code) mixing-zone model to determine the likely water temperature increases, the likely duration and frequency of discharge, and the dimensions of the thermal plume. The model indicated that a portion of the Colorado River would remain at ambient water temperature, allowing mobile aquatic organisms to avoid the thermal plume by passing the plume on the bottom of the river and throughout much of the water column. For example, during the maximum expected thermal plume dimensions, the thermal plume that is 5 °F (2.8 °C) above ambient conditions reaches the bottom of the river from the last port of the discharge pipe to 120 ft (37 m) downstream, and the plume extends approximately 25 percent across the width of the river. In that part of the river, the benthic invertebrate species (e.g., grass (*Palaemonetes pugio*), white, and brown shrimp) would be able to move along the bottom of the river on the far side of the discharge structure without passing through the elevated temperature plume. Approximately 120 ft (37 m) downstream of the last port of the discharge pipe, the positive buoyancy of the warmer water causes the plume to rise to the surface of the river. NRC (2011b) predicted the surface of the river to have an elevated temperature across the entire width of the river from approximately 1,060 ft (323 m) from the last port of the discharge pipe to about 4,400 ft (1,341 m) downstream from the ports. As the plume rises to the surface and extends from bank to bank, however, a portion of the water column would remain at ambient river temperatures and would allow mobile organisms—such as foraging fish (e.g., Gulf menhaden, black drum (*Pogonias cromis*), spotted seatrout (*Cynoscion nebulosus*), striped mullet)—to move up and downstream.

Less mobile organisms would not be able to swim away to avoid the thermal plume, such as eggs, larvae, and mollusks. The most common juvenile and adult species collected in Segment B, where the plume could reach across the river at the surface, include Gulf menhaden, grass shrimp, black drum, white shrimp, and striped mullet (ENSR 2008b). The overall impact to these species from the effects of the thermal plume would be unlikely to noticeably alter these populations because these organisms have a high fecundity, and the number of organisms lost would be insignificant compared to their population in the lower Colorado River.

NRC's (2011b) simulation models the discharge plume based on four-unit operations, which would likely be larger and occur more often than the discharge from continued operations of STP, Units 1 and 2. For example, STPNOC has discharged to the Colorado River once during the operation of STP, Units 1 and 2, in 1997, as part of a system test (STPNOC 2010b). For four-unit operations, STPNOC estimated that water from the MCR would be discharged to the Colorado River as frequently as once every 11 days and could be continuous for as much as 75 days (NRC 2011b). NRC (2011b) determined that STPNOC's discharge operating policy would rarely result in discharges from the MCR that would create a thermal plume during times when river water quality is poor.

The STP cooling system also limits thermal impacts to the MCR and the Colorado River. STP uses a cooling pond-based heat-dissipation system that withdraws and discharges cooling water to the MCR. The MCR is similar to a closed-cycle cooling system since the water in the reservoir continues to circulate from the MCR, into the plant, and back again. STP discharges to the Colorado River to maintain water chemistry and quality within the MCR. Because the water within the MCR is reused, discharges are generally less frequent than other types of cooling systems, such as once-through cooling systems.

After reviewing the status of STPNOC's TPDES permit, modeling of the thermal plume, and the type of cooling system at STP, the NRC staff concludes that the level of thermal impacts to the aquatic community due to renewing the STP operating license is SMALL. The thermal plume is unlikely to noticeably impact aquatic resources near STP for the following reasons:

- STPNOC's TPDES permits limit the amount and timing of discharges.
- Modeling studies indicate that mobile aquatic species could avoid the thermal plume by swimming at a lower depth or different side of the river.
- Species or life-stages that are less mobile organisms would not be able to swim away to avoid the thermal plume, such as eggs, larvae, and mollusks. However, most species observed in this area generally have high fecundity, and the number of organisms lost would be insignificant compared to their population in the lower Colorado River.

- Cooling water is not regularly discharged into the Colorado River since STP uses a cooling pond-based heat-dissipation system that reuses water from the MCR.

4.5.4 Mitigation

The design of the RMPF and operating procedures mitigate potential impingement, entrainment, and thermal shock to aquatic organisms in the lower Colorado River as follows:

- Flow Reduction—STPNOC reduces the flow rate, or amount of water withdrawn from the Colorado River, by reusing water in the MCR.
- Reduced Intake Velocity—At an approach velocity of 0.5 ft/s or less, most fish can swim away and escape from the intake current (66 FR 65274). The maximum design approach velocity in front of the traveling screens at the RMPF is approximately 0.5 ft/s, based on a maximum pumping rate of approximately 538,000 gpm (STPNOC 2008, 2010c).
- Technologies to Exclude Organisms and to Collect and Return Organisms to the Water Body—The RMPF has coarse trash racks, traveling screens, and a fish bypass system (STPNOC 2010c).
- Intake Location—The RMPF is situated in a portion of the lower Colorado River that has lower density of many fish and invertebrates and overall lower species richness than further downstream, closer to the GIWW (ENSR 2008b).
- Time of Withdraws—Operational procedures for the RMPF also minimize impingement and entrainment because STPNOC intermittently draws water from the Colorado River for Units 1 and 2, and pumping occurs during periods of lower biological productivity (e.g., periods of high river flow and lower salinity).

Additional details regarding these mitigation measures are described above, in Section 4.5.1.

4.6 Terrestrial Resources

The issues related to terrestrial resources applicable to STP are listed in Table 4–12. There is no Category 2 issue related to terrestrial resources. The NRC staff did not identify any new and significant information during the review of STPNOC's ER, the staff's site audit, the scoping process, or the evaluation of other available information (e.g., applicable permits and data reports as listed in the reference section of this SEIS chapter). Therefore, there is no impact related to these issues beyond those discussed in the GEIS. For these issues and consistent with the GEIS, the NRC staff concludes that the impacts to terrestrial resources are SMALL, and additional site-specific mitigation measures are unlikely to be sufficiently beneficial to warrant implementation.

Table 4–12. Terrestrial Resources Issues Identified in the GEIS

Issue	GEIS Section	Category
Cooling tower impacts on crops & ornamental vegetation	4.3.4	1
Cooling town impacts on native plants	4.3.5.1	1
Bird collisions with cooling towers	4.3.5.2	1
Powerline right-of-way management (cutting herbicide application)	4.5.6.1	1
Bird collisions with powerlines	4.5.6.1	1
Impacts of electromagnetic fields on flora & fauna (plants, agricultural crops, honeybees, wildlife, livestock)	4.5.6.3	1
Floodplains & wetland on powerline right-of-way	4.5.7	1

Source: Table B–1 in Appendix B, Subpart A, to 10 CFR Part 51

4.7 Protected Species and Habitats

Section 2.2.7 of this SEIS describes protected species and habitats in the vicinity of the STP site. Table 4–13 lists the one Category 2 issue related to protected species and habitats that is applicable to STP.

Table 4–13. Protected Species Issues Identified in the GEIS

Issue	GEIS Section	Category
Threatened or endangered species	4.1	2

Source: Table B–1 in Appendix B, Subpart A, to 10 CFR Part 51

This site-specific, or Category 2 issue, requires consultation with the appropriate agencies to determine whether threatened or endangered species are present and whether they would be adversely affected by continued operation of STP during the license renewal term. In the case of STP, the U.S. Fish and Wildlife Service (FWS) is responsible for terrestrial and freshwater species listed under the Endangered Species Act (ESA), the Bald and Golden Eagles Act, and the Migratory Bird Treaty Act (MBTA). The National Marine Fisheries Service (NMFS) is responsible for marine and anadromous species listed under the ESA and the Magnuson–Stevens Fishery Conservation and Management Act (MSA) and those species that have been designated as NMFS Species of Concern. The Texas Parks and Wildlife Division is responsible for species protected by the State of Texas Statutes. Descriptions of protected species and habitats appear in Section 2.2.8.

Listed Species Protected Under the Endangered Species Act. The NRC staff corresponded with both the FWS and NMFS to determine impacts to Federally listed species and to decide whether to initiate Section 7 consultation as a result of the proposed STP license renewal. The NRC developed a list of Federally listed species within the vicinity of STP and requested concurrence on this list in a February 16, 2011, letter (NRC 2011f). The FWS responded to this request on June 2, 2011, with an updated list and recommendations concerning specific species (FWS 2011). Specific species for which FWS had concerns are discussed in Section 2.2.8.1.

The NRC sent a similar letter to the NMFS on February 16, 2011 (NRC 2011h). The NMFS responded to this letter in an e-mail dated March 3, 2011 (NMFS 2011) and provided the NRC with a list of Federally listed species under its jurisdiction in Texas.

Table 4–14 provides the NRC's ESA effect determinations for each Federally listed species identified in Section 2.2.8.1.

Table 4–14. Effect Determinations for Federally Listed Species

Species	ESA Effect Determination	Justification for Determination
Amphibians		
Houston toad *(Bufo houstonensis)*	unlikely to adversely affect	The species potentially occurs on the STP site or along the t-line corridors, but the proposed action would not result in measurable or detectable impacts or reach the scale at which a take occurs.
San Marcos salamander *(Eurycea nana)*	unlikely to adversely affect	The species potentially occurs on the STP site or along the t-line corridors, but the proposed action would not result in measurable or detectable impacts or reach the scale at which a take occurs.
Texas blind salamander *(Typhlomolge rathbuni)*	unlikely to adversely affect	The species potentially occurs on the STP site or along the t-line corridors, but the proposed action would not result in measurable or detectable impacts or reach the scale at which a take occurs.
Arachnids		
Robber Baron Cave meshweaver *(Cicurina baronia)*	no effect	This species occurs in underground caves in counties through which the t-lines cross. However, t-line maintenance activities would not affect this species.
Madla Cave meshweaver *(Cicurina madla)*	no effect	This species occurs in underground caves in counties through which the t-lines cross. However, t-line maintenance activities would not affect this species.
braken bat cave meshweaver *(Cicurina venii)*	no effect	This species occurs in underground caves in counties through which the t-lines cross. However, t-line maintenance activities would not affect this species.
Government Canyon bat cave meshweaver *(Cicurina vespera)*	no effect	This species occurs in underground caves in counties through which the t-lines cross. However, t-line maintenance activities would not affect this species.
Government Canyon bat cave spider *(Neoleptoneta microps)*	no effect	This species occurs in underground caves in counties through which the t-lines cross. However, t-line maintenance activities would not affect this species.

Species	ESA Effect Determination	Justification for Determination
Cokendolpher cave harvestman *(Texella cokendolpheri)*	no effect	This species occurs in underground caves in counties through which the t-lines cross. However, t-line maintenance activities would not affect this species.
Birds		
piping plover *(Charadrius melodus)*	unlikely to adversely affect	The species occurs in the action area, but the proposed action would not result in measurable or detectable impacts or reach the scale at which a take occurs.
golden-cheeked warbler *(Dendroica chrysoparia)*	unlikely to adversely affect	This species occurs in counties through which the t-lines cross. However, t-line maintenance would not result in any measurable or detectable impacts or reach the scale at which a take occurs.
northern aplomado falcon *(Falco femoralis septentrionalis)*	unlikely to adversely affect	This species occurs Matagorda County and in counties through which the t-lines cross. However, continued STP site operation and maintenance and t-line maintenance would not result in any measurable or detectable impacts or reach the scale at which a take occurs.
whooping crane *(Grus americana)*	unlikely to adversely affect	This species occurs Matagorda County and in counties through which the t-lines cross. However, continued STP site operation and maintenance and t-line maintenance would not result in any measurable or detectable impacts or reach the scale at which a take occurs.
Attwater's greater prairie-chicken *(Tympanuchus cupido attwateri)*	unlikely to adversely affect	This species occurs in counties through which the t-lines cross. However, t-line maintenance would not result in any measurable or detectable impacts or reach the scale at which a take occurs.
black-capped vireo *(Vireo atricapilla)*	unlikely to adversely affect	This species occurs in counties through which the t-lines cross. However, t-line maintenance would not result in any measurable or detectable impacts or reach the scale at which a take occurs.
Crustaceans		
Peck's cave amphipod *(stygobromus pecki)*	no effect	This species occurs in two underground springs: Comal Springs and Hueco Springs. The t-lines do not cross or run near these springs.

Species	ESA Effect Determination	Justification for Determination
Fish		
fountain darter *(Etheostoma fonticola)*	no effect	This species only occurs in the San Marcos and Comal rivers. T-line maintenance would not affect this species because none of the t-lines crosses these rivers.
San Marcos gambusia *(Gambusia georgei)*	no effect	This species only occurs in the San Marcos River. T-line maintenance would not affect this species because none of the t-lines cross this river.
smalltooth sawfish *(Pristis pectinata)*	no effect	The species does not occur in the Colorado River or any of the water bodies crossed by the t-lines.
largetooth smallfish *(Pristis pristis)*	no effect	The species does not occur in the Colorado River or any of the water bodies crossed by the t-lines.
Insects		
helotes mold beetle *(Batrisodes venyivi)*	no effect	This species occurs in underground caves in counties through which the t-lines cross. However, t-line maintenance activities would not affect this species.
Comal Springs riffle beetle *(Heterelmis comalensis)*	no effect	This species occurs in two underground springs: Comal Springs and Fern Bank Springs. The t-lines do not cross or run near these springs.
unnamed beetle *(Rhadine exilis)*	no effect	This species occurs in underground caves in counties through which the t-lines cross. However, t-line maintenance activities would not affect this species.
unnamed beetle *(Rhadine infernalis)*	no effect	This species occurs in underground caves in counties through which the t-lines cross. However, t-line maintenance activities would not affect this species.
Comal Springs dryopid beetle *(Stygoparnus comalensis)*	no effect	This species occurs in surface water in two springs: Comal Springs and Fern Bank Springs. The t-lines do not cross or run near these springs.
Mammals		
sei whale *(Balaenoptera borealis)*	no effect	The species does not occur in the Colorado River or any of the water bodies crossed by the t-lines.
blue whale *(Balaenoptera musculus)*	no effect	The species does not occur in the Colorado River or any of the water bodies crossed by the t-lines.

Species	ESA Effect Determination	Justification for Determination
finback whale *(Balaenoptera physalus)*	no effect	The species does not occur in the Colorado River or any of the water bodies crossed by the t-lines.
Gulf coast jaguarundi *(Herpailurus yaguarondi cacomitli)*	no effect	The species does not occur on the STP site and is unlikely to occur along the t-line corridors due to habitat preferences.
ocelot *(Leopardus pardalis)*	no effect	The species does not occur on the STP site and is unlikely to occur along the t-line corridors due to habitat preferences.
humpback whale *(Megaptera novaeangliae)*	no effect	The species does not occur in the Colorado River or any of the water bodies crossed by the t-lines.
sperm whale *(Physeter macrocephalus)*	no effect	The species does not occur in the Colorado River or any of the water bodies crossed by the t-lines.
West Indian manatee *(Trichechus manatus)*	no effect	The species does not occur in the Colorado River or any of the water bodies crossed by the t-lines.
Plants		
Navasota ladies' tresses *(Spiranthes parksii)*	no effect	This species occurs in small-scale canopy openings of forests. Thus, this species is unlikely to be in t-line corridors, and t-line maintenance would not affect the species.
Texas wild rice *(Spiranthes parksii)*	no effect	This species is an aquatic plant found in the San Marcos River. T-line maintenance would not affect this species because none of the t-lines cross this river.
Reptiles		
American alligator *(Alligator mississipiensis)*	unlikely to adversely affect	This species occurs on the STP site and may occur along t-line corridors. However, continued STP site operation and maintenance and t-line maintenance would not result in any measurable or detectable impacts or reach the scale at which a take occurs.
loggerhead sea turtle *(Caretta caretta)*	no effect	The species does not occur in the action area.
green sea turtle *(Chelonia mydas)*	no effect	The species does not occur in the action area.
leatherback sea turtle *(Dermochelys coriacea)*	no effect	The species does not occur in the action area.
hawksbill sea turtle *(Eretmochelys imbricata)*	no effect	The species does not occur in the action area.

Species	ESA Effect Determination	Justification for Determination
Kemp's ridley sea turtle *(Lepidochelys kempii)*	no effect	The species does not occur in the action area.

Based on a review of the ER, the information provided by the FWS, and the NRC staff's independent review of available information, the NRC staff concludes that the proposed license renewal would have no effect on 31 of the 41 Federally listed species that occur in Matagorda County or in one of the counties through which the transmission line corridors traverse. The NRC staff concludes that the proposed license renewal may affect, but is unlikely to adversely affect, the remaining 10 species. Of these 10 species, only the American alligator (Alligator mississippiensis) has been observed on the site since STP began operating. There are three amphibian and six bird species that have not been observed on the site but have the potential to occur in areas of suitable habitat on the STP site or along the transmission line corridors. Continued operation and maintenance of the site will not involve any new changes to operation (e.g., construction, refurbishment, or ground-disturbing activities) or changes to existing land use conditions in either natural or developed areas. Thus, continued operation of STP would have no direct or indirect adverse effects to these species. Furthermore, the continued operation of STP during the license renewal term would preserve the existing habitats on the STP site. Therefore, this could result in beneficial effects to the 10 species discussed above.

The majority of the transmission line corridors traverse agricultural and range lands, which require minimal maintenance activities. Thus, continued operation and maintenance of the transmission lines would not result in habitat alteration. Herbicide application could create potential adverse effects by exposing these species to chemicals. However, these effects would be insignificant (i.e., those impacts that would never reach the scale where a take might occur) or discountable (i.e., those impacts that cannot be meaningfully measured, detected, or evaluated). The NRC staff did not identify any adverse effects associated with either STP site operation and maintenance or transmission line corridor maintenance that could reasonably be attributed to the proposed license renewal. However, because these species have the potential to occur in the area, the NRC staff conservatively has concluded that the proposed action may affect, but is unlikely to adversely affect, these species.

Designated Critical Habitat Protected Under the Endangered Species Act. The STP site is in close proximity to four units of designated piping plover (*Charadrius melodus*) critical habitat, the closest of which lies 7 mi (11 km) south of the STP site boundary along the shoreline of West Matagorda Bay. Because continued operation and maintenance of the STP site would involve no onsite or offsite disturbances, the proposed license renewal would result in no direct or indirect effects to piping plover critical habitat. The transmission line corridors do not occur near any of the four parcels of designated critical habitat. Thus, the NRC staff concludes that the proposed license renewal would have no effect on designated piping plover critical habitat.

Proposed Species and Proposed Critical Habitat Protected Under the Endangered Species Act. The NRC staff did not identify any Federally proposed species or proposed critical habitat within the action area during its review. Additionally, in its correspondence with NRC, the FWS (2011) and NMFS (2011) did not identify any proposed species or proposed critical habitat. Thus, the NRC staff concludes that the proposed license renewal would have no effect on Federally proposed species or proposed critical habitat.

Species Designated as NMFS Species of Concern. Though some of the species of concern listed in Section 2.2.8.2 occur in Matagorda Bay, none of the species of concern in the vicinity of

STP occur in the Colorado River and would, therefore, not be impinged or entrained by STP cooling water intake or otherwise affected by the proposed license renewal. The NRC staff concludes that there is no adverse impact to any NMFS species of concern.

<u>Species Protected Under the Bald and Golden Eagles Protection Act</u>. Though bald eagles occur throughout the STP region, no known nests are in close proximity to any of the STP buildings, parking lots, or other structures that could be disturbed by ongoing human activity. Because the proposed license renewal does not involve construction or land disturbances, no bald eagle habitat would be affected by the proposed license renewal. The NRC staff concludes that there is no adverse impact to the bald eagle.

<u>Species Protected Under the Migratory Bird Treaty Act</u>. As discussed in Section 2.2.8.4, a variety of migratory birds inhabit the STP site and surrounding region. Because the proposed license renewal does not involve construction or land disturbances, no migratory birds would be affected by the proposed license renewal. The NRC staff concludes that there is no adverse impact to migratory birds.

<u>Species Protected Under the Marine Mammal Protection Act</u>. Section 2.2.8.5 discusses marine mammals in the vicinity of STP. None of these species occur in the Colorado River and would, therefore, not be impinged or entrained by STP cooling water intake or otherwise affected by the proposed license renewal. The NRC staff concludes that there is no adverse impact to any marine mammals.

<u>Species Protected Under the Magnuson–Stevens Act</u>. Section 2.2.8.6 identifies species with essential fish habitat (EFH) with the potential to occur in the vicinity of STP. Of these species, ENSR (2008) collected the mangrove snapper and brown shrimp, white shrimp have been collected during ecological studies associated with STP, and white and brown shrimp have been collected during impingement or entrainment samples.

The NRC prepared an EFH assessment (NRC 2011c) as part of the review of the Units 3 and 4 COL application review. The NRC staff included the Colorado River, Matagorda Bay, and the Gulf of Mexico in the scope of its analysis because construction activities for the proposed Units 3 and 4 would include barge traffic. In that EFH assessment, the NRC concluded that the proposed Units 3 and 4 would have minimal adverse effects on EFH. The NMFS concurred with this determination in April 2010 (NMFS 2010). Because the area that would be affected by the proposed license renewal is smaller than the affected area for the proposed STP, Units 3 and 4, and would not require any construction or changes to current operation, the NRC staff concludes that the NRC's EFH assessment for the proposed STP, Units 3 and 4 (NRC 2011c), bounds the analysis for the proposed license renewal of STP, and that there are no adverse impacts to any EFH species.

<u>Species Protected Under State of Texas Statutes</u>. Section 2.2.8.7 discusses species protected under Texas's State Statutes. Some State-listed species may occur along the transmission line corridors. However, the minimal transmission line maintenance associated with the STP transmission lines is unlikely to affect any State-listed species. Because the transmission line corridors are well-established, continued maintenance will also not reduce or affect the amount or quality of available habitat. The NRC staff concludes that there are no adverse impacts to any State-listed species.

<u>Conclusion</u>. The NRC staff concludes that the impacts of the proposed STP license renewal on protected species and habitats would be SMALL, as defined by the NRC for the purposes of National Environmental Policy Act (NEPA) compliance.

4.8 Human Health

The human health issues applicable to South Texas Project are discussed below and listed in Table 4–15 for Category 1, Category 2, and uncategorized issues.

Table 4–15. Human Health Issues.
Table B-1 of Appendix B to Subpart A of 10 CFR Part 51 contains more information on these issues.

Issue	GEIS Section	Category
Radiation exposures to the public during refurbishment	3.8.1[a]	1
Occupational radiation exposures during refurbishment	3.8.2[a]	1
Microbiological organisms (occupational health)	4.3.6	1
Microbiological organisms (public health, for plants using lakes or canals or cooling towers or cooling ponds that discharge to a small river)	4.3.6	2
Noise	4.3.7	1
Radiation exposures to public (license renewal term)	4.6.2	1
Occupation radiation exposures (license renewal term)	4.6.3	1
Electromagnetic fields—acute effects (electric shock)	4.5.4.1	2
Electromagnetic fields—chronic effects	4.5.4.2	Uncategorized

[a] Issues apply to refurbishment, an activity that STP does not plan to undertake.

Source: Table B–1 in Appendix B, Subpart A, to 10 CFR Part 51

4.8.1 Generic Human Health Issues

Category 1 issues applicable to STP in regard to human health impacts are listed in Table 4–15. STPNOC stated in its ER that it was not aware of any new and significant human health issues associated with the renewal of the STP operating license. The staff has not identified any new and significant information related to human health issues associated with the operation of STP, Units 1 and 2, during the period of license renewal as a result of its independent review of STPNOC's ER, the site audit, and the scoping process. The NRC staff also reviewed other sources of information, such as applicable permits and data reports, as listed in the reference section of this SEIS chapter. Therefore, the NRC staff concludes that, for Category 1 human health issues, there would be no impact from nonradiological issues to the public or to workers during the renewal term beyond those discussed in the GEIS.

4.8.2 Radiological Impacts of Normal Operations

Category 1 issues applicable to STP in regard to radiological impacts are listed in Table 4–15. Regarding the potential for new and significant radiological information, STPNOC evaluated the issue of tritium contained in groundwater on the plant site and concluded that the tritium in groundwater would not preclude the water's current or future use; therefore, the issue is not new and significant. The staff discusses groundwater monitoring for radioactivity later in this section. In its radiological evaluation, the NRC staff determined that the issue is not new and significant.

The staff has not identified any new and significant information related to human health issues associated with radiation exposures during its independent review of STPNOC's ER, the site audit, and the scoping process. Therefore, the NRC staff concludes that there would be no impact from radiation exposures to the public or to workers during the renewal term beyond those discussed in the GEIS.

The findings in the GEIS are as follows:

- Radiation exposures to public (license renewal term)—Based on information in the GEIS, the NRC found that radiation doses to the public will continue at current levels associated with normal operations.
- Occupational exposures (license renewal term)—Based on information in the GEIS, the NRC found that projected maximum occupational doses during the license renewal term are within the range of doses experienced during normal operations and normal maintenance outages and would be well below regulatory limits.

According to the GEIS, the impacts to human health are SMALL, and additional plant-specific mitigation measures are unlikely to be sufficiently beneficial to warrant implementation. There are no Category 2 issues related to radiological impacts of routine operations.

The information presented below is a discussion of selected radiological programs conducted at STP.

South Texas Project Radiological Environmental Monitoring Program. STP conducts a Radiological Environmental Monitoring Program (REMP) to assess the radiological impact, if any, to its employees, the public, and the environment from the operations at STP, Units 1 and 2. The REMP measures the aquatic, terrestrial, and atmospheric environment for radioactivity, as well as the ambient radiation. In addition, the REMP measures background radiation (i.e., cosmic sources, global fallout, and naturally occurring radioactive material, including radon). The REMP supplements the radioactive effluent monitoring program by verifying that any measurable concentrations of radioactive materials and levels of radiation in the environment are not higher than those calculated using the radioactive effluent release measurements and transport models.

An annual radiological environmental operating report is issued, which contains a discussion of the results of the monitoring program. The report contains data on the monitoring performed for the most recent year. The REMP collects samples of environmental media to measure the radioactivity levels that may be present. The media samples are representative of the radiation exposure pathways that may impact the public.

The STP REMP is made up of four categories based on the exposure pathways to the public—airborne, waterborne, ingestion, and direct radiation. The air is sampled in areas around STP by measuring the levels of radioactive iodine and particulate matter on filters. For the waterborne pathway, the water samples are taken from surface water, groundwater, and drinking water. Also included in this pathway are sediment samples taken from the MCR and the Colorado River. The ingestion pathway samples local broadleaf vegetation, agricultural products, and food products. The direct exposure pathway measures environmental radiation doses using thermoluminescent dosimeters.

In addition to the REMP, STP has an onsite Groundwater Protection Program designed to monitor the onsite plant environment for detection of leaks from plant systems and pipes containing radioactive liquid (STPNOC 2010). Additional information on the Groundwater

Protection Program is contained later in this section and in the Groundwater Quality section in Chapter 2 of this document.

The staff reviewed the STP annual radiological environmental operating reports for 2006 through 2010 to look for any significant impacts to the environment or any unusual trends in the data (STP 2007a, 2008d, 2009a, 2010a, 2011a). A 5-year period provides a data set that covers a broad range of activities that occur at a nuclear power plant such as refueling outages, non-refueling outage years, routine operation, and years where there may be significant maintenance activities. Based on the staff's review, no adverse trends (i.e., steadily increasing buildup of radioactivity levels) were observed, and the data showed that there was no measurable impact to the environment from operations at STP.

<u>Tritium Groundwater Monitoring</u>. Nuclear industry events involving tritium prompted STP to sample groundwater in the shallow aquifer near the nuclear plants in 2005.

In 2007, the NEI established a standard for monitoring and reporting radioactive isotopes in groundwater. This standard is contained in NEI 07-07, *Industry Ground Water Protection Initiative—Final Guidance Document* (NEI 2007). STPNOC implemented the recommendations of this industry standard and has broadened the Groundwater Monitoring Program to include samples collected near the nuclear plants. Results of STPNOC's Groundwater Monitoring Program are contained in the annual REMP report submitted to the NRC in May of each year. These reports are available for review by the public through the ADAMS electronic reading room available through the NRC Web site.

In the 2010 REMP report, STPNOC reported that tritium was detected on site. The applicant's evaluation shows that the positive results are likely due to the well's location in an area that is influenced by the MCR. Other positive samples appear to be the result of discharges to the ground involving water previously considered non-radioactive since only trace quantities of tritium were measured. All groundwater sample containing tritium were below the EPA's drinking water standard of 20,000 pCi/l (740 Becquerels per liter). Also, the data showed no impact to sources of drinking water. The water samples from the onsite drinking water source (a deep aquifer) and offsite sampling of the Colorado River showed only natural background radiation levels (STPNOC 2011a).

Based on its review of the applicant's monitoring reports, the staff concludes that there are no significant impacts to human health associated with tritium in the groundwater at the STP site. The applicant's Groundwater Protection Program will monitor the groundwater and report the results in its annual radiological environmental monitoring report. Also, NRC inspectors will periodically review STPNOC's Groundwater Protection Program to ensure the program continues to be effective. Additional information on the applicant's Groundwater Protection Program and tritium in groundwater are in Sections 2.2.5 and 4.4.3 of this SEIS.

<u>Texas Department of State Health Services Environmental Monitoring Program</u>. The Texas Department of State Health Services (DSHS) performs its own independent environmental monitoring around the STP site and other nuclear facilities (i.e., research reactors, commercial users of radioactive material, and the U.S. Department of Energy's (DOE's) Pantex facility) located in Texas. All analyses of environmental media (i.e., soil, air, water, and vegetation) are performed by its Laboratory Services Section. The State's radiation branch performs the monitoring of direct radiation from a facility using TLDs.

The staff reviewed the State's environmental summary reports for 2005 through 2009 (the most recent report available at the time of the staff's review) (TDSHS 2012). In each of the reports, the State concluded that the sample data indicated no release of radioactive material to the environment that exceeded the regulatory or license limits of the DSHS or any other agency such as the NRC or the DOE.

South Texas Project Radioactive Effluent Release Program. All nuclear plants were licensed with the expectation that they would release radioactive material to both the air and water during normal operation. However, NRC regulations require that radioactive gaseous and liquid releases from nuclear power plants must meet radiation dose-based limits specified in 10 CFR Part 20 and the as low as is reasonably achievable (ALARA) criteria in Appendix I to 10 CFR Part 50. Regulatory limits are placed on the radiation dose that members of the public can receive from radioactive effluents released by a nuclear power plant. In addition, nuclear power plants are required by 10 CFR 50.36(a) to submit an annual report to the NRC, which lists the types and quantities of radioactive effluents released into the environment. The radioactive effluent release reports are available for review by the public through the ADAMS electronic reading room available through the NRC Web site.

The NRC staff reviewed the annual radioactive effluent release reports for 2006 through 2010 (STPNOC 2007b, 2008e, 2009b, 2010d, 2011d). The review focused on the calculated doses to a member of the public from radioactive effluents released from STP. The doses were compared to the radiation protection standards in 10 CFR 20.1301 and the ALARA dose design objectives in Appendix I to 10 CFR Part 50.

Dose estimates for members of the public are calculated based on radioactive gaseous and liquid effluent release data and atmospheric and aquatic transport models. The 2010 annual radioactive material release report (STPNOC 2011d) contains a detailed presentation of the radioactive discharges and the resultant calculated doses. The following summarizes the calculated dose to a member of the public located outside the STP site boundary from radioactive gaseous and liquid effluents released during 2010:

- The total-body dose to an offsite member of the public from STP Unit 1 radioactive liquid effluents was 4.75×10^{-3} mrem (4.75×10^{-5} mSv) and 7.75×10^{-3} mrem (7.75×10^{-5} mSv) for Unit 2, which is well below the 3 mrem (0.03 mSv) dose criterion in Appendix I to 10 CFR Part 50.

- The organ (GI-tract) dose to an offsite member of the public from STP Unit 1 radioactive liquid effluents was 4.79×10^{-3} mrem (4.79×10^{-5} mSv) and 7.78×10^{-3} mrem (7.78×10^{-5} mSv), which is well below the 10 mrem (0.10 mSv) dose criterion in Appendix I to 10 CFR Part 50.

- The air dose at the site boundary from gamma radiation in gaseous effluents from STP Unit 1 was 4.43×10^{-4} mrad (4.43×10^{-6} mGy) and 1.62×10^{-3} mrad (1.62×10^{-5} mGy) for Unit 2, which is well below the 10 mrad (0.1 mGy) dose criterion in Appendix I to 10 CFR Part 50.

- The air dose at the site boundary from beta radiation in gaseous effluents from Unit 1 was 2.02×10^{-4} mrad (2.02×10^{-6} mGy) and 2.01×10^{-3} mrad (2.01×10^{-5} mGy) for Unit 2, which is well below the 20 mrad (0.2 mGy) dose criterion in Appendix I to 10 CFR Part 50.

- The dose to an organ (bone) from radioactive iodine, radioactive particulates, and carbon-14 from Unit 1 was 2.62×10^{-1} mrem (2.62×10^{-3} mSv) and 2.66×10^{-1} mrem (2.66×10^{-1} mSv) for Unit 2, which is well below the 15 mrem (0.15 mSv) dose criterion in Appendix I to 10 CFR Part 50.

- The highest dose from direct radiation, as measured by TLDs, to an offsite member of the public was 0.65 mrem (0.0065 mSv). This dose is based on a conservative assumption that an individual is located at the STP site fence east of the two reactor units for the entire year.
- The staff summed the applicant's data on the individual total body doses from radioactive gaseous and liquid effluents from both units and added it to the dose from direct radiation to obtain the maximum all pathways dose to an offsite member of the public from the operation of STP, Units 1 and 2. The all pathways annual dose is 0.67 mrem (0.0067 mSv), which is well below the 25 mrem (0.25 mSv) dose standard in EPA's 40 CFR Part 190.

The staff's review of the STP Radioactive Effluent Control Program showed that radiation doses to members of the public were controlled within Federal radiation protection standards contained in Appendix I to 10 CFR Part 50, 10 CFR Part 20, and 40 CFR Part 190.

The applicant has no plans to conduct refurbishment activities during the license renewal term; however, routine plant refueling and maintenance activities currently performed will continue during the license renewal term. Based on the past performance of the radioactive waste system to maintain the dose from radioactive effluents to be ALARA, similar performance is expected during the license renewal term. Continued compliance with regulatory requirements is expected during the license renewal term; therefore, the impacts from radioactive effluents would be SMALL.

4.8.3 Microbiological Organisms

For power plants that use a cooling pond, lake, or canal or that discharge to a small river, the effects of microbiological organisms on human health are listed as a Category 2 issue and require plant-specific evaluation for license renewal review. This issue is applicable to STP because the facility uses a cooling pond, as defined in the GEIS (NRC 1996). The cooling pond (MCR) discharges to Colorado River that has the mean annual average flow of approximately 2,629 cfs (NRC 2011b). This meets the definition of a small river. The MCR is within the confine of the STP security perimeter and is not available for public use.

The Category 2 designation is based on the potential for public health impacts associated with thermal enhancement of *Naegleria fowleri*, a pathogenic amoeba, and other enteric pathogens that could not be assessed generically. The NRC noted that impacts of nuclear plant thermal discharges are considered to be of small significance if they do not enhance the presence of microorganisms that are detrimental to water quality and public health (NRC 1996).

Microbiological organisms that grow at temperatures above 45 °C to 50 °C (113 °F to 122 °F) are termed thermophilic, or heat-loving, organisms (Brock 1974). STP has TPDES permit (No. WQ0001908000) to discharge to the Colorado at the daily average temperature limit of 95 °F and daily maximum temperature limit of 97 °F (STPNOC 2010). These limits are below the temperature at which thermophilic microorganisms grow and thrive (113 °F to 122 °F). Hence, the potential of waterborne disease outbreak due to discharge from the MCR to the Colorado River is remote.

Furthermore, the TPDES permit limits the discharge to less than 12.5 percent of the river flow and may not exceed 200 million gpd. It is likely that the discharge would occur during high river flow periods, which are reported by the STPNOC to be during the winter and spring when the river temperature is at low level.

The staff asked the Texas Department of Health about any concerns the department might have relative to the microorganisms in the MCR that could cause waterborne disease outbreak in the area (NRC 2012). The department responded that it did not have any records of such outbreak, and it is not aware of any potential concerns about outbreaks associated with the operation of STP during the extended period of operation.

The staff concludes that the potential impacts to public health from microbiological organisms, resulting from operation of the STP cooling water discharge system to the aquatic environment on or near the site, are SMALL, and no further mitigations are warranted.

4.8.4 Electromagnetic Fields—Acute Effects

Based on the GEIS, the NRC found that electric shock resulting from direct access to energized conductors or from induced charges in metallic structures has not been found to be a problem at most operating plants and, generally, is not expected to be a problem during the license renewal term. However, site-specific review is required to determine the significance of the electric shock potential along the portions of the transmission lines that are within the scope of this SEIS.

In the GEIS (NRC 1996), the NRC found that without a review of the conformance of each nuclear plant transmission line with National Electrical Safety Code (NESC) criteria, it was not possible to determine the significance of the electric shock potential (IEEE 2002). Evaluation of individual plant transmission lines is necessary because the issue of electric shock safety was not addressed in the licensing process for some plants. For other plants, land use in the vicinity of transmission lines may have changed, or power distribution companies may have chosen to upgrade line voltage. To comply with 10 CFR 51.53(c)(3)(ii)(H), the applicant must provide an assessment of the impact of the proposed action on the potential shock hazard from the transmission lines if the transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendations of the NESC for preventing electric shock from induced currents.

STPNOC analyzed its transmission lines to identify the limiting case for each line where the potential exists for the highest current-induced shock. STPNOC calculated the electric field strength and induced current for each of the lines using a computer code called ACDCLINE, produced by the Electric Power Research Institute. The input parameters included the design features of each of the limiting-case transmission lines, and a tractor-trailer was assumed to be the maximum vehicle size under the lines. STPNOC reported in its ER and in two supplemental letters (STPNOC 2011c, 2011f) that there are three transmission lines (i.e., two Hill County lines and one Skyline line) that exceed the NESC 5 milliampere (mA) criterion for preventing electric shock from induced currents. However, STPNOC states that the configuration of these lines has changed since the original plant construction. These lines are no longer directly connected with STP. A substation was constructed at Elm Creek. The original Hill County and Skyline transmission lines are now looped into the Elm Creek substation before proceeding to the Hill County and Skyline substations. The lines pass through land that is primarily agricultural and rangeland, with some forest land and lesser land-use categories. The areas are mostly remote, with low population densities. The lines cross numerous county, State, and U.S. highways.

As reported by STPNOC in its ER, the service providers for the STP transmission lines have surveillance and maintenance procedures that periodically examine the lines to ensure they remain within their design criteria. These procedures include routine aerial inspections that include checks for encroachments, broken conductors, broken or leaning structures, and signs of trees burning, any of which would be evidence of clearance problems. Ground inspections include examination for clearance, integrity of structures, and surveillance for dead or diseased trees that might fall on the transmission lines. Problems noted during any inspection are reported for follow-up corrective action. STPNOC has considered potential mitigation measures to reduce or avoid adverse impacts from electric shock from its transmission lines, with a combination of options, as follows:

- re-examining the induced current calculations for selected transmission lines (for accuracy and possible safety margin identification),
- raising the transmission towers at the potentially affected road-transmission line intersections,
- modifying the double-circuit lines to reduce the current-induced shock potential, or
- placing caution signs under the transmission lines.

Based on information provided by STPNOC and potential mitigation measures (to reduce or avoid adverse impacts) considered by the applicant, the staff concludes that potential impact from acute electric shock during the renewal period would be SMALL to MODERATE. This conclusion is based on the fact that the three transmission lines exceed the NESC 5 mA criterion by a small percentage, the locations where the lines exceed the standard are in remote locations or are on private property, and the applicant, in accordance with 10 CFR 51.53(c)(3)(iii), has considered potential mitigation measures to reduce or avoid adverse impacts from electric shock.

4.8.5 Electromagnetic Fields—Chronic Effects

In the GEIS, the effects of chronic exposure to 60 Hz electromagnetic fields from powerlines were not designated as Category 1 or 2 and will remain uncategorized until a scientific consensus is reached on the health implications of these fields.

The potential effects of chronic exposure from these fields continue to be studied and are not known at this time. The National Institute of Environmental Health Sciences (NIEHS) directs related research through the DOE.

The NIEHS report (NIEHS 1999) contains the following conclusion:

> The NIEHS concludes that ELF EMF (extremely low frequency electromagnetic field) exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. In our opinion, this finding is insufficient to warrant aggressive regulatory concern. However, because virtually everyone in the United States uses electricity and therefore is routinely exposed to ELF EMF, passive regulatory action is warranted such as continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. The NIEHS does not believe that other cancers or non cancer health outcomes provide sufficient evidence of a risk to currently warrant concern.

This statement is not sufficient to cause the staff to change its position with respect to the chronic effects of electromagnetic fields. The staff considers the GEIS finding of “UNCERTAIN” still appropriate and will continue to follow developments on this issue.

4.9 Socioeconomics

The socioeconomic issues applicable to STP, Units 1 and 2, are shown in Table 4–16 for Category 1, Category 2, and one uncategorized issue (environmental justice). Section 2.2.8 of this SEIS describes the socioeconomic conditions near STP, Units 1 and 2.

Table 4–16. Socioeconomics during the Renewal Term

Issues	GEIS Section	Category
Housing impacts	4.7.1	2
Public services: public safety, social services, & tourism & recreation	4.7.3, 4.7.3.3, 4.7.3.4, 4.7.3.6	1
Public services: public utilities	4.7.3.5	2
Public services: education (license renewal)	4.7.3.1	1
Offsite land use (license renewal term)	4.7.4	2
Public Services: transportation	4.7.3.2	2
Historic & archaeological resources	4.7.7	2
Aesthetic impacts (license renewal term)	4.7.6	1
Aesthetic impacts of transmission lines (license renewal term)	4.5.8	1
Environmental justice	Not addressed[a]	Uncategorized

(a) Guidance for implementing Executive Order 12898 and conducting an environmental justice impact analysis was not available prior to the completion of the GEIS. This issue must be addressed in plant-specific reviews.

4.9.1 Generic Socioeconomic Issues

The STPNOC ER, scoping comments, other available data records on STP, Units 1 and 2, were reviewed and evaluated for new and significant information. The review included a data gathering site visit to STP, Units 1 and 2 (the NRC staff also reviewed other sources of information such as applicable permits and data reports as listed in the reference section of this SEIS chapter). No new and significant information was identified during this review that would change the conclusions presented in the GEIS. Therefore, for these Category 1 issues, impacts during the renewal term are not expected to exceed those discussed in the GEIS. For STP, Units 1 and 2, the NRC staff incorporates the GEIS conclusions by reference. Impacts for Category 2 issues and the uncategorized issue (environmental justice) are discussed in Sections 4.9.2 through 4.9.7.

4.9.2 Housing

Appendix C of the GEIS (NRC 1996) presents a population characterization method based on two factors—sparseness and proximity. Sparseness measures population density within 20 mi (32 km) of the site, and proximity measures population density and city size within 50 mi (80 km). Each factor has categories of density and size. A matrix is used to rank the population category as low, medium, or high as shown in Figure C.1 of the GEIS.

According to the 2000 Census, an estimated 35,291 people lived within 20 mi (32 km) of STP, Units 1 and 2, which equates to a population density of 36 persons per square mile

(STPNOC 2010). This translates to a Category 1, "most sparse," population density using the GEIS measure of sparseness (less than 40 persons per square mile and no community with 25,000 or more people within 20 mi). An estimated 255,118 people live within 50 mi (80 km) of STP, Units 1 and 2, with a population density of 32 persons per square mile (STPNOC 2010). Applying the GEIS proximity measures, STP is classified as proximity Category 1 (no city with 100,000 or more persons and less than 50 persons per square mile within 50 mi). Therefore, according to the sparseness and proximity matrix presented in the GEIS, rankings of sparseness Category 1 and proximity Category 1 result in the conclusion that the STP is located in a low population area.

Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, states that impacts on housing availability are expected to be of SMALL, MODERATE, or LARGE. MODERATE or LARGE housing impacts of the workforce associated with refurbishment may be associated with plants located in sparsely populated areas or in areas with growth control measures that limit housing development. Because (a) STPNOC has no planned refurbishment activities and (b) Brazoria County and Matagorda County are not subject to growth-control measures that would limit housing development, any changes in employment at STP would have little noticeable effect on housing availability in these counties. Since STPNOC has no plan to add non-outage employees during the license renewal period, employment levels at STP would remain relatively constant with no additional demand for permanent housing during the license renewal term. Based on this information, there would be no additional impact on housing during the license renewal term beyond what has already been experienced. Because there is no additional impact, the impact is considered to be SMALL (not MODERATE or LARGE).

4.9.3 Public Services—Public Utilities

Impacts on public utility services (e.g., water, sewer) are considered SMALL if the public utility has the ability to respond to changes in demand and would have no need to add or modify facilities. Impacts are considered MODERATE if service capabilities are overtaxed during periods of peak demand. Impacts are considered LARGE if additional system capacity is needed to meet ongoing demand.

Analysis of impacts on the public water systems considered both plant demand and plant-related population growth. Section 2.1.7 of this SEIS describes the permitted withdrawal rate and actual use of water for reactor cooling at STP, Units 1 and 2.

Since STPNOC has no plans to add non-outage employees during the license renewal period, employment levels at STP would remain relatively unchanged with no additional demand for public water services. Public water systems in the region are adequate to meet the demands of residential and industrial customers in the area. Therefore, there would be no additional impact to public water services during the license renewal term beyond what is currently being experienced. Because there is no additional impact, the impact is considered to be SMALL (not MODERATE or LARGE).

4.9.4 Public Services—Transportation

Table B-1 of Appendix B to Subpart A of 10 CFR Part 51 states that:

> Transportation impacts (level of service) of highway traffic generated...during the term of the renewed license are generally expected to be of SMALL significance. However, the increase in traffic associated with additional workers and the local road and traffic control conditions may lead to impacts of MODERATE or LARGE significance at some sites.

The regulation in 10 CFR 51.53(c)(3)(ii)(J) requires all applicants to assess the impacts of highway traffic generated by the proposed project on the level of service of local highways during the term of the renewed license. Since STPNOC has no plans to add non-outage employees during the license renewal period, traffic volume and levels of service on roadways in the vicinity of STP, Units 1 and 2, would not change. Therefore, there would be no transportation impacts during the license renewal term beyond those already being experienced. Because there is no additional impact, the impact is considered to be SMALL (not MODERATE or LARGE).

4.9.5 Offsite Land Use

Table B-1 of Appendix B to Subpart A of 10 CFR Part 51 notes that “significant changes in land use may be associated with population and tax revenue changes resulting from license renewal.” Section 4.7.4 of the GEIS defines the magnitude of land-use changes as a result of plant operation during the license renewal term as SMALL when there will be little new development and minimal changes to an area’s land-use pattern, as MODERATE when there will be considerable new development and some changes to the land-use pattern, and LARGE when there will be large-scale new development and major changes in the land-use pattern.

Tax revenue can affect land use because it enables local jurisdictions to provide the public services (e.g., transportation and utilities) necessary to support development. Section 4.7.4.1 of the GEIS states that the assessment of tax-driven land-use impacts during the license renewal term should consider the size of the plant’s tax payments relative to the community’s total revenues, the nature of the community’s existing land-use pattern, and the extent to which the community already has public services in place to support and guide development. If the plant’s tax payments are projected to be small relative to the community’s total revenue, tax driven land-use changes during the plant’s license renewal term would be SMALL, especially where the community has pre-established patterns of development and has provided public services to support and guide development. Section 4.7.2.1 of the GEIS states that if tax payments by the plant owner are less than 10 percent of the taxing jurisdiction’s revenue, the significance level would be SMALL. If tax payments are 10 to 20 percent of the community’s total revenue, new tax-driven land-use changes would be MODERATE. If tax payments are greater than 20 percent of the community’s total revenue, new tax-driven land-use changes would be LARGE. This would be especially true where the community has no pre-established pattern of development or has not provided adequate public services to support and guide development.

4.9.5.1 Population-Related Impacts

Since STPNOC has no plans to add non-outage employees during the license renewal period, there would be no plant operations-driven population increase in the vicinity of STP, Units 1 and 2. Therefore, there would be no additional population-related offsite land use impacts during the license renewal term beyond those already being experienced.

4.9.5.2 Tax Revenue-Related Impacts

As discussed in Chapter 2, STPNOC pays property taxes for STP, Units 1 and 2, to Matagorda County, Matagorda County Hospital District, Navigation District #1, Drainage District #3, Palacios Seawall District, and the Coastal Plains Groundwater District. Since STPNOC started making property tax payments to local jurisdictions, population levels and land use conditions in Matagorda County has remained relatively unchanged (STPNOC 2010); therefore, tax revenue from STP, Units 1 and 2, has had little or no effect on land use conditions within the county.

Since employment levels at STP, Units 1 and 2, would remain relatively unchanged with no increase in the assessed value of STP, Units 1 and 2, annual property tax payments would also be expected to remain relatively unchanged throughout the license renewal period. Based on this information, there would be no additional tax-revenue-related offsite land use impacts during the license renewal term beyond those already being experienced. Because there is no additional impact, the impact is considered to be SMALL (not MODERATE or LARGE).

4.9.6 Historic and Archaeological Resources

The National Historic Preservation Act (NHPA) requires Federal agencies to consider the effects of their undertakings on historic properties. Historic properties are defined as resources that are eligible for listing on the National Register of Historic Places (NRHP). The criteria for eligibility are listed in 36 CFR 60.4 and include association with significant events in history; association with the lives of persons significant in the past; embodiment of distinctive characteristics of type, period, or construction; and sites or places that have yielded or are likely to yield important information. The historic preservation review process (Section 106 of NHPA) is outlined in regulations issued by the Advisory Council on Historic Preservation (ACHP) in 36 CFR Part 800. In accordance with 36 CFR 800.8(c), the NRC has elected to use the NEPA process to comply with the obligations found under Section 106 of the NHPA.

The issuance of a renewed operating license for a nuclear power plant is a Federal action that could affect historic properties on or near the nuclear plant site and transmission lines. In accordance with the provisions of the NHPA, the NRC is required to make a reasonable effort to identify historic properties included in or eligible for inclusion in the NRHP in the area of potential effect (APE). The APE for license renewal is the nuclear power plant site, transmission lines, and immediate environs. If historic properties are present, the NRC is required to contact the State Historic Preservation Office (SHPO), assess the potential impact, and resolve any possible adverse effects of the undertaking (license renewal) on historic properties. NRC is also required to notify the SHPO if historic properties would not be affected by license renewal or if no historic properties are present. The SHPO is part of the Texas Historical Commission (THC) in the State of Texas. This section provides the NRC's assessment of effects from the proposed license renewal action for STP, Units 1 and 2. Section 2.2.10 of this SEIS provides specific historic and cultural information near the STP site.

On March 17, 2009, STP initiated informal consultation with the THC regarding the renewal of operating licenses for STP, Units 1 and 2. STP concluded in its letter to THC that there would be no effect on historic properties from license renewal and associated operation and maintenance activities (STPNOC 2010b). The THC responded to STP on October 26, 2009, with a determination of "No Historic Properties Affected, Project May Proceed" (STPNOC 2010b). The THC response is in the form of a stamp on the last page of the STP letter that was sent to the THC, which STP included in its ER for license renewal (STPNOC 2010b).

Prior to the site audit in May 2011, NRC contacted the THC concerning license renewal for STP. The staff and THC concluded there was no need to meet during the environmental audit to discuss cultural resources (NRC 2011a). The THC determined that there were no known issues with license renewal for STP and referred the NRC to the THC response to STP on October 26, 2009, with the determination of "No Historic Properties Affected, Project May Proceed" (STPNOC 2010b).

In accordance with 36 CFR 800.8(c), on January 27, 2011, and February 17, 2011, respectively, the NRC initiated consultations on the proposed action by writing to the ACHP and SHPO

(NRC 2011d, 2011e). In February 2011, the NRC initiated consultation with six Federally recognized tribes: the Yselta del Sur Pueblo Tribe, Alabama-Cousahatta Tribe, Kiowa Tribe of Oklahoma, the Comanche Nation, Tonkawa Tribe of Oklahoma, and Kickapoo Traditional Council (Appendix D contains a copy of these letters for reading convenience). Also in February 2011, the NRC initiated consultation with four additional tribes: the Apalachicola Band of Creek Indians, Lipan Apache Band of Texas, Pamaque Clan of Coahuila Y Tejas, and the Tap Pilam-Coahuiltecan Nation (Appendix D contains a copy of these letters). In its letters, the NRC provided information about the proposed action and the definition of APE. In addition, the NRC indicated that the NHPA review would be integrated with the NEPA process, in accordance with 36 CFR 800.8. NRC invited participation in the identification and possible decisions concerning historic properties and invited participation in the scoping process. Four tribes—the Apalachicola Band of Creek Indians, the Kickapoo Traditional Council, the Tonkawa Tribe of Oklahoma, and the Tap Pilam-Coahuiltecan Nation—responded to the NRC with scoping comments. These comments included concerns with potential accidents, requests to re-survey the STP site, requests for notification if historic and cultural resources of cultural significance were discovered on the STP site, and statements of no concern with the undertaking. NRC responded to the tribes in October 2011 and has taken the comments into consideration while preparing this SEIS (Appendix D lists copies of these letters).

As described in Section 2.2.10, there are no recorded archaeological sites or historic structures on the STP site. STPNOC has identified a potential historic gravesite located on the southeast boundary of the STP site within the APE. STP staff interviewed descendants of the former property owner and confirmed the presence of a grave from the late 1800s; however, little is known about the gravesite, and it is not a recorded historic and archaeological resource. The NRC staff has confirmed that there are no planned ground-disturbing activities near the gravesite and it would be protected from any operation and maintenance activities associated with the license renewal term as the activities “would occur several miles from the [grave]site and would be conducted in accordance with STP environmental compliance procedures” (STPNOC 2011g).

STPNOC has no planned refurbishment activities associated with license renewal at the STP site (STPNOC 2011g). A review of operation and maintenance activities that occur in and around the STP site indicates that these activities are limited to the use of existing roads and previously disturbed areas and are subject to STP environmental compliance procedures (applicable to any future potential land disturbing constructions at STP).

For the purposes of NHPA Section 106 consultation, the NRC staff concludes a finding of no effect to historic properties (36 CFR Section 800.4(d)(1)) based on the following:

- historic and cultural resources located within the APE,
- tribal input,
- STP environmental compliance procedures,
- there will be no refurbishment or ground-disturbing activities associated with the relicensing of STP, Units 1 and 2,
- SHPO finding of “No Historic Properties—Affected, Project May Proceed,” and
- the NRC staff’s cultural resource analysis and consultation.

For the purposes of the NRC staff's NEPA analysis, in consideration of the conclusion reached in the NHPA Section 106 consultation, the NRC staff concludes that potential impacts on historic and cultural resources related to STP license renewal would be SMALL.

4.9.7 Environmental Justice

Under Executive Order (EO) 12898 (59 FR 7629), Federal agencies are responsible for identifying and addressing, as appropriate, disproportionately high and adverse human health and environmental impacts on minority and low-income populations. In 2004, the NRC issued a *Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions* (69 FR 52040), which states, "The Commission is committed to the general goals set forth in EO 12898, and strives to meet those goals as part of its NEPA review process."

The Council on Environmental Quality (CEQ) provides the following information in *Environmental Justice: Guidance Under the National Environmental Policy Act* (CEQ 1997):

> **Disproportionately High and Adverse Human Health Effects.**
>
> Adverse health effects are measured in risks and rates that could result in latent cancer fatalities, as well as other fatal or nonfatal adverse impacts on human health. Adverse health effects may include bodily impairment, infirmity, illness, or death. Disproportionately high and adverse human health effects occur when the risk or rate of exposure to an environmental hazard for a minority or low-income population is significant (as employed by NEPA) and appreciably exceeds the risk or exposure rate for the general population or for another appropriate comparison group.
>
> **Disproportionately High and Adverse Environmental Effects.**
>
> A disproportionately high environmental impact that is significant (as employed by NEPA) refers to an impact or risk of an impact on the natural or physical environment in a low-income or minority community that appreciably exceeds the environmental impact on the larger community. Such effects may include ecological, cultural, human health, economic, or social impacts. An adverse environmental impact is an impact that is determined to be both harmful and significant (as employed by NEPA). In assessing cultural and aesthetic environmental impacts, impacts that uniquely affect geographically dislocated or dispersed minority or low-income populations or American Indian tribes are considered.

The environmental justice analysis assesses the potential for disproportionately high and adverse human health or environmental effects on minority and low-income populations that could result from the operation of STP during the license renewal term. In assessing the impacts, the following definitions of minority individuals and populations and low-income population were used (CEQ 1997):

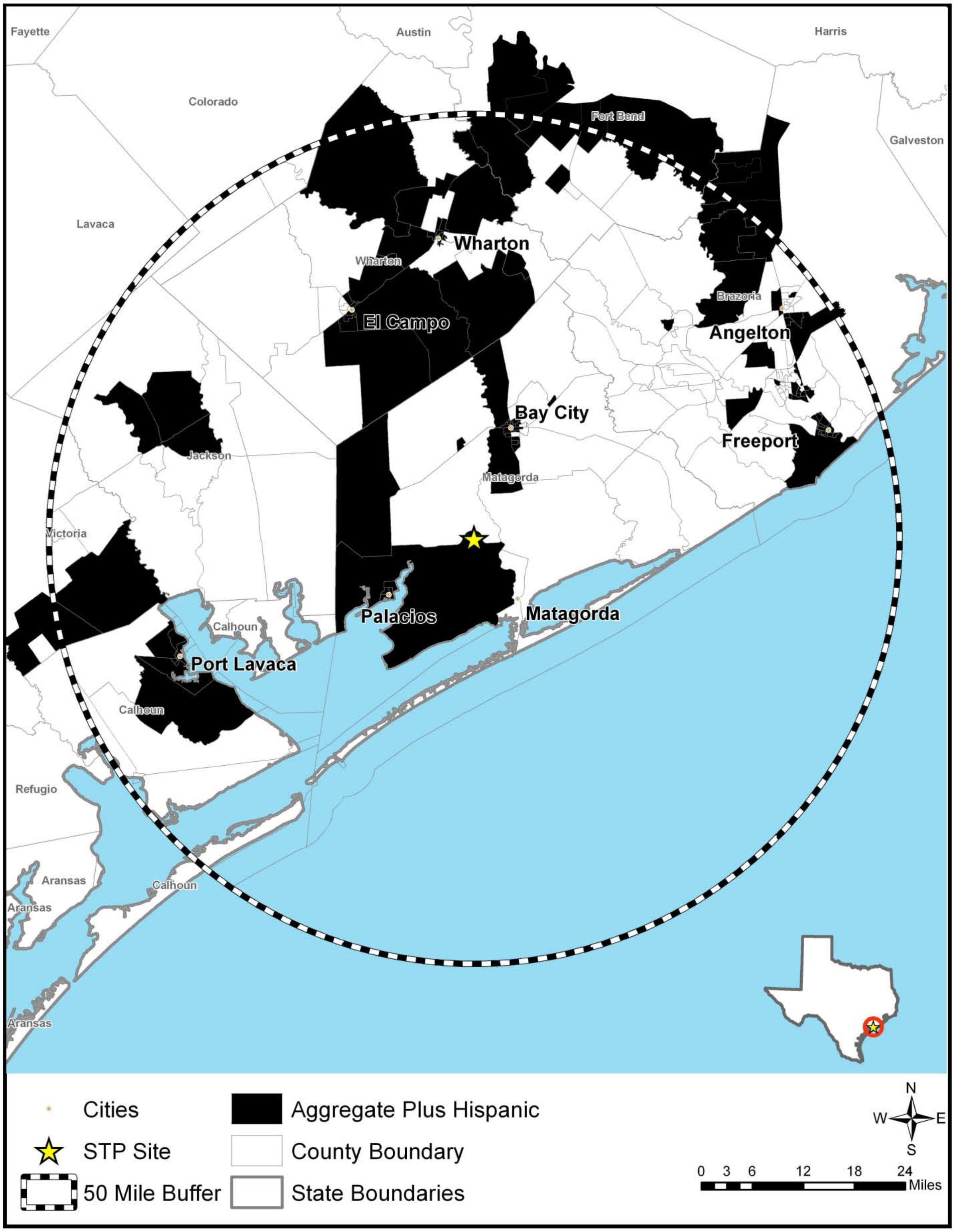
> **Minority individuals.**
>
> Individuals who identify themselves as members of the following population groups: Hispanic or Latino, American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, or two or more races, meaning individuals who identified themselves on a Census form as being a member of two or more races, for example, Hispanic and Asian.

> **Minority populations.**
>
> Minority populations are identified when (1) the minority population of an affected area exceeds 50 percent or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.
>
> **Low-income population.**
>
> Low-income populations in an affected area are identified with the annual statistical poverty thresholds from the Census Bureau's Current Population Reports, Series P60, on Income and Poverty.

Minority Population. According to 2010 Census data, 45.9 percent of the total population (approximately 110,201 persons) residing within a 50-mi (80-km) radius of STP identified themselves as minority individuals. The largest minority group was Hispanic or Latino (of any race) (approximately 82,000 persons or 33.9 percent), followed by Black or African American (approximately 23,000 persons or 9.6 percent) (CAPS 2011).

According to 2010 Census data, minority populations in the socioeconomic ROI (Matagorda and Brazoria Counties) comprised 47.4 percent of the total two-county population as shown in Table 2–17 (USCB 2011). Figure 4–2 shows minority population block groups using 2010 Census data for race and ethnicity within a 50-mi (80-km) radius of STP.

1 **Figure 4–2. 2010 Census Minority Block Groups Within a 50-mi Radius of STP**



Source: USCB 2012.

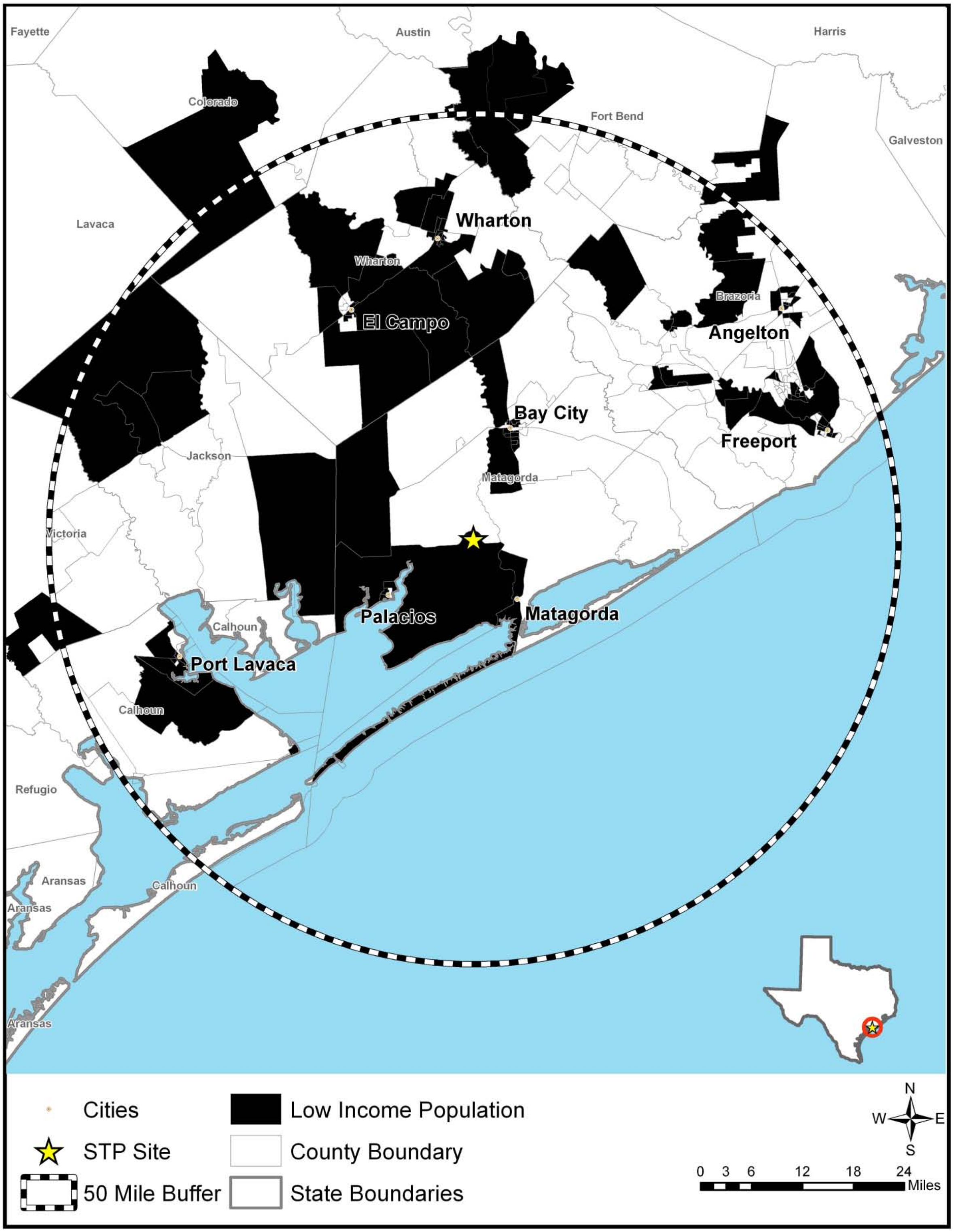
Census block groups were considered minority population block groups if the percentage of the minority population within any block group exceeded 45.9 percent (the percent of the minority population within the 50-mi radius of STP). A minority population exists if the percentage of the minority population within the block group is meaningfully greater than the minority population percentage in the 50-mi radius. Minority population block groups are concentrated in the Bay City area, El Campo, Freeport, Palacios, and Port Lavaca. Smaller concentrations of minority population block groups are found in Angelton and Wharton. The nearest minority population (i.e., percentage is meaningfully greater than the percentage in the 50-mi radius) to STP is located in Matagorda, Texas. In Matagorda, according to the 2010 Census, approximately 15 percent of the Matagorda population identified themselves as minority.

<u>Low-Income Population</u>. According to 2006 through 2010 American Community Survey 5-year estimates, an average of 11.4 percent of families and 14.2 percent of individuals residing in nine counties—all or parts of which are located within a 50-mi radius of STP (Brazoria, Calhoun, Colorado, Fort Bend, Jackson, Lavaca, Matagorda, Victoria, and Wharton)—were identified as living below the Federal poverty threshold in 2010 (USCB 2010). The 2010 Federal poverty threshold was $22,314 for a family of four.

According to 2006 through 2010 American Community Survey 5-year estimates, the median household income for Texas was $49,646, with 16.8 percent of the State population and 13 percent of families living below the Federal poverty threshold in 2010 (USCB 2011). Brazoria County had a lower median household income average ($43,258) and lower percentages of individuals (10.6 percent) and families (8.2 percent) living below the poverty level when compared to the State average. Matagorda County had a lower household income average ($48,508) compared to the State average and higher than Brazoria County, but a higher percentage of individuals (18.6 percent) and families (21.6 percent) living below the poverty level when compared to Brazoria County and the State (USCB 2011).

Figure 4–3 shows low-income census block groups within a 50-mi (80-km) radius of STP. Census block groups were considered low-income population block groups if the percentage of individuals living below the Federal poverty threshold within any block group exceeded the percent of the individuals living below the Federal poverty threshold within the 50-mi radius of STP. Similar to the locations of minority population block groups, the majority of low-income population block groups are located in the Bay City area, Freeport, Palacios, Port Lavaca, and Wharton. Smaller concentrations of minority population block groups are located near Angelton. The nearest low-income population to STP is located in Matagorda, Texas.

1 **Figure 4–3. Census 2010 Low-Income Block Groups Within a 50-mi Radius of STP**



Source: USCB 2012

Analysis of Impacts. The NRC addresses environmental justice matters for license renewal in the following ways:

- identifying the location of minority and low-income populations that may be affected by the continued operation of the nuclear power plant during the license renewal term,
- determining whether there would be any potential human health or environmental effects to these populations and special pathway receptors, and
- determining if any of the effects may be disproportionately high and adverse.

Figure 4–2 and Figure 4–3, above, identify the location of minority and low-income populations residing within a 50-mi (80-km) radius of STP. This area of impact is consistent with the impact analysis for public and occupational health and safety, which also focuses on populations within a 50-mi (80-km) radius of the nuclear plant. Chapter 4 presents the assessment of environmental and health impacts for each resource area. The analyses of impacts for all environmental resource areas indicated that the impact from license renewal would be SMALL.

Potential impacts to minority and low-income populations (including migrant workers or Native Americans) would mostly consist of socioeconomic and radiological effects; however, radiation doses from continued operations during the license renewal term are expected to continue at current levels and would remain below regulatory limits. Chapter 5 of this SEIS discusses the environmental impacts from postulated accidents that might occur during the license renewal term, which include both design-basis and severe accidents. In both cases, the NRC has generically determined that impacts associated with design-basis accidents are SMALL because nuclear plants are designed and operated to successfully withstand such accidents, and the probability-weighted risks associated with severe accidents were also SMALL.

Therefore, based on this information and the analysis of human health and environmental impacts presented in Chapters 4 and 5 of this SEIS, there would be no disproportionately high and adverse impacts to minority and low-income populations from the continued operation of STP during the license renewal term.

As part of addressing environmental justice concerns associated with license renewal, the NRC also assessed the potential radiological risk to special population groups (such as migrant workers or Native Americans) from exposure to radioactive material received through their unique consumption and interaction with the environment patterns. These include subsistence consumption of fish, native vegetation, surface waters, sediments, and local produce; absorption of contaminants in sediments through the skin; and inhalation of airborne radioactive material released from the plant during routine operation. This analysis is presented below.

Subsistence Consumption of Fish and Wildlife. The special pathway receptors analysis is an important part of the environmental justice analysis because consumption patterns may reflect the traditional or cultural practices of minority and low-income populations in the area, such as migrant workers or Native Americans.

Section 4-4 of EO 12898 (1994) directs Federal agencies, whenever practical and appropriate, to collect and analyze information on the consumption patterns of populations that rely principally on fish or wildlife or both for subsistence and to communicate the risks of these consumption patterns to the public. In this SEIS, the NRC considered whether there were any means for minority or low-income populations to be disproportionately affected by examining impacts to American Indians, Hispanics, migrant workers, and other traditional lifestyle special pathway receptors. Special pathways take into account the levels of radiological and nonradiological contaminants in native vegetation, crops, soils and sediments, groundwater, surface water, fish, and game animals on or near STP.

The following is a summary discussion of the NRC's evaluation from Section 4.8.2 of the REMP that assesses the potential impacts for subsistence consumption of fish and wildlife near the STP site.

STPNOC has an ongoing, comprehensive REMP to assess the impact of STP operations on the environment. To assess the impact of nuclear power plant operations, samples are collected annually from the environment and analyzed for radioactivity. A nuclear power plant effect would be indicated if the radioactive material detected in a sample was significantly larger than background levels. Two types of samples are collected. The first type, control samples, is collected from areas that are beyond the measurable influence of the nuclear power plant or any other nuclear facility. These samples are used as reference data to determine normal background levels of radiation in the environment. These samples are then compared with the second type of samples, indicator samples, collected near the nuclear power plant. Indicator samples are collected from areas where any contribution from the nuclear power plant will be at its highest concentration. These samples are then used to evaluate the contribution of normal nuclear power plant operations to radiation or radioactivity levels in the environment. An effect would be indicated if the radioactivity levels detected in an indicator sample was significantly larger than the control sample or background levels.

Samples of environmental media are collected from the aquatic and terrestrial pathways in the vicinity of STP. The aquatic pathways include surface water, groundwater, drinking water, fish, crab, shrimp, oyster, and shoreline sediment. The terrestrial pathways include airborne particulates, food products (i.e., leafy vegetables such as cabbage and various edible greens, are collected from gardens and farms in the vicinity of STP), beef, poultry, wild animal meat (i.e., waterfowl, deer, rabbits, and alligator), and broadleaf vegetation. In 2010, analyses performed on samples of environmental media showed no significant or measurable radiological impact above background levels from normal STP operations (STPNOC 2011).

Conclusion. Based on the radiological environmental monitoring data from STP, the NRC finds that no disproportionately high and adverse human health impacts would be expected in special pathway receptor populations in the region as a result of subsistence consumption of water, local food, fish, and wildlife.

4.10 Evaluation of New and Potentially Significant Information

The staff has not identified new and significant information on environmental issues related to operation during the renewal term. The staff also determined that information provided during the public comment period did not identify any new issue that requires site-specific assessment. The staff reviewed the discussion of environmental impacts associated with operation during the renewal term in the GEIS and has conducted its own independent review, including public involvement process (e.g., public meetings) to identify issues with new and significant information.

New and significant information is information that identifies a significant environmental issue not covered in the GEIS and codified in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, or information that was not considered in the analyses summarized in the GEIS and that leads to an impact finding that is different from the finding presented in the GEIS and codified in 10 CFR Part 51.

In accordance with 10 CFR 51.53(c), the ER submitted by the applicant must provide an analysis of the Category 2 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B. Additionally, it must discuss actions to mitigate any adverse impacts associated with the proposed action and environmental impacts of alternatives to the proposed action. In accordance with 10 CFR 51.53(c)(3), the ER does not need to contain an analysis of any Category 1 issue unless there is significant new information on a specific issue.

The NRC also has a process for identifying new and significant information. That process is described in NUREG-1555, Supplement 1, *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal* (NRC 1999b). The search for new information includes:

- review of an applicant's ER and the process for discovering and evaluating the significance of new information,
- review of public comments,
- review of environmental quality standards and regulations,
- coordination with Federal, State, and local environmental protection and resource agencies, and
- review of the technical literature.

New information discovered by the staff is evaluated for significance using the criteria set forth in the GEIS. For Category 1 issues where new and significant information is identified, reconsideration of the conclusions for those issues is limited in scope to the assessment of the relevant new and significant information; the scope of the assessment does not include other facets of an issue that are not affected by the new information.

4.11 Cumulative Impacts

The staff considered potential cumulative impacts in the environmental analysis of continued operation of STP nuclear plant during the 20-year license renewal period. Cumulative impacts may result when the environmental effects associated with the proposed action are overlaid or added to temporary or permanent effects associated with other past, present, and reasonably foreseeable actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. It is possible that an impact that may be SMALL by itself could result in a MODERATE or LARGE cumulative impact when considered in combination with the impacts of other actions on the affected resource. Likewise, if a resource is regionally declining or imperiled, even a SMALL individual impact could be important if it contributes to or accelerates the overall resource decline.

For the purposes of this cumulative analysis, past actions are those before the receipt of the license renewal application. Present actions are those related to the resources at the time of current operation of the power plant, and future actions are those that are reasonably foreseeable through the end of plant operation including the period of extended operation. Therefore, the analysis considers potential impacts through the end of the current license terms as well as the 20-year renewal license term. The geographic area over which past, present, and reasonably foreseeable actions would occur is dependent on the type of action considered and is described below for each resource area.

The staff describes the incremental impacts of the proposed action (i.e., STP license renewal) in Sections 4.1-4.9 of this SEIS. To evaluate cumulative impacts, the incremental impacts of the proposed action are combined with other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person who undertakes such actions. The staff used the information provided in the ER; responses to requests for additional information; information from other Federal, State, and local agencies; scoping comments; and information gathered during the audit at the STP site to identify other past, present, and reasonably foreseeable actions. To be considered in the cumulative analysis, the staff determined if the project would occur within the noted geographic areas of interest and within the period of extended operation, if it was reasonably foreseeable, and if there would be potential overlapping effect with the proposed project. For past actions, consideration within the cumulative impacts assessment is resource and project specific. In general, the effects of past actions are included in the description of the affected environment in Chapter 2, which serves as the baseline for the cumulative impacts analysis. However, past actions that continue to have an overlapping effect on a resource potentially affected by the proposed action are considered in the cumulative analysis.

Other actions and projects were identified during this review and considered in the staff's independent analysis of the potential cumulative effects. Examples of other actions and projects that were considered in this analysis include the following:

- proposed STP, Units 3 and 4,
- White Stallion Energy Center (WSEC),
- LCRA–San Antonio Water System (SAWS) Project,
- Mary Rhodes Pipeline Phase II, and
- Brazos Bend State Park, Mad Island Marsh Preserve, Mad Island Wildlife Management Area, Big Boggy National Wildlife Refuge, and the Texas Prairie Wetland Project.

The complete description of each of the projects and actions that were considered are listed in the discussions of the following sections.

4.11.1 Land Use

As discussed in Section 4.1 of this SEIS, onsite land use and powerline right-of-way conditions are expected to remain unchanged during the license renewal term for STP. Therefore, cumulative impacts of land use are SMALL.

4.11.2 Air Quality

This section addresses the direct and indirect effects of license renewal on air quality resources when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The geographic area considered in the cumulative air quality analysis is the county of the proposed action because air quality designations for criteria air pollutants are generally made at the county level. Counties are further grouped together based on a common air shed—known as an air quality control region (AQCR)—to provide for the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). The STP site is located in Matagorda County, Texas, which is part of the Metropolitan Houston-Galveston Intrastate AQCR (40 CFR 81.38). Additional counties in this AQCR include Austin, Brazoria, Chambers, Colorado, Fort Bend, Galveston, Harris, Liberty, Montgomery, Walker, Waller, and Wharton Counties.

Section 2.2.2 summarizes the air quality designation status for Matagorda County as well as other counties in the Metropolitan Houston-Galveston Intrastate AQCR. As noted in Section 2.2.2, EPA regulates six criteria pollutants under the NAAQS. These pollutants are carbon monoxide, lead, nitrogen dioxide, ozone, sulfur dioxide, and particulate matter. Matagorda County is designated as unclassified or in attainment for all NAAQS criteria pollutants. All other counties in this AQCR are designated as unclassified or in attainment with respect to the NAAQS criteria pollutants, except Brazoria County, which is classified nonattainment/severe relative to the 8-hour ozone standard.

Criteria pollutant air emissions from the STP site are presented in Section 2.2.2.1. These emissions are principally from standby diesel generators and conform to Texas State air emission requirements in 30 TAC 101.10 (Texas Administrative Code). Continued operations of the STP site would result in annual air emissions comparable to those noted in Section 2.2.2.1. Assuming an average annual emission rate of 58.62 tons per year of total emissions from all sources, an additional 20 years of operation would result in approximately 1,172.4 tons (1,066.9 metric tons) of total emissions from all sources. There is no planned site refurbishment associated with license renewal; therefore, there are no additional air emissions beyond those noted in Section 2.2.2.1 for normal operations.

Foreseeable projects that could contribute meaningfully to cumulative impacts to air quality include the construction and operation of STP, Units 3 and 4, and the construction and operation of the WSEC, a 1,320 mW coal and petroleum coke plant located about 5 mi (8 km) northeast of the STP site (MCEDC 2011).

In September 2007, STPNOC submitted COL applications to the NRC for two new nuclear units on the STP site. If approved, STPNOC would construct the new units adjacent to the currently operating Units 1 and 2. Construction activities would cause some localized temporary air-quality effects because of emissions and fugitive dust from operation of the earth-moving and material-handling equipment. Emissions from workers' vehicles and motorized construction equipment exhaust would be temporary. NRC assumed that construction crews would use dust-control practices to control and reduce fugitive dust. STPNOC proposed such activities during construction of proposed Units 3 and 4 (STPNOC 2010b). Section 111.145 of TCEQ's regulations requires dust suppression control during the construction of facilities and parking lots. Construction activities and their effect on air quality will be similar for the WSEC coal plant. It is unlikely that construction of the two projects would overlap because WSEC is scheduled to begin construction in 2012, 2 years earlier than the proposed construction of proposed Units 3 and 4.

During operations, two new nuclear plants would have similar air emissions, primarily from backup diesel generators, to those of existing STP, Units 1 and 2. Because air emissions would be similar for the new nuclear plants, the NRC expects similar air permitting conditions and regulatory requirements as that for Units 1 and 2. In STPNOC's ER for Units 3 and 4, STPNOC stated that "[a]ir emissions sources would be managed in accordance with Federal, Texas, and local air quality control laws and regulations." Likewise, NRC assumes that the WSEC facility would be operated in accordance with Federal, Texas, and local air quality control laws and regulations. Effluents from power plants such as the WSEC are typically released through stacks and with significant vertical velocity. Section 8.3.1 of this SEIS characterizes the impacts for the emissions from similar plants as being clearly noticeable, but given existing regulatory regimens, permit requirements, and emissions controls, the coal-fired plant would not destabilize air quality.

Potential cumulative effects of global climate change (GCC) and increases in average annual temperatures, higher probabilities of extreme heat events, higher occurrences of extreme rainfall (intense rainfall or drought), and changes in the wind patterns could affect concentrations of the air pollutants and their long-range transport because their formation partially depends on the temperature and humidity and is a result of the interactions between hourly changes in the physical and dynamic properties of the atmosphere, atmospheric circulation features, wind, topography, and energy use (IPCC 2010).

The NRC staff examined the cumulative effects of the continued operation of STP, Units 1 and 2, the construction and operation of STP, Units 3 and 4, and the construction and operation of the WSEC coal plant. The cumulative impacts on criteria pollutants from emissions of effluents from the STP site and the WSEC would be noticeable, principally as a result of the contribution of WSEC, but not destabilizing. The NRC staff concludes that cumulative impacts from other past, present, and reasonably foreseeable future actions on air quality resources in the geographic areas of interest would be MODERATE. The incremental contribution of impacts on air quality resources associated with STP license renewal would be SMALL, as described in Section 4.2.

4.11.3 Water Resources

This section addresses the direct and indirect effects of license renewal on water resources when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. As described in Sections 4.3 and 4.4, the incremental impacts on water resources from continued operations during the proposed license renewal term would be SMALL. This analysis considers three geographic areas of interest. For the lower Colorado River, the geographic area of interest is the drainage basin of the Colorado River and Matagorda Bay in Region K. For the Shallow Chicot Aquifer, which could be affected by seepage and spills, the geographic area of interest extends from recharge areas in Matagorda County to downgradient discharge areas along the Colorado River. For the Deep Chicot Aquifer, the geographic area of interest extends from recharge areas in Wharton County to Matagorda Bay.

The Colorado River and Chicot aquifers are hydraulically connected. As such, this review focused on the projects and activities that would use groundwater or could affect the Chicot aquifers beneath the STP site or would withdraw or discharge water to the Colorado River within their respective geographic areas.

4.11.3.1 Cumulative Impacts on Surface Water Resources

In addition to continued operation of STP, Units 1 and 2, the NRC staff identified several other past, present, and foreseeable projects (NRC 2011b). These projects include the proposed STP, Units 3 and 4, the WSEC, the LCRA–SAWS Project, and the Mary Rhodes Pipeline Phase II Project, in addition to the existing water use for municipal, irrigation, industrial, and instream uses. NRC and USACE (2011b) also considered potential effects of GCC on water supply in Region K, in which STP, Units 1 and 2, is located.

The projected average long-term consumptive surface-water use of proposed STP, Units 3 and 4, would be 37,430 ac-ft/yr (46.2 million m^3/yr) at 100 percent load factor (NRC 2011b). The projected consumptive use for STP, Units 3 and 4, is 2.8 and 2.9 percent of the water available to Region K in 2010 and 2060, respectively. Because the incremental water use of proposed STP, Units 3 and 4, is a small percentage of the water available to the region and would not require additional allocation over the current water right held by STPNOC, the NRC staff concludes that the incremental impact of water use for STP, Units 3 and 4, on the Colorado River would be minimal.

Although its future is uncertain because of continuing legal action, a water-sharing project between the LCRA and the SAWS, involving Regions K and L, could affect water resources in the region. An off-channel storage reservoir in Wharton County is proposed. The planned project would provide 377,000 ac-ft/yr (465 million m^3/yr) of water to Regions K and L, and Region L would receive 150,000 ac-ft/yr (185 million m^3/yr) from Region K starting in the 2020 decade (NRC 2011b). The LCRWPG has considered the effects of the LCRA–SAWS Project while estimating the water availability in its 2011 Region Water Plan (LCRWPG 2010).

The WSEC is a 1,320-MW power plant, proposed to be located in Matagorda County near Farm-to-Market (FM) Road 2668, 1 mi (1.6 km) south of the Port of Bay City, approximately 5 mi (8 km) northeast of the STP site. On October 13, 2008, proponents for WSEC applied to LCRA for a new firm water supply of 22,000 ac-ft/yr (27 million m^3/yr), with the total diversion from the Colorado River estimated at 29,750 ac-ft/yr (37 million m^3/yr), accounting for delivery losses (NRC 2011b). The total WSEC withdrawal would be 2.2 and 2.3 percent of the water available to the region in 2010 and 2060, respectively. Because the incremental water withdrawal for WSEC is a small percentage of the water available to the region, the NRC staff concludes that the impact of WSEC withdrawal on the region's water supply would be minimal.

The City of Corpus Christi has a water right amounting to 35,000 ac-ft/yr (43 million m^3/yr) from the Colorado River (NRC 2011b). Water planning of the City of Corpus Christi indicates that the city may start to use its currently unused water rights from the Colorado River by 2020 or sooner, depending on demand (City of Corpus Christi 2011). Although the City of Corpus Christi does not currently use its water rights from the Colorado River, these rights are accounted for in Region K water availability planning. To use its water rights from the Colorado River, the City of Corpus Christi would build Phase II of Mary Rhodes Pipeline from Bay City to Lake Texana to tie into the existing Phase I of the pipeline that delivers water from Lake Texana to the city (NRC 2011b). The City of Corpus Christi water right would represent 2.6 and 2.7 percent of the water available to the region in 2010 and 2060, respectively. Because the incremental water withdrawal by the City of Corpus Christi is a small percentage of the water available to Region K, the NRC staff concludes that the impact of the City of Corpus Christi withdrawal on the region's water supply would be minimal.

Freshwater inflow needs for Matagorda Bay represent the only use of lower Colorado River waters downstream of the STP site (NRC 2011b). The LCRA, TCEQ, Texas Parks and Wildlife Department, and the TWDB estimated Matagorda Bay freshwater inflow needs (LCRA et al. 2006). LCRA et al. (2006) estimated a target for freshwater inflow that would optimize productivity of selected estuarine species and the critical freshwater inflow that would promote repopulation of finfish and shellfish following a dry period. The average target freshwater inflow was established at 118,975 ac-ft/mo (146.7 million m^3/mo) or 1,972 cfs (55 m^3/s). The critical freshwater inflow was established at 36,000 ac-ft/mo (44 million m^3/mo) or 597 cfs (17 m^3/s). Recommendations made in LRCA et al. (2006) with regard to inflow needs continue to be reviewed by the TCEQ, and, if formally established, they could make the cited volume of surface water discharge unavailable for other uses (NRC 2011b).

NRC and USACE (NRC 2011b) considered the U.S. Global Change Research Program's (USGCRP's) most recent compilation of the state of knowledge relative to GCC effects (USGCRP 2009). NRC and USACE reviewed forecasted increases in temperature and decreases in precipitation for the Colorado River watershed reported by USGCRP (2009) and determined that GCC could affect water supply in the Colorado River Basin by reducing surface runoff and increasing evapotranspiration during the period of STP, Units 1 and 2, extended operations. The USGCRP has identified that the region is likely to experience water conflicts by 2025 because of increasing population and potential endangered species' needs

(USGCRP 2009). The NRC and USACE (NRC 2011b) concluded that while the GCC-related changes may not be insignificant nationally or globally, their impact on STP regional water resources would not be destabilizing. Thus, the NRC staff concludes that GCC effects would not substantially add to regional surface water cumulative impacts during the license renewal term for STP, Units 1 and 2.

Historically, the waters of the Colorado River Basin have been extensively used, and the region has surface water planning, allocation, and development systems in place to manage the use of its limited surface water resources. The cumulative impact on surface water use in Region K relative to the unaltered conditions prior to these uses, from past and present diversions and reasonably foreseeable future projects, would noticeably alter but not destabilize the surface water resource. Nevertheless, due to the potential impacts associated with water use conflicts and maintenance of Colorado River flows to Matagorda Bay, the NRC staff concludes that cumulative impacts on surface water resources during the license renewal term would be MODERATE.

4.11.3.2 Cumulative Impacts on Groundwater Resources

Water drawn from the Shallow Chicot Aquifer in the vicinity of the STP site is slightly saline, and, consequently, it is used primarily for livestock watering. Offsite livestock wells are located close to the STP site boundary, and four are located on leased grazing land within the STP site (i.e., between the MCR and the Colorado River) (see Section 2.2.5.1). No groundwater is withdrawn from the Shallow Chicot Aquifer for use by STP, Units 1 and 2. STP operation does result in seepage from the MCR entering the Upper Shallow Aquifer, and the MCR water carries with it the constituents contained in plant cooling water (e.g., tritium, TDS) (NRC 2011b; STPNOC 2010b). Operation of the plant has also resulted in leaks and releases to the Shallow Aquifer within the protected area (e.g., the TDS line leaks and steam condensate discharge) (MACTEC 2009). These releases have not substantially affected the groundwater quality within the STP site, and impacts on groundwater quality off site would be less. Specifically, for the Shallow Chicot Aquifer, tritium levels remain below the EPA primary DWS, and TDS concentrations remain within the range defining a slightly saline groundwater. Because of the reasons presented above, the NRC staff concludes that cumulative impacts on groundwater use and quality during the license renewal term, related to the Shallow Chicot Aquifer, would be SMALL.

In contrast, water drawn from the Deep Chicot Aquifer is of higher quality. Aside from the existing STP-owned groundwater wells completed in the Deep Chicot Aquifer that supply STP, Units 1 and 2, the closest wells to the STP site completed in the Deep Chicot Aquifer are the public water supply wells in the communities of Selkirk and Exotic Isle, which are located adjacent to the STP site eastern boundary (see Section 2.2.5). Wells for these communities are approximately 1 mi (1.6 km) from the nearest STP production well and 3.75 mi (6 km) from STP, Units 1 and 2. Review of other existing or planned projects in the surrounding area indicates groundwater use by Equistar Chemicals LP's Matagorda facility, the OXEA Corporation Bay City Plant, and the municipal water supply for Bay City. The shortest distance from this group of facilities to STP is approximately 5 mi (8 km) (NRC 2011b).

Groundwater used at STP, Units 1 and 2, is from the Deep Chicot Aquifer. Public water supplies and other large-scale industrial users also draw from this aquifer. As noted in Section 4.4.2.1, there has been a regional drawdown in the Deep Aquifer in the vicinity of the STP site. By 1980, a regional drawdown of approximately 35 ft (11 m) was attributed to groundwater development to the north of the STP site (STPNOC 2009a). Proposed STP, Units 3 and 4, would also use the groundwater from the production wells at the STP site.

Groundwater use by STP, Units 1 and 2, is 768 gpm (2,910 L/min) for normal operations (see Section 2.1.7.2). Groundwater use by the proposed STP, Units 3 and 4, is 975 gpm (3,690 L/min) for normal operations. These rates represent 2.4 and 3.1 percent, respectively, of the annual rate of groundwater use permitted by the CPGCD in Matagorda County during the 2008 to 2010 permit period (NRC 2011b). Based on the best available information, other than the proposed STP, Units 3 and 4, there are no other foreseeable nearby new projects with a substantial demand for groundwater. The aquifer drawdown projections from STP well pumping for selected distances are shown in Table 4–6 and discussed in Section 4.4.2.1. Potential impacts of drawdown from STP operations on other groundwater users, and from other users' pumping on STP, would be minimal because the Deep Chicot Aquifer remains confined, and changes in pumping lift over the 20-year renewal period would not be substantial.

Because of higher groundwater use in the past, subsidence has been an issue in the STP region. The USGS (Ryder and Ardis 2002) has described subsidence in Matagorda County as less than 1 ft (0.3 m) since 1900 over most of the region, with somewhat higher subsidence of 1.5 ft (0.46 m) noted in western Matagorda County. STPNOC has observed a subsidence rate of less than 0.1 in. (0.25 cm) to about 0.2 in. (0.50 cm) per year during construction and through STP, Units 1 and 2, operations in 1993 (STPNOC 2008b). The updated final safety analysis report (UFSAR) for STP, Units 1 and 2, projected regional subsidence from 1973 through 2020 to be between 2.5 and 3 ft (0.76 and 0.9 m) based on a projected regional groundwater decline of 87 ft (26.5 m) and subsidence coefficients derived from regional observations (STPNOC 2009c). To minimize the potential for subsidence, STPNOC spaced its main production wells (i.e., wells 5, 6, and 7) over 5,000 ft (1,520 m) apart and distributes the pumping rates among them. All groundwater users in Matagorda County operate their wells under the rules of the CPGCD (2009). The purpose of the CPGCD is to provide for conserving, preserving, protecting, and recharging the groundwater to control subsidence and prevent the waste and pollution of the groundwater resource. Groundwater use under the rules of the CPGCD minimizes the potential for excessive drawdown, saltwater intrusion, or land subsidence impacts to arise and affect neighboring groundwater users (CPGCD 2009). Current observations of drawdown are consistent with the drawdown projected in the UFSAR for STP, Units 1 and 2, and subsidence projections are consistent with observations. These potential impacts are greatest on site where they are monitored. As noted in Section 4.3.2.1, drawdown at STP production wells is currently in equilibrium with the surrounding groundwater aquifer, and continued operation of STP wells for an additional 20 years beyond the current license would increase drawdown by less than 1 ft (0.3 m). Additional subsidence resulting from this change in drawdown during the license renewal term would be minimal.

Operation of STP, Units 1 and 2, does not adversely affect groundwater quality in the Deep Chicot Aquifer because of the low-conductivity layer between 100 and 150 ft (30 and 46 m) thick that separates and isolates the Shallow Chicot Aquifer from the Deep Chicot Aquifer. Similarly, because of the hydraulic isolation of the Deep Chicot Aquifer from the Shallow Chicot Aquifer and any releases at the land surface, other nearby groundwater users are also not adversely affecting groundwater quality in the Deep Chicot Aquifer. Groundwater drawdown at the STP production wells is great enough to reverse the regional gradient and draw groundwater in the Deep Chicot Aquifer from beneath the STP site into the production wells. Thus, if any releases from the plant were to move from the Shallow to the Deep Chicot Aquifer, the contamination would likely be drawn to and intercepted by STP groundwater production wells (NRC 2011b).

With regard to the Deep Chicot Aquifer, because of the reasons presented above, the NRC staff concludes that cumulative impacts on groundwater use and quality during the license renewal term would be SMALL.

4.11.4 Aquatic Resources

This section addresses the direct and indirect effects of license renewal on aquatic resources when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The geographic area considered in this analysis includes the STP site and the portion of the lower Colorado River basin within influence of STP operations, including Matagorda Bay.

The benchmark for assessing cumulative impacts on aquatic resources takes into account the preoperational environment, as recommended by EPA (1999) for its review of NEPA documents:

> Designating existing environmental conditions as a benchmark may focus the environmental impact assessment too narrowly, overlooking cumulative impacts of past and present actions or limiting assessment to the proposed action and future actions. For example, if the current environmental condition were to serve as the condition for assessing the impacts of relicensing a dam, the analysis would only identify the marginal environmental changes between the continued operation of the dam and the existing degraded state of the environment. In this hypothetical case, the affected environment has been seriously degraded for more than 50 years with accompanying declines in flows, reductions in fish stocks, habitat loss, and disruption of hydrologic functions. If the assessment took into account the full extent of continued impacts, the significance of the continued operation would more accurately express the state of the environment and thereby better predict the consequences of relicensing the dam.

Sections 2.2.5 and 2.2.7 of this SEIS present an overview of the history and factors that led to the current condition of the aquatic features on the STP site, the Colorado River, and Matagorda Bay. Since the 1920s, development and redirection of the lower Colorado River has affected the water quality, water chemistry, and aquatic resources. These alterations have increased the freshwater input to Matagorda Bay and marine and estuarine inputs to the lower Colorado River, resulting in a change in salinity. Anthropogenic activities has decreased available habitat for some species and increased available habitat for others. For example, construction and development projects have reduced the area available for aquatic organisms to navigate through the Colorado River and Matagorda Bay due to erosion, habitat modification, and habitat fragmentation. Overall, species richness and diversity have increased in the lower Colorado River near STP (from the GIWW to navigation mile marker 8) based on surveys in 2007 to 2008 compared to similar surveys in 1983 to 1984 (ENSR 2008b; NRC 1986, 2011b; STPNOC 2010b). The change in the aquatic community could be due to differences in study methods (e.g., differences in sampling protocol over time), environmental conditions (e.g., variance in weather conditions during the two sampling efforts), or from human activities (e.g., the river diversion projects that has increased the marine and estuarine flow into the lower Colorado River).

Many natural and anthropogenic activities can influence the current and future aquatic biota in the area surrounding STP. Potential biological stressors include continued entrainment, impingement, and potential heat shock from STP, Units 1 and 2 (if the license renewal is granted), as described in Section 4.5, construction and operation of STP, Units 3 and 4, other water use projects, urbanization, fishing, and GCC, as described below.

Construction and Operations of STP, Units 3 and 4. In 2007, STPNOC submitted an application to the NRC to construct and operate two additional nuclear reactors on the STP site, referred to in this SEIS as STP, Units 3 and 4. In 2011, NRC published its final EIS evaluating the environmental impacts of the proposed construction and operations of Units 3 and 4 (NRC 2011b). This project would have overlapping impacts with the continued operations of

Units 1 and 2. For example, all four units would draw water from the MCR, which need to be filled higher than current levels (STPNOC 2010c). STPNOC would draw the additional makeup water from the Colorado River through the RMPF. Species impinged and entrained would be similar to those impinged and entrained during operations of Units 1 and 2. Past impingement and entrainment studies and NRC evaluations of such studies concluded that impacts to the important species would be insignificant and minor, primarily because the density of organisms in the vicinity is rather low and the species are ubiquitous in the region (McAden 1984, 1985; NRC 1986, 2011b). Additionally, the design and operation of the RMPF minimize impacts on aquatic biota, as described in Section 4.5.2. Therefore, impacts from operation of the RMPF (impingement, entrainment, and entrapment) for four units are unlikely to destabilize aquatic resources in the lower Colorado River.

Operation of the four units would also affect aquatic resources in the MCR. Higher intake levels to provide cooling water for four units would increase impingement and entrainment at the CWISs in the MCR. The two discharges from the four units would increase the water temperature in the MCR. Aquatic organisms in the MCR would either avoid or acclimate to the new conditions. Because the aquatic community in the MCR is isolated from the onsite water bodies and the Colorado River, these impacts would not noticeably alter the aquatic resources within the geographic area of interest.

Operation of two additional units would increase the frequency and duration of discharges from the MCR into the Colorado River. STPNOC would manage discharges, as needed, based on water quality in the MCR and TPDES permit conditions (STPNOC 2010b). Chemical releases from discharging into the Colorado River are expected to be below the criteria for protection of aquatic life (TCEQ 2005). NRC (2011b) determined that under certain conditions, such as poor river water quality, the size and configuration of the thermal plume could impede passage of the aquatic organisms in the Colorado River, including species that are of commercial and recreational importance and species that are Federally managed and have designated essential fish habitat. NRC (2011b) concluded that the foraging behavior and high fecundity of such aquatic organisms suggest that the effects from the thermal plume would not noticeably alter or destabilize the populations or aquatic community in the lower Colorado River.

NRC (2011b) concluded that the impacts to aquatic resources from other construction and operational activities of all four units would not noticeably alter or destabilize aquatic resources. These impacts include additional seepage from the MCR that could influence flow to Little Robbins Slough and wetlands, increased non-permeable surfaces (e.g., parking lots and buildings) that would change the flow of stormwater into the drainages on site, maintenance dredging in the Colorado River, shoreline restoration activities along the Colorado River, and disturbances from vessel traffic to marine mammals (NRC 2011b).

<u>Other Water Use Projects</u>. Future projects near STP that would withdraw or redirect significant quantities of the Colorado River include the proposed LCRA–SAWS Project, WSEC, and municipal use (TWDB 2006; WSEC 2011).

The LCRA–SAWS Project is projected to generate 150,000 ac-ft of new water supplies by 2060 through conjunctive use of groundwater from the Gulf Coast Aquifer and surface water supplies from the Colorado River (TWDB 2006). LCRA–SAWS (2009) will evaluate impacts to aquatic habitat in the Colorado River with and without the proposed project. WSEC, a proposed coal-fired generating plant, would withdraw approximately 22,000 ac-ft per year of water from the lower Colorado River (WSEC 2011). LCRA included water use from WSEC growth in its water supply resource plan for Region K, Matagorda County. Other sources of water use included in water supply estimates include increases in municipal use due to population, manufacturing, mining, irrigation, transfer of water via the proposed Mary Rhodes Pipeline II, and other categories (TWBD 2006). From 2010 to 2040, the plan estimates an annual increase of 12 percent without the WSEC Project and 80 percent with the WSEC Project (LCRA 2008).

These projects have the potential to change the freshwater contribution in the river within the vicinity of STP by redirecting the flow or by withdrawing a significant amount of freshwater. Changes in flow of saltwater into the river could change the habitat (or salinity) for many species. In response, estuarine-marine species would likely become more abundant if the salinity increases whereas freshwater species would likely become more abundant if the salinity decreases. The Colorado River diversion project, which increased the flow between the Colorado River and Matagorda Bay, resulting in an increase in salinity near the STP site, likely influenced the shift in aquatic communities near STP towards estuarine-marine species (ENSR 2008b; NRC 1975, 1986, 2011b).

Urbanization and Development. Residential or industrial development in the vicinity of STP site can affect aquatic resources. Increased urbanization and population growth, while projected to be low in comparison to other locations in Texas (NRC 2011b), would still lead to increased development along the shores of the Colorado River that can contribute to cumulative impacts in the lower Colorado River basin through habitat loss and nonpoint source pollution. Future activities could lead to increased water needs, nonpoint and point source water pollution, vessel traffic on the waterways, and maintenance dredging.

Proposed future power generation facilities to support increased energy usage, including WSEC and the Victoria County Station, may require the development of new transmission systems in the geographic area of interest. The WSEC may be required to add additional transmission capabilities within the vicinity for its power transmission, but that information is currently not available to evaluate (WSEC 2011). If WSEC or Victoria County Station build new transmission corridors, they would likely have a minor effect on aquatic species assuming the owners consider aquatic resource when routing transmission lines and employ best management practices (BMPs) during construction and maintenance activities.

STPNOC would use existing transmission corridors to support power transmission from proposed Units 3 and 4 and during the period of extended operations for Units 1 and 2. STPNOC (2010b, 2010c) would employ vegetation maintenance and control along existing and future corridors, which would not be expected to increase and contribute to cumulative effects (NRC 2011b).

Fishing. Commercial and recreational fishing in the Colorado River and Matagorda Bay would likely continue to increase in the future. The region is recognized for recreational fishing of many species, and fishing would likely increase with increased urbanization in the vicinity. Matagorda Bay is one of the recognized regions in Texas for commercial fishing, primarily associated with the shrimp industry (TPWD 2002), although these fisheries are not significant contributors to employment in the region (NRC 2011b). In efforts to improve the fisheries in the area, TPWD has designated the “most eastern half of the eastern arm of Matagorda Bay” as a finfish and shellfish nursery, closing the area to commercial fishing and commercial harvesting of oysters (LCRA et al. 2006). A freshwater inflow needs study for Matagorda Bay has identified several alternatives associated with water management strategies designed to improve commercial fishing opportunities (LCRA et al. 2006). If management strategies do not improve sustainability of fisheries, increased fishing pressures could result in overall decreased biological productivity for the Colorado River and Matagorda Bay.

Climate Change. In addition to direct anthropogenic activities, GCC could impose additional stressors on aquatic communities. The presence of natural environmental stressors (e.g., short-or long-term changes in precipitation or temperature) would contribute to the cumulative environmental impacts to the Colorado River and Matagorda Bay. GCC could lead to decreased precipitation, increased sea levels, varying freshwater inflow, increased temperatures, increased storm surges, greater intensity of coastal storms, and increased nonpoint source pollution from runoff during these storms (GCRP 2009; Montagna et al. 1995; Nielsen-Gammon 1995). Such changes could directly affect habitat for aquatic communities by altering the flow of freshwater, water quality, salinity, and dissolved oxygen levels. Habitat alterations could result in changes to community structure, species abundance, and species diversity. These kinds of changes occurred in the vicinity of STP with the diversion of the Colorado River into the Gulf and Matagorda Bay since the 1920s (NRC 2011b).

GCC could also slow efforts to restore nursery habitats in Matagorda Bay. The Colorado River diversion project increased the flow of freshwater into the bay in an effort to improve habitat for wetlands, oyster reefs, and other nursery grounds (USACE 2009). However, LCRA et al. (2006) indicated slower than expected results and showed that more freshwater inflow into the bay is needed to increase biological productivity in the bay. The effects of rising sea level, which would increase salinity in the bay, would likely be counterproductive to the current efforts to increase freshwater flows into the Bay. Changes in water quality in Matagorda Bay and the lower Colorado River could create areas that are hypoxic (low in dissolved oxygen) and lead to further stress on aquatic communities (Montagna et al. 1995). These stressors would result in shifts in species ranges, habitats, and migratory behaviors and also alter ecosystem processes (GCRP 2009).

<u>Conclusion</u>. Past, present and reasonably foreseeable future activities exist in the geographic area of interest that could contribute to cumulative effects to aquatic ecological resources. Future development of industries that compete for water in the Colorado River, such as WSEC, as well as management of water budgets across the State of Texas through diversion projects like the LCRA–SAWS Project and the Mary Rhodes Pipeline Phase II Project, would likely affect aquatic resources in the lower Colorado River. Such actions in combination with other direct and indirect anthropogenic and natural environmental stressors, including GCC, would cumulatively lead to effects on the aquatic communities that would noticeably alter important attributes such as species range, habitat availability, ecosystem processes, migratory corridors and behavior, species diversity, and species abundance. The NRC staff concludes that cumulative impacts from past, present, and reasonably foreseeable actions to aquatic resources in the geographic area of interest would be MODERATE. The incremental impact from continued operations of Units 1 and 2 during the period of extended operation would be SMALL.

4.11.5 Terrestrial Resources

<u>Historic Conditions</u>. Section 2.6 discusses the ecoregion in which the STP site lies—the Western Gulf Coastal Plain—which is dominated by tallgrass and shortgrass prairie. Historically, these prairies covered about 6.5 million ac (2.6 million ha) within Texas. During the past century, urban and industrial development and agricultural expansions have fragmented the natural habitat. In the late 1800s, ranchers introduced large numbers of cattle to the region. Livestock grazing continues to be a major land use, but the majority of land has been altered for cultivation of rice, sugarcane, forage, and grain. By the 1980s, Diamond and Smeins (1984) estimated that less than one percent of Texas's native coastal prairie grasslands remained in a relatively pristine state.

The Texas Gulf coasts historically contained abundant and diverse wetlands. Approximately 30 percent of the coastal prairies along the Texas Gulf coasts were once wetlands (TPWD 2010). Human activities, including landscape alteration for agricultural, industrial, or urban uses, continue to significantly threaten remaining wetland habitats (TPWD 2005). In addition, decreased precipitation, sea-level rise, more frequent high-intensity storm surges, and increased temperatures resulting from GCC have contributed to wetland losses (GCRP 2009). Nonetheless, rice fields, prairie wetlands, and coastal marshes continue to provide important habitat for waterfowl and many other wildlife species. TPWD (2005) identified the Gulf coasts and associated grassland prairies, wetlands, marshes, and agriculture as one of the most important wintering areas for North America's waterfowl populations.

On the immediate site, STPNOC cleared land for, built, and filled the 7,000-ac (2,800-ha) MCR and cleared an additional 300 ac (120 ha) for the facility's buildings, parking lots, roads, and other infrastructure.

In the region surrounding the STP site, construction of many industrial facilities and wastewater treatment plants have resulted in the loss of terrestrial habitat. These facilities include:

- the Formosa Plastics Corporation plant,
- the Texas Liquid Fertilizer Company,
- the Alcoa aluminum plant,
- the Equistar Chemical LP's Matagorda facility, and
- the OXEA Corporation's chemical plant.

Other Projects. Many projects near the STP site could affect the terrestrial environment in the future. These projects are discussed in this section.

Chemicals Inc. has a specialty chemical plant near STP. The plant's 107.5-ac (44-ha) site is located about 5 mi (8 km) south of Bay City (Chemicals Inc. 2011).

About 5 mi (8 km) northeast of the STP site, a 1,200-ac (490-ha) tract of land is the site for the WSEC, a 1,320-net-mW coal and petroleum coke plant (MCEDC 2011). The TCEQ granted the project its air quality permit in September 2010. The status of the facility's wastewater permit is uncertain. Coal-fired plants are a major source of air pollution in the U.S. because they release sulfur dioxide, nitrogen oxides, mercury, carbon dioxide, and particulates. Nitrous oxides and sulfur dioxides combine with water to form acid rain, which can lead to erosion and changes in soil pH levels. Mercury deposits onto soil and surface water, which may then be taken up by terrestrial and aquatic plant or animal species and poses the risk of bioaccumulation.

In September 2007, STPNOC submitted COL applications to the NRC for two new nuclear units on the STP site. If approved, STPNOC would construct the new units adjacent to the currently operating Units 1 and 2. As a result, about 540 ac (220 ha) would be disturbed. Of this, the new reactors, the associated buildings and infrastructure, and a new heavy haul road would occupy 300 ac (120 ha), and the remaining 240 ac (100 ha) would only be temporarily disturbed for temporary buildings, construction equipment storage, and material laydown (NRC 2011b). The majority of land that would be disturbed is currently maintained or mowed grasslands, shrub-scrub habitat, or used for existing industrial activities. The new units would require additional transmission lines to transfer power to the regional electric grid. However, STPNOC would not create any new or expand any existing transmission line corridors (NRC 2011b). In the NRC's EIS regarding the proposed new STP units, the NRC (2011b) concluded that impacts to the terrestrial environment would be SMALL for this proposed action.

Development of the proposed Mary Rhodes Pipeline Phase II Project would likely also contribute to regional habitat loss and fragmentation. Potential cumulative impacts resulting from construction and operation of the proposed water transport line would be similar to those impacts from constructing and maintaining new transmission line corridors and include habitat fragmentation, creation of early successional habitat, and displacement of certain wildlife species.

For projects listed above, construction and operation would impact wildlife by increasing noise and traffic, which could alter behavior or cause a shift in habitat use in undisturbed land bordering construction areas. Birds in the immediate area would be more likely collide with tall structures and construction equipment. However, construction impacts would be short-term and relatively minor. Hence, the impacts would not destabilize the environment.

Urbanization and Habitat Fragmentation. As the region surrounding the STP site becomes more developed, habitat fragmentation will increase. Species that require larger ranges, especially predators, will likely suffer reductions in their populations. In contrast, herbivores will experience less predation pressure, and their populations are likely to increase. Edge species will likely benefit from the fragmentation, while species that require interior forest or swamp habitat will likely suffer. The transmission line corridors established for STP transmission lines represent habitat fragmentation, though many of these corridors pass through cultivated land that has already been converted from its native habitat or shrub-scrub habitat, which was minimally altered during transmission line construction. Habitat fragmentation of surrounding areas may increase the value of the network of wetlands within the Texas Prairie Wetlands Project—110 ac of which is set aside on the STP site—because this land will not experience fragmentation or other human-induced impacts.

Parks and Wildlife Preserves. The FWS and State have set many lands in the STP region aside as parks, preserves, or management areas. These include:

- Brazos Bend State Park,
- Mad Island Marsh Preserve,
- Mad Island Wildlife Management Area,
- Big Boggy National Wildlife Refuge, and
- the Texas Prairie Wetland Project, for which 110 ac (45 ha) on the STP site is set aside.

Section 2.2.6 of this SEIS describes these parks and preserves in more detail. These areas will continue to provide valuable habitat to native wildlife, migratory birds, and native prairie and marsh vegetation. Both the National Wildlife Refuge Network and the Texas Prairie Wetland Project are ongoing efforts. In the future, FWS and Ducks Unlimited will continue to acquire lands for these projects.

Conclusion. The NRC staff examined the cumulative effects of the construction of STP, neighboring energy projects, continued urbanization and habitat fragmentation, and nearby parks and wildlife preserves. The NRC staff concludes that the minimal terrestrial impacts on the continued STP operations would not contribute to the overall decline in the condition of terrestrial resources. The NRC staff believes that the cumulative impacts of other and future actions during the term of license renewal on terrestrial habitat and associated species, when added to past, present, and reasonably foreseeable future actions, would be MODERATE.

4.11.6 Human Health

Radiological Impacts. The radiological dose limits for protection of the public and workers have been developed by the NRC and EPA to address the cumulative impact of acute and long-term exposure to radiation and radioactive material. These dose limits are codified in 10 CFR Part 20 and 40 CFR Part 190. For the purpose of this analysis, the area within a 50-mi (80.4-km) radius of STP was included. The REMP conducted by STPNOC in the vicinity of the STP site measures radiation and radioactive materials from all sources (i.e., hospitals and other licensed users of radioactive material); therefore, the monitoring program measures cumulative radiological impacts. Within the 50-mi (80-km) radius of the STP site, there are currently no other nuclear power reactors or uranium fuel cycle facilities.

Radioactive effluent and environmental monitoring data for the 5-year period from 2006 to 2010 were reviewed as part of the cumulative impacts assessment. In Section 4.8.1 of this SEIS, the NRC staff concluded that impacts of radiation exposure to the public and workers (occupational) from operation of STP during the renewal term are SMALL. The NRC and the State of Texas would regulate any future actions in the vicinity of the STP site that could contribute to cumulative radiological impacts.

As stated in its ER, the applicant stores its spent nuclear fuel in its spent fuel pool. The applicant estimates that there is adequate capacity in its spent fuel pool to store spent fuel until 2025. For reactor operations past that date, STPNOC plans to install a dry fuel storage system at the STP site for the storage of its spent fuel. The installation and monitoring of this facility will be governed by NRC requirements in 10 CFR Part 72, “Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste.” Radiation from this projected storage facility as well as from the operation of STP, Units 1 and 2, are required to be within the radiation dose limits in 10 CFR Part 20, 40 CFR Part 190, and 10 CFR Part 72. The NRC performs periodic inspections of every licensed dry fuel storage facility to verify its compliance with all licensing and regulatory requirements. Currently, the applicant has not submitted an application to the NRC for the dry fuel storage system, so no further information is available.

In September 2007, STPNOC applied to the NRC for a COL pursuant to the requirements of 10 CFR Part 52 for the construction and operation of two additional reactors at the STP site. STPNOC submitted information on the site and surrounding area to NRC in its application for the COL. The NRC reviewed the COL application and issued the final EIS (NRC 2011b), which analyzed the impacts on the surrounding communities and natural resources to determine if the STP site is suitable to support two additional reactor units (proposed Units 3 and 4). The NRC also evaluated the cumulative impacts of the operation of four reactor units and considered the possible life extension of STP, Units 1 and 2, for 20 years. In the final EIS, the NRC staff concludes that cumulative radiological impacts would be SMALL.

In addition, pursuant to 10 CFR Part 20 and 40 CFR Part 190, the cumulative radiological impacts from STP, Units 1 and 2, the possible projected dry fuel storage system, and two additional reactor units are required to meet the acceptable radiation dose limits (protecting human health) specified in these regulations. EPA regulation (40 CFR 190) limits the total dose to an offsite individual near STP from “all uranium fuel cycle facilities and all pathways,” located at STP. Furthermore, the STP REMP would monitor the buildup of radioactivity in the environment to effectively ensure that the levels remain acceptable. Based on this information, the staff concludes that cumulative radiological impacts would be SMALL.

<u>Electromagnetic Fields Impacts</u>. For electromagnetic fields impacts on human health, the staff determined that not all of the STP transmission lines are operating within design specifications and meet current NESC criteria. In Section 4.8.4, the NRC staff determined that the potential impacts from STP transmission lines were SMALL to MODERATE. However, STP addressed the issue of acute shock by providing the staff with potential actions it is considering to mitigate

the impacts. Therefore, the staff concludes that the transmission lines are not expected to significantly affect the overall potential for electric shock from induced currents within the analyzed area of interest.

With respect to the effects of chronic exposure to ELF-EMF, as discussed in Section 4.8.5, the GEIS finding of “uncertain” is appropriate to STP.

For the reasons listed above, the staff concludes that the cumulative impacts of continued operation of the STP transmission lines and other transmission lines in the affected area would be SMALL to MODERATE.

Microorganisms Impacts. In the environmental review for the proposed Units 3 and 4, the NRC staff determined that other projects (e.g., the Mary Rhodes Pipeline Phase II Project) would use or divert river water upstream of STP. These projects, depending on the magnitude and without mitigation measures, could reduce freshwater river flow and increase the ambient river water temperature (Neuces River Authority 2001; TWDB 2006b; WSEC 2009). Therefore, this cumulative effect on Colorado River conditions could be favorable for an increased presence of thermophilic microorganisms and, subsequently, increase the risk of public exposure to potential harmful microorganisms (thermophilic). However, based on past data on waterborne diseases from recreational water activities in Texas and the discharging limits on STP, cumulative impacts to human health due to exposure to microorganisms in the Colorado River would likely be minimal (CDC 2009; TDSHS 2010). Hence, the staff concludes that cumulative impacts to human health due to exposure to microorganisms in the Colorado River would be SMALL.

4.11.7 Socioeconomics

This section addresses socioeconomic factors that have the potential to be directly or indirectly affected by changes in operations at STP in addition to the aggregate effects of other past, present, and reasonably foreseeable future actions. The primary geographic area of interest considered in this cumulative analysis is Brazoria and Matagorda Counties, where approximately 84 percent of STP employees reside (see Table 2–12). This is where the economy, tax base, and infrastructure would most likely be affected since STP workers and their families reside, spend their income, and use their benefits within these counties.

As discussed in Section 4.9 of this SEIS, continued operation of STP during the license renewal term would have no impact on socioeconomic conditions in the region beyond those already experienced. Since STPNOC has no plans to hire additional workers during the license renewal term, overall expenditures and employment levels at STP would remain relatively constant with no additional demand for permanent housing and public services. In addition, since employment levels and tax payments would not change, there would be no population or tax revenue-related land use impacts. Based on this information and other information presented in Chapter 4 of this SEIS, there would be no additional contributory effect on socioeconomic conditions in the future from the continued operation of STP during the license renewal term beyond what is currently being experienced.

Environmental Justice. The environmental justice cumulative impact analysis assesses the potential for disproportionately high and adverse human health and environmental effects on minority and low-income populations that could result from past, present, and reasonably foreseeable future actions including STP operations during the renewal term. Adverse health effects are measured in terms of the risk and rate of fatal or nonfatal adverse impacts on human health. Disproportionately high and adverse human health effects occur when the risk or rate of exposure to an environmental hazard for a minority or low-income population is significant and exceeds the risk or exposure rate for the general population or for another appropriate comparison group. Disproportionately high environmental effects refer to impacts or risk of impact on the natural or physical environment in a minority or low-income community that are significant and appreciably exceed the environmental impact on the larger community. Such effects may include biological, cultural, economic, or social impacts. Some of these potential effects have been identified in resource areas presented in Chapter 4 of this SEIS. Minority and low-income populations are subsets of the general public residing in the area, and all would be exposed to the same hazards generated from STP operations.

Based on the information discussed in this section, and the analysis of human health and environmental impacts presented in Chapters 4 and 5, it is unlikely there would be any disproportionately high and adverse contributory effect on minority and low-income populations from the continued operation of STP and other reasonably foreseeable future actions during the license renewal term.

4.11.8 Historic and Archaeological Resources

This section addresses the direct and indirect effects of license renewal on historic and cultural resources when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The geographic area considered in this analysis is the APE associated with the proposed undertaking, as described in Section 2.2.9.

Before construction of STP, the area was largely undisturbed and contained archaeological sites. In the early 1970s, the Texas Archaeological Survey conducted cultural resources investigations of the STP site and surrounding area. The investigations included a literature review, a pedestrian survey, and limited subsurface testing (NRC 2011b; STPNOC 2010b, 2010c). The construction of STP was completed in the 1980s, and much of the site had been heavily disturbed by construction activities including the construction of the MCR. Section 2.2.10 presents an overview of the existing historic and archaeological resources located on the STP site. As described in Section 4.9.6, no cultural resources would be affected by relicensing activities associated with the STP site.

Past land development has resulted in impacts on, and the loss of cultural resources near and at, the STP site. The impacts from other past, present, and reasonably foreseeable projects were reviewed to analyze overlapping impacts that might affect cultural resources. Direct impacts would occur if archaeological sites in the APE are physically removed or disturbed. The following projects are located within the geographic area considered for cumulative impacts:

- construction and operation of STP, Units 3 and 4,
- transmission lines, and
- future urbanization.

Construction and operation of STP, Units 3 and 4, transmission lines, and future urbanization have the potential to result in impacts on cultural resources through inadvertent discovery during ground-disturbing activities. However, based on the best available information, there are no known historic or archaeological resources on the STP site. In addition, STPNOC has environmental compliance procedures in place for cultural resource protection and inadvertent discovery and has stated the construction and operation activities would not affect the unrecorded gravesite on the STP site (STPNOC 2011g). Future urbanization near STP would be required to comply with applicable State and Federal laws regarding protection of cultural and archaeological resources, and any impacts would be mitigated accordingly.

Based on this information, the NRC staff finds that the continued operation of STP during the license renewal term would not incrementally contribute to cumulative impacts on historic and archaeological resources within STP and in the surrounding area. Therefore, the cumulative impacts on historic and archaeological resources during the license renewal term would be SMALL.

4.11.9 Summary of Cumulative Impacts

The staff considered the potential impacts resulting from the operation of STP during the period of extended operation and other past, present, and reasonably foreseeable future actions near STP. The preliminary determination is that the potential cumulative impacts would range from SMALL to MODERATE, depending on the resource. Table 4–17 summarizes the cumulative impacts on resources areas.

Table 4–17. Summary of Cumulative Impacts on Resource Areas

Resource Area	Cumulative Impact
Air quality	The NRC staff examined the cumulative effects of the continued operation of STP, Units 1 and 2, the construction and operation of STP, Units 3 and 4, and the construction and operation of the nearby WSEC coal plant. The cumulative impacts on criteria pollutants from emissions of effluents from the STP site and the WSEC would be noticeable (but not destabilizing), principally as a result of the contribution of WSEC. In addition, cumulative effects of GCC would contribute to the degradation of air quality resources in the geographic areas of interest (i.e., AQCR). For these reasons, the cumulative impacts on air quality during the license renewal term would be MODERATE.
Water resources	Waters of the Colorado River Basin have been extensively used, and the region has surface water planning, allocation, and development systems in place to manage the use of its limited surface water resources. Nevertheless, because of the potential impacts associated with water use conflicts and maintenance of Colorado River flows to Matagorda Bay, the cumulative impacts on surface water resources during the license renewal term would be MODERATE. Because of the effective controls by the CPGCD on water use and because the STP operational leaks have not substantially affected the groundwater quality within the STP site, the cumulative impacts on groundwater resources during the license renewal term would be SMALL.
Aquatic ecology	Future development of industries that compete for water in the Colorado River, such as WSEC, as well as management of water budgets across the State of Texas through diversion projects like the LCRA–SAWS Project and the Mary Rhodes Pipeline Phase II Project would likely affect aquatic resources in the lower Colorado River. Such actions, in combination with other direct and indirect anthropogenic and natural environmental stressors—including GCC—would cumulatively lead to effects on the aquatic communities that would noticeably alter important attributes, such as species range, habitat availability, ecosystem processes, migratory corridors and behavior, species diversity, and species abundance. For these reasons, the cumulative impacts on aquatic ecology during the license renewal term would be MODERATE.

Resource Area	Cumulative Impact
Terrestrial ecology	The staff examined the cumulative effects of the construction at STP (e.g., proposed STP, Units 3 and 4), neighboring projects, continued urbanization and habitat fragmentation, and nearby parks and wildlife preserves. The staff concludes that the minimal terrestrial impacts on the continued STP operations would not contribute to the overall decline in the condition of terrestrial resources. For these reasons, the cumulative impacts on terrestrial ecology during the license renewal term would be MODERATE.
Human health	The radiological dose limits for protection of the public and workers have been developed by the NRC and EPA to address the cumulative impact of acute and long-term exposure to radiation and radioactive material. The NRC and the State of Texas would regulate any future actions in the vicinity of the STP site that could contribute to cumulative radiological impacts. In addition, the cumulative radiological impacts from operation of STP, Units 1 and 2, the projected dry fuel storage system, and two additional reactor units would be required to meet the radiation dose limits in 10 CFR Part 20 and 40 CFR Part 190. For these reasons, cumulative radiological impacts during the license renewal term would be SMALL.
Socioeconomics	Since STPNOC has no plans to hire additional workers during the license renewal term, employment levels at STP would remain relatively constant, with no additional demand for housing, public utilities, public services, or increased traffic. Based on this information and other information presented in Chapter 4 of this SEIS, there would be no additional contributory effect on socioeconomic conditions in the future from the continued operation of STP during the license renewal term beyond what is currently being experienced (i.e., no cumulative impact). As discussed in Section 4.11.7, there would also be no disproportionately high and adverse impacts to minority and low-income populations from the continued operation of STP during the license renewal term.
Historic & archaeological resources	As described in Sections 4.9.6 and 4.11.8, the continued operation of STP during the license renewal term would not incrementally contribute to the cumulative impacts on historic and archaeological resources within STP and in the surrounding area. Therefore, the cumulative impacts on historic and archaeological resources during the license renewal term would be SMALL.

4.12 References

10 CFR Part 20. *Code of Federal Regulations*, Title 10, *Energy*, Part 20, "Standards for protection against radiation."

10 CFR Part 50. *Code of Federal Regulations*, Title 10, *Energy*, Part 50, "Domestic licensing of production and utilization facilities."

10 CFR Part 51. *Code of Federal Regulations*, Title 10, *Energy*, Part 51, "Environmental protection regulations for domestic licensing and related regulatory functions."

10 CFR Part 54. *Code of Federal Regulations*, Title 10, *Energy*, Part 54, "Requirements for renewal of operating licenses for nuclear power plants."

36 CFR Part 60. *Code of Federal Regulations*, Title 36, *Parks, Forests, and Public Property, Part 60*, "National register of historic places."

36 CFR Part 800. *Code of Federal Regulations*, Title 36, *Parks, Forests, and Public Property*, Part 800, “Protection of historic properties.”

40 CFR Part 141. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 141, “National primary drinking water regulations.”

40 CFR Part 190. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 190, “Environmental radiation protection standards for nuclear power operations.”

59 FR 7629. Executive Order 12898. Federal actions to address environmental justice in minority populations and low-income populations. *Federal Register* 59(32):7629–7634. February 16, 1994.

66 FR 65274. U.S. Environmental Protection Agency. National pollutant discharge elimination system: regulations addressing cooling water intake structures for new facilities; final rule. *Federal Register*. December 18, 2001.

69 FR 41576. U.S. Environmental Protection Agency. National pollutant discharge elimination system—final regulations to establish requirements for cooling water intake structures at phase ii existing facilities; final rule. *Federal Register*. July 9, 2004.

69 FR 52040. U.S. Nuclear Regulatory Commission. Policy statement on the treatment of environmental justice matters in NRC regulatory and licensing actions. *Federal Register.* 69(163):52040–52048. August 24, 2004.

76 FR 22174. U.S. Environmental Protection Agency. National pollutant discharge elimination system—cooling water intake structures at existing facilities and Phase I facilities. *Federal Register*. April 20, 2011.

[AEC] U.S. Atomic Energy Commission. 1975. *Final Environmental Statement Related to Operation of South Texas Project, Units 1 and 2. Houston Lighting & Power Company, City Public Service Board of San Antonio, Central Power and Light Company, City of Austin, Docket Nos. 50-498 and 50-499*. Washington, DC: Directorate of Licensing. March 1975. ADAMS No. ML11172A200.

[CAPS] Missouri Census Data Center Circular Area Profiling System. Version 10C. Using Data from Summary File 1, 2010 Census Summary of Census Tracts in a 50-mi radius around the South Texas Project (28.97 Lat., -96.04Long.). March 2012.

[CEQ] Council on Environmental Quality. 1997. “*Environmental Justice: Guidance Under the National Environmental Policy Act*.” December 10, 1997. Available at <http://www.epa.gov/compliance/ej/resources/policy/ej_guidance_nepa_ceq1297.pdf> (accessed on April 6, 2012). ADAMS No. ML082520150.

Chemicals Inc. 2011. “Growing in Matagorda County.” Available at <http://www.chemicalsinc.com/Bay%20City%20Fact%20Sheet%20Rev.pdf> (accessed 27 September 2011).

City of Corpus Christi. 2009. *Garwood Pipeline Project, Project Update 2009*. Corpus Christi, TX: Water Department. October 2, 2009. Available at <http://www.cctexas.com/files/g17/GarwoodCouncilPresentation100209.pdf> (accessed 31 August 2011).

City of Corpus Christi. 2011. *Lake Texana & Mary Rhodes Pipeline II*. Corpus Christi, TX: Water Department. Available at <http://cctexas.com/water/resources/MaryRhodesPipeline.html> (accessed 21 October 2011).

[USACE] U.S. Army Corps of Engineers. 2005. *Galveston District Projects, Mouth of the Colorado River*. Galveston, TX: U.S. Army Corps of Engineers, Galveston District. Available at <http://www/swg/usace.army.mil/items/coloradoriver/MOC/asp> (accessed 16 December 2009). ADAMS No. ML100601372.

[CPGCD] Coastal Plains Groundwater Conservation District. 2010. *Rules of the Coastal Plains Groundwater Conservation District*. Bay City, TX: CPGCD. February 4, 2010. Available at <http://www.coastalplainsgcd.com/> (accessed 21 October 2011).

[CPGCD] Coastal Plains Groundwater Conservation District. 2011. *Operating Permit, Permit No. OP-04122805*. Bay City, TX: CPGCD. February 24, 2011. ADAMS No. ML11256A058.

Diamond DD, Smeins FE. 1984. Remnant grassland vegetation and ecological affinities of the upper coastal prairie of Texas. *Southwestern Naturalist* 29(3):321–334.

Edward E. Johnson, Inc. 1966. *Ground Water and Wells, A Reference Book for the Water-Well Industry*. Saint Paul, MN: Edward E. Johnson, Inc.

[ENSR] ENSR Corporation. 2008a. *Aquatic Ecology—Main Cooling Reservoir and Circulating Water Intake Structure Study, Unit 3 and 4 Licensing Project*. Houston, TX. ADAMS No. ML090860875.

[ENSR] ENSR Corporation. 2008b. *Aquatic Ecology—Colorado River Monitoring Report, Unit 3 and 4 Licensing Project*. Houston, TX. ADAMS No. ML081750196.

[EPA] Environmental Protection Agency. 1977. *Guidance for Evaluating the Adverse Impact of Cooling Water Intake Structures on Aquatic Environment. Washington, DC: Office of Water Enforcement, Permits Division. Section 316(b). May 1, 1977. 408 p.*

[EPA] Environmental Protection Agency. 1985. *Authorization to Discharge Under the National Pollutant Discharge Elimination System*. Permit No. TX0064947.

[EPA] Environmental Protection Agency. 1998. *Guidelines for Ecological Risk Assessment*. Washington, DC: Risk Assessment Forum. EPA/630/R-95/002F.

[EPA] Environmental Protection Agency. 1999. *Consideration of Cumulative Impacts in EPA Review of NEPA Documents*. Washington, DC: Office of Federal Activities (2252A). EPA-315-R-99-002.

[FWS] U.S. Fish and Wildlife Service. 2011. Letter from AM Strand, Field Supervisor, to T Tran, Project Manager, NRC. Subject: Reply to request for species list for South Texas license renewal review. June 2, 2011. ADAMS No. ML11173A241.

Gulf of Mexico Fishery Management Council (GMFMC). 2004. *Final Environmental Impact Statement for the Generic Amendment to the Following Fishery Management Plans of the Gulf of Mexico: Shrimp Fishery of the Gulf of Mexico, Red Drum Fishery of the Gulf of Mexico, Reef Fish Fishery of the Gulf of Mexico, Stone Crab Fishery of the Gulf of Mexico, Coral and Coral Reef Fishery of the Gulf of Mexico, Spiny Lobster Fishery of the Gulf of Mexico and South Atlantic; Coastal Migratory Pelagic Resources of the Gulf of Mexico and South Atlantic*. Tampa, FL.

Institute of Electrical and Electronics Engineers, Inc. (IEEE). 2002. National Electrical Safety Code.

Intergovernmental Panel on Climate Change (IPCC). 2010. "IPCC Fourth Assessment Report: Working Group II Report—Impacts, Adaptation and Vulnerability." Available at <http://www.ipcc.ch/ipccreports/ar4-wg2.htm> (accessed April 2012).

Karl, TR, et al., eds., *Global Climate Change Impacts in the United States*, New York, NY: U.S. Global Change Research Program, Cambridge University Press. Available at <http://downloads.globalchange.gov/usimpacts/pdfs/climate-impacts-report.pdf>. ADAMS No. ML100580077.

[LCRA] Lower Colorado River Authority. 2008. *Water Supply Resource Plan: Water Demand Projections for Municipal and Industrial Needs*. Austin, TX. Available at <http://www.lcra.org/library/media/public/docs/water/wsrp/WSRPDecember2008report.pdf> (accessed 13 June 2011).

[LCRA et al.] Lower Colorado River Authority (LCRA), Texas Commission on Environmental Quality (TCEQ), Texas Parks and Wildlife (TPWD), and Texas Water Development Board (TWDB). 2006. *Matagorda Bay Freshwater Inflow Needs Study. August 2006*. Available at <http://www.lcra.org/library/media/public/docs/water/wmp/FINS_Final_Report.pdf> (accessed 31 August 2011).

[LCRA–SAWS] Lower Colorado River Authority and San Antonio Water System. 2009. “Colorado River Flow Relationships to Aquatic Habitat and State Threatened Species: Blue Sucker.” Available at <http://www.lcra.org/library/media/public/docs/lswp/scopes/BIO_AH_2009_Scope.pdf> (accessed 12 September 2011).

[LCRWPG] Lower Colorado River Water Planning Group. 2010. *2011 Region K Water Plan*. Prepared for Texas Water Development Board. July 2010. Available at <http://www.twdb.state.tx.us/wrpi/rwp/3rdRound/2011_RWP/RegionK/> (accessed 31 August 2011).

[MACTEC] MACTEC Engineering and Consulting, Inc. 2009. *Conceptual Site Model for Units 1 and 2, Groundwater Protection Initiative, South Texas Project Electric Generating Station. Wadsworth, TX:* MACTEC Engineering and Consulting, Inc. Revision 1. May 20, 2009. ADAMS No. ML11256A058.

McAden DC, Greene GN, Baker, WB. 1984. *Colorado River Entrainment and Impingement Monitoring Program, Phase Two Studies.* Ecology Division, Environmental Protection Department, Houston Lighting & Power Company. Report 1. October 1984. ADAMS No. ML11256A057.

McAden DC, Greene GN, Baker WB. 1985. *Colorado River Entrainment and Impingement Monitoring Program, Phase Two Studies.* Ecology Division, Environmental Protection Department, Houston Lighting & Power Company. Report 2. April 1985. ADAMS No. ML11256A057.

[MCEDC] Matagorda County Economic Development Corporation. 2011. “Matagorda County Project Status Updates for 19-Sept-2011.” Available at <http://www.mcedc.net/news.php?op=view&id=155> (accessed 27 September 2011).

Menzie C, Henning MH, Cura J, Finkelstein K, Gentile J, Maughan J, Mitchell D, Petron S, Potocki B, Svirsky S, Tyler P. 1996. Report of the Massachusetts Weight-of-Evidence Workshop: A weight-of-evidence approach for evaluating ecological risks. Human and Ecological Risk Assessment 2:227–304.

Montagna PA, Brenner J, Gibeaut J, Morehead S. 1995. Coastal Impacts. In: North GR, Schmandt J, Clarkson J, editors. *The Impact of Global Warming on Texas*. Austin, TX: University of Texas Press.

National Environmental Policy Act of 1969, as amended. 42 U.S.C. §4321, et seq.

National Historic Preservation Act of 1966, as amended. 16 U.S.C. §470, et seq.

[NEI] Nuclear Energy Institute. 2007. *Industry Groundwater Protection Initiative—Final Guidance Document*. Washington, DC: NEI. NEI 07-07. August 2007. ADAMS No. ML072600290.

[NIEHS] National Institute of Environmental Health Sciences. 1999. *NIEHS Report on Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields*. Triangle Park, NC: NIEHS. Publication No. 99-4493. 80 p. Available at <http://www.niehs.nih.gov/about/materials/niehsreport.pdf>.

Nielsen-Gammon, JW. 1995. The Changing Climate of Texas. In: North GR, Schmandt J, Clarkson J, editors. *The Impact of Global Warming on Texas*. Austin, TX: University of Texas Press.

[NMFS] National Marine Fisheries Service. 2010. Letter from M Croom, Assistant Regional Administrator for Habitat Conservation, to Johnson, Rulemaking and Directives Branch Chief, NRC. Subject: Concurrence with EFH assessment for STP, Units 3 and 4. ADAMS No. ML101190379.

[NMFS] National Marine Fisheries Service. 2011. E-mail from T. Mincey, Program Analyst, to T. Tran, Project Manager, NRC. Subject: South Texas Project Federally listed species. March 3, 2011. ADAMS No. ML110690848.

[NRC] U.S. Nuclear Regulatory Commission. 1975*. Final Environmental Statement Related to the Proposed South Texas Project, Units 1 and 2*. Washington, DC: NRC. NUREG-75/019.

[NRC] U.S. Nuclear Regulatory Commission. 1986. *Final Environmental Statement Related to the Operation of South Texas Project, Units 1 and 2*. Washington, DC: NRC. NUREG-1171.

[NRC] U.S. Nuclear Regulatory Commission. 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. Washington, DC: NRC. NUREG-1437. May 1996. ADAMS Nos. ML040690705 and ML040690738.

[NRC] U.S. Nuclear Regulatory Commission. 1999. Section 6.3—Transportation, Table 9.1, Summary of findings on NEPA issues for license renewal of nuclear power plants. In: *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. Washington, DC: NRC. NUREG-1437, Volume 1, Addendum 1. August 1999. ADAMS No. ML04069720.

[NRC] U.S. Nuclear Regulatory Commission. 2010. *Final Supplemental Environmental Impact Statement Regarding Indian Point Generating, Units 2 and 3*. Washington, DC: Office of Nuclear Reactor Regulation. NUREG-1437, Supplement 38.

[NRC] U.S. Nuclear Regulatory Commission. 2011a. E-mail from B Martin, THC, to TK O'Neil, PNNL. Subject: STP license renewal—SHPO meeting. May 2, 2011. ADAMS No. ML11259A029.

[NRC] U.S. Nuclear Regulatory Commission. 2011b. *Environmental Impact Statement for Combined Licenses (COLs) for South Texas Project Electric Generating Station, Units 3 and 4.* Washington, DC: NRC. NUREG-1937, Volumes 1 and 2. ADAMS Nos. ML11049A000 and ML11049A001.

[NRC] U.S. Nuclear Regulatory Commission. 2011c. *Essential Fish Habitat Assessment for South Texas Project Electric Generating Station, Units 3 and 4*. Washington, DC: NRC. Final Report. ADAMS No. ML11049A001.

[NRC] U.S. Nuclear Regulatory Commission. 2011d. Letter from BM Pham, NRC, to DL Klima, Advisory Council on Historic Preservation. Subject: South Texas Project, Units 1 and 2, license renewal application review. January 27, 2011. ADAMS No. ML110200002.

[NRC] U.S. Nuclear Regulatory Commission. 2011e. Letter from BM Pham, NRC, to M Wolfe, Texas Historical Commission. Subject: South Texas Project, Units 1 and 2, license renewal application review. February 17, 2011. ADAMS No. ML110190549.

[NRC] U.S. Nuclear Regulatory Commission. 2011f. Letter from D Wrona, Branch Chief, to M Orms, FWS. Subject: Request for concurrence on list of Federally protected species. February 16, 2011. ADAMS No. ML110190429.

[NRC] U.S. Nuclear Regulatory Commission. 2011g. Letter from T Tran, NRC, to GT Powell, STPNOC. Subject: Audit report regarding South Texas Project license renewal application—cultural resources. July 18, 2011. ADAMS No. ML11173A304.

[NRC] U.S. Nuclear Regulatory Commission. 2011h. Letter from B. Pham, Branch Chief, NRC, to D. Bernhart, Assistant Southeast Regional Administrator for Protected Resources, NMFS. Subject: Request for list of Federally protected species and important habitats within the area under evaluation for the South Texas Project, Units 1 and 2, license renewal application review. February 16, 2011. ADAMS No. ML110190434.

[NRC] U.S. Nuclear Regulatory Commission (NRC). 2011i. Draft Supplemental Environmental Impact Statement Regarding Seabrook Station. NUREG-1437, Supplement 46. Office of Nuclear Reactor Regulation. Washington, DC. July 31, 2011. ADAMS No. ML11213A024.

[NRC] U.S. Nuclear Regulatory Commission. 2012. E-mail from T. Tran, Project Manager, NRC, to L. Gaul, PhD, MPH, Epidemiologist, Emerging and Acute Infectious Diseases Branch, TDSHS. Subject: NEPA consultation, waterborne outbreak. May 4, 2012. ADAMS No. ML12128A061.

Ryder PD, Ardis AF. 2002. *Hydrology of the Texas Gulf Coast Aquifer Systems, Regional Aquifer-Systems Analysis-Gulf Coast Plain*. Reston, VA: U.S. Geological Survey. U.S. Geological Survey Professional Paper 1416-E.

[STPNOC] South Texas Project Nuclear Operating Company. 2007a. *South Texas Project, Units 1 and 2. 2006 Annual Environmental and Annual Radiological Environmental Operating Reports*. Wadsworth, TX. ADAMS No. ML071270211.

[STPNOC] South Texas Project Nuclear Operating Company. 2007b. *South Texas Project, Units 1 and 2. Radioactive Effluent Release Report for 2006*. Wadsworth, Texas. ADAMS No. ML071280681.

[STPNOC] South Texas Project Nuclear Operating Company. 2008a. Letter from G Gibson, STPNOC, to NRC Document Control Desk. Subject: Response to RAIs. July 15, 2008. ADAMS No. ML082040684.

[STPNOC] South Texas Project Nuclear Operating Company. 2008b. Letter from G Gibson, STPNOC, to NRC Document Control Desk. Subject: South Texas Project, Units 3 and 4, Docket Nos. 52-012 and 52-013, Response to RAIs. July 2, 2008. ADAMS No. ML081970465.

[STPNOC] South Texas Project Nuclear Operating Company. 2008c. Letter from S Head, STPNOC, to NRC Document Control Desk. Subject: Response to RAIs. December 18, 2008. ADAMS No. ML090860873.

[STPNOC] South Texas Project Nuclear Operating Company. 2008d. *South Texas Project, Units 1 and 2. 2007 Annual Environmental and Annual Radiological Environmental Operating Reports*. Wadsworth, TX. ADAMS No. ML081280093.

[STPNOC] South Texas Project Nuclear Operating Company (STPNOC). 2008e. *South Texas Project, Units 1 and 2. Radioactive Effluent Release Report for 2007*. Wadsworth, TX. ADAMS No. ML081300023.

[STPNOC] South Texas Project Nuclear Operating Company. 2009a. *South Texas Project, Units 1 and 2. 2008 Annual Environmental and Annual Radiological Environmental Operating Reports*. Wadsworth, TX. ADAMS No. ML091310066.

[STPNOC] South Texas Project Nuclear Operating Company. 2009b. *South Texas Project, Units 1 and 2. Radioactive Effluent Release Report for 2008*. Wadsworth, TX. ADAMS No. ML091200487.

[STPNOC] South Texas Project Nuclear Operating Company. 2009c. *Updated Final Safety Analysis Report Units 1 and 2*. Bay City, TX: STPEGS. Revision 15. April 29, 2010. ADAMS No. ML103220222.

[STPNOC] South Texas Project Nuclear Operating Company. 2009d. *Water Conservation Plan, STP Nuclear Operating Company, South Texas Project Electric Generating Station, Certificate of Adjudication 14-5437 A*. Revision 2. May 1, 2009. ADAMS No. ML11256A058.

[STPNOC] South Texas Project Nuclear Operating Company. 2010a. *South Texas Project, Units 1 and 2. 2009 Annual Environmental and Annual Radiological Environmental Operating Reports*. Wadsworth, TX. ADAMS No. ML101260530.

[STPNOC] South Texas Project Nuclear Operating Company. 2010b. *South Texas Project, Units 1 and 2, License Renewal Application. Bay City, TX: STPNOC. "Environmental Report*." September 2010. ADAMS No. ML103010263.

[STPNOC] South Texas Project Nuclear Operating Company. 2010c. *South Texas Project, Units 3 and 4, License Renewal Application. Bay City, TX: STPNOC. Part 3, "Environmental Report*." Revision 4. ADAMS No. ML102860592.

[STPNOC] South Texas Project Nuclear Operating Company. 2010d. *South Texas Project, Units 1 and 2. Radioactive Effluent Release Report for 2009*. Wadsworth, TX. ADAMS No. ML101090091.

[STPNOC] South Texas Project Nuclear Operating Company. 2011a. *South Texas Project, Units 1 and 2. 2010 Annual Environmental and Annual Radiological Environmental Operating Reports*. Wadsworth, TX. ADAMS No. ML111250429.

[STPNOC] South Texas Project Nuclear Operating Company. 2011b. Letter from AW Harrison, Manager Licensing, to NRC Document Control Desk. Subject: Transmittal of documents to support review of the STP LRA. TAC Nos. ME 4938 and ME 5122. STP Letter No. NOC-AE-11002720. August 31, 2011. ADAMS Nos. ML11256A056 and ML11256A059.

[STPNOC] South Texas Project Nuclear Operating Company. 2011c. Letter from G.T. Powell, Vice President, STPNOC, to NRC Document Control Desk. Subject: Response to RAI for the STP LRA. TAC Nos. ME4938 and ME5122. STP Letter No. NOC-AE-11002719. September 6, 2011. ADAMS No. ML11255A211.

[STPNOC] South Texas Project Nuclear Operating Company. 2011d. South Texas Project, Units 1 and 2. Radioactive Effluent Release Report for 2010. Wadsworth, TX. ADAMS No. ML11124A121.

[STPNOC] South Texas Project Nuclear Operating Company. 2011e. Letter from GT Powell, Vice President, STPNOC, to U.S. Nuclear Regulatory Commission, Document Control Desk. Subject: Response to RAI for the STP LRA. TAC Nos. ME4938 and ME5122. STP Letter No. NOC-AE-11002723. September 12, 2011. ADAMS No. ML11259A014.

[STPNOC] South Texas Project Nuclear Operating Company. 2011f. Letter from D.W. Rencurrel, Senior Vice President, STPNOC, to U.S. Nuclear Regulatory Commission, Document Control Desk. Subject: Response to Requests for Additional Information for the South Texas Project License Renewal Application (TAC Nos. ME4938 and ME5122) (STP Letter Number NOC-AE-1002761). November 17, 2011. ADAMS No. ML11333A094.

[STPNOC] South Texas Project Nuclear Operating Company. 2011g. Letter from G.T. Powell, Vice President, STPNOC, to U.S. Nuclear Regulatory Commission, Document Control Desk. Subject: Response to Requests for Additional Information for the South Texas Project License Renewal Application (TAC Nos. ME4938 and ME5122) (STP Letter Number NOC-AE-1 1002691). July 5, 2011. ADAMS No. ML11193A074.

[TCEQ] Texas Commission on Environmental Quality. 2005. TPDES Permit No. WQ0001908000. Austin, TX.

[TCEQ] Texas Commission on Environmental Quality. 2007. Letter from K Holligan, TCEQ, to RA Gangluff, STPNOC. Subject: Cooling water intake structures Phase II rules; South Texas Project Electric Generating Station, TPDES Permit No. WQOOO 1908000. June 27, 2007. ADAMS No. ML 11256A057.

[TCEQ] Texas Commission on Environmental Quality. 2009. *Amendment to Certificate of Adjudication, Certificate of Adjudication 14-5437 A*. March 17, 2009. ADAMS No. ML11256A058.

[TDSHS] Texas Department of State Health Services. "Radiation Branch Environmental Monitoring Summary Reports." Available at <http://www.dshs.state.tx.us/radiation/publications.shtm>.

Texas Water Code, Title 2, *Water Administration*, Subtitle B, "Water Rights," Chapter 11, "Water Rights." Available at <http://www.statutes.legis.state.tx.us/Docs/WA/htm/WA.11.htm>.

[TPWD] Texas Parks and Wildlife Department. 2002. *Executive Summary: The Texas Shrimp Fishery. A report to the Governor and the 77th Legislature of Texas*. Texas Parks and Wildlife Department. September 2002.

[TPWD] Texas Parks and Wildlife Department. 2005. *Land and Water Resources Conservation and Recreation Plan*. Austin, TX: TPWD. 137 p. Available at <http://www.tpwd.state.tx.us/publications/pwdpubs/pwd_pl_e0100_0867/> (accessed 26 September 2011).

[TPWD] Texas Parks and Wildlife Department. 2010. "Prairie Pothole and Marsh Wetlands." Available at <http://www.texaswetlands.org/prairie.htm> (accessed 26 September 2011).

[TWDB] Texas Water Development Board. 2006. *Water for Texas—2007.* Austin, TX: TWDB. Volume II. Available at <http://www.twdb.state.tx.us/publications/reports/State_Water_Plan/2007/2007StateWaterPlan/CHAPTER%202_REGIONAL%20K%20FINAL%20112706.pdf> (accessed 13 June 2011).

[TWDB] Texas Water Development Board. 2007. *State Water Plan—Water for Texas 2007*. Austin, TX: TWDB. Document No. GP-8-1. Volume 1. January 2007. Available at <http://www.twdb.state.tx.us/wrpi/swp/swp.asp> (accessed 31 August 2011).

[TWDB] Texas Water Development Board. 2011. "Water Resources Planning and Information, 2012 Draft State Water Plan & Public Comments." Available at <http://www.twdb.state.tx.us/wrpi/swp/draft.asp> (accessed 21 October 2011).

[USCB] U.S. Census Bureau. 2010. "*American FactFinder, Census 2000 and 2007–2009, 3-Year Estimate, American Community Survey*. State and County QuickFacts on Lucas, Ottawa, Sandusky and Wood Counties, Ohio. Housing Characteristics for 2000 and 2006–2008, 3-Year Estimate." Available at <http://factfinder.census.gov> and <http://quickfacts.census.gov> (accessed April 2011).

[USCB] U.S. Census Bureau. 2011. "American FactFinder, 2006–2010 American Community Survey 5-year estimates and Data Profile Highlights information on Brazoria, Calhoun, Fort Bend, Jackson, Matagorda, Victoria, and Wharton Counties and State of Texas." Available at <http://factfinder.census.gov and http://quickfacts.census.gov> (accessed March 2012).

[USGCRP] U.S. Global Research Program. 2009. *Global Climate Change Impacts in the United States*. New York, NY: Cambridge University Press. Available at <http://downloads.globalchange.gov/usimpacts/pdfs/climate-impacts-report.pdf> (accessed 31 August 2011).

Wilber D.H. and R. Bass. 1998. "Effect of the Colorado River Diversion on Matagorda Bay Epifauna." Estuarine, Coastal and Shelf Science (1998) 47:309–318.

5.0 ENVIRONMENTAL IMPACTS OF POSTULATED ACCIDENTS

This chapter describes the environmental impacts from postulated accidents that might occur during the period of extended operation. The term "accident" refers to any unintentional event outside normal plant operations that results in a release, or the potential for a release, of radioactive materials into the environment. Two classes of postulated accidents are evaluated in the generic environmental impact statement (GEIS)—design-basis accidents (DBAs) and severe accidents (Table 5–1).

Table 5–1. Issues Related to Postulated Accidents
Two issues related to postulated accidents are evaluated under the National Environmental Protection Act (NEPA) in the license renewal review—DBAs and severe accidents.

Issues	Category
DBAs	1
Severe accidents	2

5.1 Design Basis Accidents

In order to receive U.S. Nuclear Regulatory Commission (NRC) approval to operate a nuclear power facility, an applicant for an initial operating license must submit a safety analysis report (SAR) as part of its application. The SAR presents the design criteria and design information for the proposed reactor and comprehensive data on the proposed site. The SAR also discusses various hypothetical accident situations and the safety features that are provided to prevent and mitigate accidents. The NRC staff (staff) reviews the application to determine if the plant design meets the NRC's regulations and requirements and includes, in part, the nuclear plant design and its anticipated response to an accident.

DBAs are those accidents that both the applicant and the staff evaluate to ensure that the plant can withstand normal and abnormal transients and a broad spectrum of postulated accidents, without undue hazard to the health and safety of the public. Many of these postulated accidents are not expected to occur during the life of the plant but are evaluated to establish the design basis for the preventive and mitigative safety systems of the nuclear power plant. The acceptance criteria for DBAs are described in Title 10 of the *Code of Federal Regulations* (CFR) Part 50 (10 CFR Part 50) and 10 CFR Part 100.

The environmental impacts of DBAs are evaluated during the initial licensing process, and the ability of the plant to withstand these accidents is demonstrated to be acceptable before issuance of the operating license. The results of these evaluations are found in applicant documentation such as the applicant's final safety analysis report (FSAR), the staff's safety evaluation report (SER), the final environmental statement (FES), and Section 5.1 of this supplemental environmental impact statement (SEIS). An applicant is required to maintain the acceptable design and performance criteria throughout the life of the nuclear power plant, including the period of extended operation. The consequences for these events are evaluated for the hypothetical maximum exposed individual; as such, changes in the plant environment will not affect these evaluations. Because of the requirements that continuous acceptability of the consequences and aging management programs (AMPs) be in effect for the period of extended operation, the environmental impacts, as calculated for DBAs, should not differ significantly from initial licensing assessments over the life of the plant, including the period of extended operation. Accordingly, the design of the plant, relative to DBAs during the period of extended operation, is considered to remain acceptable; therefore, the environmental impacts of those accidents were not examined further in the GEIS.

The Commission has determined that the environmental impacts of DBAs are of SMALL significance for all nuclear power plants because the plants were designed to successfully withstand these accidents. Therefore, for the purposes of license renewal, DBAs are designated as a Category 1 issue. The early resolution of the DBAs (i.e., successfully withstand these accidents) makes them a part of the current licensing basis (CLB) of the plant. The CLB of the plant is to be maintained by the applicant under its current license; therefore, in accordance with 10 CFR 54.30, it is not subject to review under license renewal.

No new and significant information related to the South Texas Project (STP) was identified during the review of the South Texas Project Nuclear Operating Company, LLC (STPNOC) Environmental Report (ER) (STPNOC 2010), site audit (NRC 2011), the scoping process (NRC 2012), or evaluation of other available information. Therefore, there are no impacts related to these issues beyond those discussed in the GEIS.

5.2 Severe Accidents

Severe nuclear accidents are those that are more severe than DBAs because they could result in substantial damage to the reactor core, whether or not there are serious offsite consequences. In the GEIS, the staff assessed the impacts of severe accidents during the period of extended operation, using the results of existing analyses and site-specific information to conservatively predict the environmental impacts of severe accidents for each plant during the period of extended operation.

Severe accidents initiated by external phenomena (e.g., tornadoes, floods, earthquakes, fires, and sabotage) have not traditionally been discussed in quantitative terms in FESs and were not specifically considered for the STP site in the GEIS (NRC 1996). However, the GEIS did evaluate existing impact assessments, including beyond design basis earthquakes, at existing plants—performed by NRC and by the industry at 44 nuclear plants in the U.S. In addition, the GEIS for license renewal performed a discretionary analysis of sabotages of plant systems in connection with license renewal. In the GEIS, the Commission concludes that the risk from sabotage and beyond design-basis earthquakes at existing plants is small and that the risks from other external events are adequately addressed by a generic consideration of internally initiated severe accidents (NRC 1996).

Based on information in the GEIS, the Commission found that:

> The probability weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives.

The staff identified no new and significant information related to postulated accidents (DBAs and severe accidents) during the review of the STP ER (STPNOC 2010), site audit (NRC 2011), the scoping process (NRC 2012), or evaluation of other available information. Therefore, there are no impacts related to these issues beyond those discussed in the GEIS. However, in accordance with 10 CFR 51.53(c)(3)(ii)(L), the staff has reviewed severe accident mitigation alternatives (SAMAs) for STP. The results of the review are discussed in Section 5.3.

5.3 Severe Accident Mitigation Alternatives

Section 10 CFR 51.53(c)(3)(ii)(L) requires that license renewal applicants consider alternatives to mitigate severe accidents if the staff has not previously evaluated SAMAs for the applicant's plant in an environmental impact statement (EIS) or related supplement or in an environmental assessment. The purpose of this consideration is to ensure that plant changes (e.g., hardware, procedures, and training) with the potential for improving severe accident safety performance are identified and evaluated. SAMAs have not been previously considered for STP; therefore, the remainder of Chapter 5 addresses those alternatives.

5.3.1 Overview of Severe Accident Mitigation Alternative Process

This section presents a summary of the SAMA evaluation for STP conducted by STPNOC, and the staff's review of that evaluation. The staff performed its review with contract assistance from Pacific Northwest National Laboratory. The staff's review is available in full in Appendix F of this SEIS, and the STPNOC's SAMA evaluation is available in full in Attachment F of STPNOC's ER (LRA Appendix E).

STPNOC conducted the SAMA evaluation for STP with a four-step approach. In the first step, STPNOC quantified the level of risk associated with potential reactor accidents using the plant-specific probabilistic risk assessment (PRA) and other risk models.

In the second step, STPNOC examined the major risk contributors and identified possible ways (SAMAs) of reducing that risk. Common ways of reducing risk are changes to components, systems, procedures, and training.

In the third step, STPNOC estimated the benefits and the costs associated with each of the candidate SAMAs. Estimates were made of how much each SAMA could reduce risk. Those estimates were developed in terms of dollars, in accordance with NRC guidance for performing regulatory analyses. STPNOC also estimated the costs of implementing the candidate SAMAs.

Finally, in the fourth step, STPNOC compared the cost and benefit of each of the remaining SAMAs to determine whether the SAMA was cost beneficial, meaning the benefits of the SAMA were greater than the cost (a positive cost benefit).

5.3.2 Estimate of Risk

STPNOC submitted an assessment of SAMAs for STP as part of the ER (STPNOC 2010). This assessment was based on the most recent STP PRA available at that time, a plant-specific offsite consequence analysis performed using the MELCOR Accident Consequence Code System 2 (MACCS2) computer code, and insights from the STP individual plant examination (IPE) and individual plant examination of external events (IPEEE) (HL&P 1992).

Two distinct analyses are combined to form the basis for the risk estimates used in the SAMA analysis. The first is the STP Level 1 and Level 2 PRA model, which is an updated version of the IPE (HL&P 1992) which, in turn, was an update of the earlier model completed for the purpose of supporting changes in certain STP technical specifications (NRC 1994). The second is a supplemental analysis of offsite consequences and economic impacts (essentially a Level 3 PRA model) developed specifically for the SAMA analysis. The SAMA analysis is based on the most recent STP Level 1 and Level 2 PRA model available at the time of the ER, referred to as the STP_REV6 model. The scope of the Level 1 model includes internal and external initiating events.

The following results are based upon the STP model of record (STP_REV6), as presented in the ER (STPNOC 2010). The impact of the sensitivity analysis to updated fire and seismic data on the total core damage frequency (CDF) is provided in Appendix F, Sections F.2.2 (risk estimates) and F.6.2 (cost-benefit evaluation) of this SEIS.

The STP CDF is approximately 6.4×10^{-6} per year for both internal and external events as determined from quantification of the Level 1 PRA model. The CDF is based on the risk assessment for internally initiated events, which includes internal flooding, and external events, which includes fire, seismic events, external flooding, and tornado events. The internal events CDF is approximately 3.9×10^{-6} per year, and the external events CDF is approximately 2.5×10^{-6} per year. The external events CDF includes contributions of approximately 1.0×10^{-6} per year due to fire events, 7.3×10^{-8} per year due to seismic events, and 1.4×10^{-6} per year due to other external events (STPNOC 2010).

When determined from the sum of the containment event tree (CET) sequences, or Level 2 PRA model, the CDF is approximately 6.2×10^{-6} per year (within acceptable approximation) for both internal and external events. The 6.2×10^{-6} value derived from the CET was used as the baseline CDF in the SAMA evaluations (STPNOC 2010).

The breakdown of CDF by initiating event is provided in Table 5–2, Table 5–3, Table 5–4, and Table 5–5 for internal, fire, seismic, and other external events, respectively (STPNOC 2011).

Table 5–2. STP Core Damage Frequency for Internal Events

Initiating event [(a)]	CDF (per year)	% Contribution to internal events CDF[(b, c)]	% Contribution to total CDF
Loss of all offsite power	9.6×10^{-7}	25	15
Loss of 345 kV offsite power	6.3×10^{-7}	16	10
Steam generator tube rupture (SGTR)	4.4×10^{-7}	11	7
Excessive loss-of-coolant accident (LOCA)	3.2×10^{-7}	8	5
Steam line break outside containment	2.8×10^{-7}	7	4
Loss of electrical auxiliary building heating, ventilation, and air conditioning (HVAC)	2.6×10^{-7}	7	4
Turbine trip	1.8×10^{-7}	5	3
Partial loss of main feedwater	1.5×10^{-7}	4	2
Reactor coolant pump (RCP) seal LOCA	1.5×10^{-7}	4	2
Interfacing system LOCA	1.3×10^{-7}	3	2
Loss of DC busses	9.7×10^{-8}	2	2
Small LOCAs	7.5×10^{-8}	2	1
Reactor trip	6.5×10^{-8}	2	1
Other internal events	3.6×10^{-7}	9	6
Total CDF (internal events)	$\mathbf{3.9\times10^{-6}}$	**100**	**64**

(a) The impact of the sensitivity analysis to updated fire and seismic data on the total CDF is not included in these results. Section F.2.2 provides a discussion of these impacts.

(b) Obtained from CDF given in ER Table F.2-1 (STPNOC 2010) divided by the total internal events CDF of 3.89×10^{-6}.

(c) May not total to 100 percent due to round off.

Table 5–3. STP Core Damage Frequency for Fire Events

Fire initiator description [a]	CDF (per year)	% Contribution to fire CDF[b, c]	% Contribution to total CDF
Fire zone 047 scenario X	4.0×10^{-7}	39	6
Fire zone 071 scenario X	2.1×10^{-7}	21	3
Fire zone 047 scenario B	1.8×10^{-7}	18	3
Control room fire scenario 18	1.2×10^{-7}	12	2
Fire zone 047 scenario BC	6.4×10^{-8}	6	1
Control room fire scenario 23	2.6×10^{-8}	3	0.4
Fire zone 147 scenario O	1.1×10^{-8}	1	0.2
Control room fire scenario 10	$1.0\text{x}10^{-9}$	<1	<0.1
Total CDF (fire events)	$\mathbf{1.0\times10^{-6}}$	**100**	**16**

[a] The impact of the sensitivity analysis to updated fire and seismic data on the total CDF is not included in these results. Section F.2.2 provides a discussion of these impacts.

[b] Obtained from CDF given in ER Table F.2-1 (STPNOC 2010) divided by fire events CDF of 1.02×10^{-6}.

[c] May not total to 100 percent due to round off.

Table 5–4. STP Core Damage Frequency for Seismic Events

Initiating event[a]	CDF (per year)	% Contribution to seismic CDF [b, c]	% Contribution to total CDF
Seismic event, 0.4g acceleration	4.1×10^{-8}	55	0.6
Seismic event, 0.6g acceleration	2.1×10^{-8}	28	0.3
Seismic event, 0.2g acceleration	9.8×10^{-9}	13	0.2
Seismic event, 0.1g acceleration	2.1×10^{-9}	3	<0.1
Total CDF (seismic events)	$\mathbf{7.3\times10^{-8}}$	**100**	**1.1**

[a] The impact of the sensitivity analysis to updated fire and seismic data on the total CDF is not included in these results. Section F.2.2 provides a discussion of these impacts.

[b] Obtained from CDF given in ER Table F.2-1 (STPNOC 2010) divided by seismic events CDF of 7.31×10^{-8}.

[c] May not total to 100 percent due to round off.

Table 5–5. STP Core Damage Frequency for Other External Events

Initiating event [(a)]	CDF (per year)	% Contribution to other external events CDF [(b, c)]	% Contribution to total CDF
Tornado induced failure of switchyard and essential cooling pond (ECP)	1.1×10^{-6}	79	17
Essential cooling water (ECW) failure due to breach of main cooling reservoir (MCR)	2.9×10^{-7}	21	5
External flooding scenarios 2–6	9.5×10^{-9}	<1	0.2
Flood induced loss of offsite power (LOOP)	2.1×10^{-9}	<1	<0.1
Total CDF (other external events)	**1.4×10^{-6}**	**100**	**22**

[(a)] The impact of the sensitivity analysis to updated fire and seismic data on the total CDF is not included in these results. See Section F.2.2 for a discussion of these impacts.

[(b)] Obtained from CDF given in ER Table F.2-1 (STPNOC 2010) divided by other external events CDF of 1.41×10^{-6}.

[(c)] May not total to 100 percent due to round off.

As shown in Table 5–2, internal events contribute about 61 percent of the total CDF. The two LOOP events—“Loss of All Offsite Power” and “Loss of 345 kV Offsite Power”—are the largest contributors to the internal event CDF.

As shown in Table 5–5, the CDF for other external events make up the next largest contributor (about 22 percent) of the total CDF. The “Tornado Induced Failure of Switchyard and Essential Cooling Pond (ECP)” and “Essential Cooling Water (ECW) Failure due to Breach of Main Cooling Reservoir (MCR)” are the largest contributors in this group.

As shown in Table 5–3, fire events make up the next largest contributor (about 16 percent) of the total CDF. The “Fire Zone 047 Scenario X” and “Fire Zone 071 Scenario X” are the largest contributors. Seismic events make up a small contribution of about 1 percent to the total STP CDF. Station blackout contributes about 35 percent (2.2×10^{-6} per year) of the total CDF while anticipated transients without scram (ATWS) contribute about 4 percent (2.8×10^{-7} per year) to the total CDF (STPNOC 2011).

In the ER, STPNOC estimated the dose to the population within 80 km (50 mi) of the STP site to be approximately 0.0174 person-Sievert (Sv) (1.74 person-roentgen equivalent man (rem)) per year. The breakdown of the total population dose by containment release mode is summarized in Table 5–6. Large early releases, with induced SGTR and interfacing systems loss of coolant accident (ISLOCA), are the dominant contributors to the population dose risk at STP. Small early releases with pre-existing small containment failure and late releases with no sprays are also significant contributors to the population dose risk.

Table 5–6. Breakdown of Population Dose by Containment Release Mode

Containment release mode [(a)]	Population dose (person-rem [(b)] per year)	% Contribution
Large early releases (<3 hrs)	0.68	39
Small early releases (<3 hrs)	0.59	34
Late releases (>3 hrs)	0.42	24
Intact containment	0.05	3
Total	**1.74**	**100**

[(a)] The impact of the sensitivity analysis to updated fire and seismic data on the release category frequency is not included in these results. Section F.2.2 provides a discussion of these impacts.

[(b)] One person-rem=0.01 person-Sv

The staff has reviewed STPNOC's data and evaluation methods and concludes that the quality of the risk analyses is adequate to support an assessment of the risk reduction potential for candidate SAMAs. Accordingly, the staff based its assessment of offsite risk on the CDFs and offsite doses reported by STPNOC.

5.3.3 Potential Plant Improvements

STPNOC's process for identifying potential plant improvements (SAMAs) consisted of the following elements:

- review of the dominant cutsets and most significant basic events from the current, plant-specific PRA,
- review of potential plant improvements identified in the STP IPE and IPEEE,
- review of SAMA candidates identified for license renewal applications for representative PWR plants, and
- review of other industry documentation discussing potential plant improvements.

Based on this process, an initial set of 21 candidate SAMAs, referred to as Phase I SAMAs, were identified. In Phase I of the evaluation, STPNOC performed a qualitative screening of the initial list of SAMAs and eliminated SAMAs from further consideration using the following criteria:

- The SAMA is not applicable to STP due to design differences.
- The SAMA has already been implemented at STP or would achieve results that have already been achieved at STP by other means.
- The SAMA has estimated implementation costs that would exceed the dollar value associated with eliminating all severe accident risk at STP.

Based on this screening, 16 SAMAs were eliminated, leaving 5 SAMAs for further evaluation. A detailed cost-benefit analysis was performed for each of the 5 SAMAs in the Phase II analysis.

STPNOC calculated the risk reduction that would be attributable to each candidate SAMA (assuming SAMA implementation) and re-quantified the risk value. The difference between the base risk value and the SAMA-reduced risk value is the averted risk, or the value of implementing the SAMA. STPNOC used this information in conjunction with the cost estimates for implementing each SAMA to perform a detailed cost-benefit comparison. STPNOC performed additional analyses to evaluate how the SAMA results would change if certain key parameters were changed, including re-assessing the cost-benefit calculations using the 95th percentile level of the failure probability distributions. The results of the uncertainty analysis are discussed in the ER, Attachment F, Section F.7. Based on the results of this SAMA analysis, none of the SAMAs have a positive net value, even when the 95th percentile PRA results were considered. Therefore, no SAMAs are being considered for implementation as part of license renewal (STPNOC 2010). The staff's concerns regarding SAMAs were provided to STPNOC in RAIs (NRC 2011). The staff's RAIs did not result in the identification of any potentially cost-beneficial SAMAs (STPNOC 2011). STPNOC's SAMA analyses and the NRC's review are discussed in more detail in the following sections.

The NRC staff concludes that STPNOC used a systematic and comprehensive process for identifying potential plant improvements for STP and that the set of SAMAs evaluated in the ER, together with those evaluated in response to the NRC staff's inquiries, is reasonably comprehensive and, therefore, is acceptable.

5.3.4 Evaluation of Risk Reduction and Costs of Improvements

STPNOC estimated the costs of implementing the 21 SAMAs through the development of site-specific cost estimates and use of other applicants' estimates for similar improvements. The costs were developed on a site basis (i.e., two units). If the cost estimate was for a single unit, based on other applicants' estimates for similar improvements, then the cost estimate was multiplied by two to derive the costs on a site basis. The site-specific cost estimates conservatively did not include contingency costs associated with unforeseen implementation obstacles or the cost of replacement power during extended outages required to implement the modifications (STPNOC 2010). The cost estimates that were based on other applicants' estimates did not account for inflation, which is considered another conservatism.

STPNOC performed additional analyses to evaluate the impact of parameter choices and uncertainties on the results of the SAMA assessment. In this process, one additional SAMA was identified for detailed cost-benefit analysis.

The staff reviewed STPNOC's basis for calculating the risk reduction for the various plant improvements and concludes that the rationale and assumptions for estimating risk reduction are reasonable and generally conservative (i.e., the estimated risk reduction is higher than what would actually be realized). Accordingly, the staff based its estimates of averted risk for the various SAMAs on STPNOC's risk reduction estimates.

5.3.5 Cost-Benefit Comparison

The methodology used by STPNOC to perform the Cost-Benefit Comparison in the Phase II analysis was based on NRC's guidance for performing a cost-benefit analysis (i.e., NUREG/BR-0184, *Regulatory Analysis Technical Evaluation Handbook* (NRC 1997)). The guidance involves determining the net value for each SAMA. If the net value of a SAMA is negative, the cost of implementing the SAMA is larger than the benefit associated with the SAMA, and it is not considered cost-beneficial. Revision 4 of NUREG/BR-0058 states that two sets of estimates should be developed, one at a 3 percent discount rate and one at a 7 percent discount rate (NRC 2004). STPNOC provided a base set of results using the 7 percent discount rate and a sensitivity study using the 3 percent discount rate. These results are presented in Table 5–7 as the total benefit baseline and total benefit baseline with uncertainty. Table 5–7 lists (a) the assumptions considered to estimate the risk reduction for each of the evaluated SAMAs, (b) the estimated risk reduction in terms of percent reduction in CDF and population dose, and (c) the estimated total benefit (present value) of the averted risk. The estimated benefits reported in Table 5–7 reflect the combined benefit in both internal and external events. There are six SAMAs listed in Table 5–7. The associated initiated events for these six SAMAs are:

- cable spreading room fire,
- ISLOCA,
- SGTR,
- loss of reactor coolant system (RCS) water seal,
- loss of standby diesel generator (SBDG) HVAC, and
- loss of essential cooling water intake structure (ECWIS) HVAC, respectively.

The staff reviewed the bases for the applicant's cost estimates. For certain improvements, the staff also compared the cost estimates to estimates developed elsewhere for similar improvements, including estimates developed as part of other applicants' analyses of SAMAs for operating reactors. The staff reviewed the costs and has found them to be reasonable and generally consistent with estimates provided in support of other plants' analyses. The staff agrees that the costs of the SAMAs evaluated would be higher than the associated benefits when they are considered independently.

Table 5–7. Phase II SAMA List (Cost-Benefit) for STP

SAMA[a]	Assumptions	% Risk reduction		Total benefit ($)		Cost ($)
		CDF[b]	Population dose (% dose reduction)	Baseline (internal + external)	Baseline with uncertainty[b]	
3b[c]—Install fire wrap on positive displacement pump (PDP) cables in cable spreading room.	Eliminate failure of the PDP due to a fire in the cable spreading room.	<1	<1	3K	4K	800K
4—Develop procedures to isolate component cooling water (CCW) inside containment.	Eliminate failure of the operator action to isolate CCW.	2	10	27K	43K	100K

SAMA[a]	Assumptions	% Risk reduction		Total benefit ($)		Cost ($)
		CDF[b]	Population dose (% dose reduction)	Baseline (internal + external)	Baseline with uncertainty[b]	
10—Enhance procedures to ensure the steam generators (SGs) are filled or maintain filled in SGTR events to scrub fission products.	Reassign a portion of the SGTR CDF contribution for the large early release category (7.48E-06 per year) and late release category (1.35E-07 per year) to the small early release category and intact containment release category, respectively.	0	2	3K	5K	100K
12—Enhance procedures to prevent clearing of RCS cold leg water seals.	Reassign the induced SGTR CDF contribution (2.4E-09 per year) for sequences in which offsite power is available from the large early release category to the intact containment release category.	0	0	<1K	<1K	100K
13—Develop procedures to open doors or use portable fans for alternate SBDG room cooling.	Eliminate failure of the operator action to provide SBDG room cooling.	<1	0	1K	2K	100K
15—Develop emergency procedures for alternate ECWIS room cooling.	Eliminate failure of the operator action to provide ECWIS room cooling.	1	2	8K	12K	100K

(a) SAMAs in bold are potentially cost-beneficial.
(b) Baseline benefits increased by a factor of 1.6 to account for uncertainties, which is discussed further in Section F.6.2.
(c) SAMA 3b retained for Phase II analysis based on results of uncertainty analysis, which is discussed further in Section F.6.2.

5.3.6 Conclusions

The NRC staff reviewed the STPNOC's analysis. The staff concludes that the methods used and the implementations of those methods were sound. The treatment of SAMA benefits and costs supports the general conclusion that the SAMA evaluations performed by STPNOC are reasonable and sufficient for the license renewal submittal.

The staff agrees with STPNOC's conclusion that none of the candidate SAMAs are potentially cost beneficial. This conclusion is based on the generally conservative treatment of costs and benefits. This conclusion is consistent with the low residual level of risk indicated in the STP PRA and the fact that STPNOC has already implemented the plant improvements identified from the IPE and IPEEE.

5.4 References

10 CFR Part 50. *Code of Federal Regulations*, Title 10, Energy, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. *Code of Federal Regulations*, Title 10, Energy, Part 51, "Environmental protection regulations for domestic licensing and related regulatory functions."

10 CFR Part 54. *Code of Federal Regulations*, Title 10, Energy, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

10 CFR Part 100. *Code of Federal Regulations*, Title 10, Energy, Part 100, "Reactor Site Criteria."

[HL&P] Houston Lighting and Power Company. 1992. "South Texas Project Electric Generating Station Level 2 Probabilistic Safety Assessment and Individual Plant Examination." August 1992. (ADAMS Nos. ML0617001702, ML0617001790, ML0617001850).

[NRC] U.S. Nuclear Regulatory Commission. 1994. Letter from Suzanne C. Black, Director, to William T. Cottle, Houston Lighting & Power Company. Subject: Issuance of Amendment Nos. 59 and 47 to Facility Operating License Nos. NPF-76 and NPF-80 and Related Relief Request—South Texas Project, Units 1 and 2 (TAC Nos. M76048 and M76049). February 17, 1994. ADAMS No. ML021300134.

[NRC] U.S. Nuclear Regulatory Commission. 1996. Generic Environmental Impact Statement for License Renewal of Nuclear Plants. Washington, DC. NRC NUREG-1437. May 1996. ADAMS Nos. ML040690705 and ML040690738.

[NRC] U.S. Nuclear Regulatory Commission. 1997. Regulatory Analysis Technical Evaluation Handbook. Washington, DC. NRC. NUREG/BR-0184. January 1997. ADAMS No. ML050190193.

[NRC] U.S. Nuclear Regulatory Commission. 2004. Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission. Washington, DC. NRC NUREG/BR-0058, Rev. 4. July 2000. ADAMS No. ML003738939.

[NRC] U.S. Nuclear Regulatory Commission. 2011. Summary of site audit related to the review of the license renewal application for South Texas Project, Units 1 and 2. August 4, 2011. ADAMS No. ML11196A005.

[NRC] U.S. Nuclear Regulatory Commission. 2012. Environmental Impact Statement Scoping Process, Summary Report, South Texas Project, Units 1 and 2, Bay City, TX. Washington, DC. NRC. 2012. ADAMS No. ML11153A082.

[STPNOC] South Texas Project Nuclear Operating Company. 2010. "South Texas Project, Applicant's Environmental Report—Operating License Renewal Stage, South Texas Project Units 1 & 2." September 2010. ADAMS No. ML103010263.

[STPNOC] South Texas Project Nuclear Operating Company. 2011. Letter from G.T. Powell, STPNOC, to U.S. Nuclear Regulatory Commission Document Control Desk, Subject: South Texas Project Units 1 and 2, Docket Nos. STN 50-498, STN 50-499, Response to Request for

Additional Information on South Texas Project License Renewal Application (TAC No. ME4938). July 5, 2011. ADAMS No. ML11193A016.

[STPNOC] South Texas Project Nuclear Operating Company. 2011b. Letter from G.T. Powell, STPNOC, to U.S. Nuclear Regulatory Commission Document Control Desk, Subject: South Texas Project Units 1 and 2, Docket Nos. STN 50-498, STN 50-499, Response to Request for Additional Information on South Texas Project License Renewal Application (TAC No. ME4938). August 23, 2011. ADAMS No. ML11250A067.

[STPNOC] South Texas Project Nuclear Operating Company. 2012b. Letter from D.W. Rencurrel, STPNOC, to U.S. Nuclear Regulatory Commission Document Control Desk, Subject: South Texas Project Units 1 and 2, Docket Nos. STN 50-498, STN 50-499, Clarification to Supplemental Response to Request for Additional Information on South Texas Project License Renewal Application—SAMA (TAC Nos. ME4938 and ME5122). February 16, 2012. ADAMS No. ML12053A259.

6.0 ENVIRONMENTAL IMPACTS OF THE URANIUM FUEL CYCLE, WASTE MANAGEMENT, AND GREENHOUSE GAS EMISSIONS

This chapter addresses issues related to the uranium fuel cycle, solid waste management, and greenhouse gas (GHG) emissions during the proposed 20-year period of extended operation.

6.1 The Uranium Fuel Cycle

The uranium fuel cycle includes uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, transportation of radioactive materials, and management of low-level wastes and high-level wastes related to uranium fuel cycle activities. The generic potential impacts of the radiological and non-radiological environmental impacts of the uranium fuel cycle and transportation of nuclear fuel and wastes are described in detail in NUREG-1437, *Generic Environmental Impact Statement* (GEIS) *for License Renewal of Nuclear Plants* (NRC 1996, 1999) based, in part, on the generic impacts given in Table S–3, “Table of Uranium Fuel Cycle Environmental Data,” located at Title 10, Part 51.51, of the *Code of Federal Regulations* (10 CFR 51.51), and in 10 CFR 51.52(c), Table S–4, “Environmental Impact of Transportation of Fuel and Waste to and from One Light-Water-Cooled Nuclear Power Reactor.”

In the GEIS, the U.S. Nuclear Regulatory Commission (NRC) staff identified nine Category 1 issues related to the fuel cycle and waste management, which appear in Table 6–1. There are no Category 2 issues related to the fuel cycle and waste management.

Table 6–1. Issues Related to the Uranium Fuel Cycle and Waste Management

Issues	GEIS Sections	Category
Offsite radiological impacts (individual effects from other than the disposal of spent fuel & high-level waste)	6.1; 6.2.1; 6.2.2.1; 6.2.2.3; 6.2.3; 6.2.4; 6.6	1
Offsite radiological impacts (collective effects)	6.1; 6.2.2.1; 6.2.3; 6.2.4; 6.6	1
Offsite radiological impacts (spent fuel and high-level waste disposal)	6.2.2.1; 6.2.2.2; 6.2.3; 6.2.4	1
Nonradiological impacts of the uranium fuel cycle	6.1; 6.2.2.6; 6.2.2.7; 6.2.2.8; 6.2.2.9; 6.2.3; 6.2.4; 6.6	1
Low-level waste storage & disposal	6.1; 6.2.2.2;6.4.2; 6.4.3; 6.4.3.1; 6.4.3.2; 6.4.3.3; 6.4.4; 6.4.4.1; 6.4.4.2; 6.4.4.3; 6.4.4.4; 6.4.4.5; 6.4.4.5.1; 6.4.4.5.2; 6.4.4.5.3; 6.4.4.5.4; 6.4.4.6;6.6	1
Mixed waste storage & disposal	6.4.5.1; 6.4.5.2; 6.4.5.3; 6.4.5.4; 6.4.5.5; 6.4.5.6; 6.4.5.6.1; 6.4.5.6.2; 6.4.5.6.3; 6.4.5.6.4; 6.6	1
Onsite spent fuel	6.1; 6.4.6; 6.4.6.1; 6.4.6.2; 6.4.6.3; 6.4.6.4; 6.4.6.5; 6.4.6.6; 6.4.6.7; 6.6	1
Nonradiological waste	6.1; 6.5; 6.5.1; 6.5.2; 6.5.3; 6.6	1
Transportation	6.1; 6.3.1; 6.3.2.3; 6.3.3; 6.3.4; 6.6, Addendum 1	1

The issue, "offsite radiological impacts (spent fuel and high-level waste disposal)," from Table 6-1, is not evaluated in this environmental impact statement (EIS), as explained later in this section. For the term of license renewal, the NRC staff did not identify any new and significant information related to the remaining uranium fuel cycle and waste management issues listed in Table 6-1 during its review of the STP Nuclear Operating Company (STPNOC) Environmental Report (STPNOC 2010), the site visit, and the scoping process. Therefore, there are no impacts related to these issues beyond those discussed in the GEIS. For these Category 1 issues, the GEIS concludes that the impacts are SMALL, except for the offsite radiological impacts (collective effects) from the uranium fuel cycle and waste management, which the NRC concluded are acceptable.

However, the offsite radiological impacts resulting from spent fuel and high-level waste disposal, that will occur after the reactors have been permanently shut down, are addressed in the Commission's Waste Confidence Decision Rule (WCD), 10 CFR 51.23. In 2010, the Commission revised the WCD (i.e., WCD Update) to reflect information gained based on experience in the storage of spent nuclear fuel and the increased uncertainty in the siting and construction of a permanent geologic repository for the disposal of spent nuclear fuel.

On June 8, 2012, the United States Court of Appeals for the District of Columbia Circuit (New York v. NRC, 681 F.3d 471 (D.C. Cir. 2012)), in response to a legal challenge to the WCD, vacated the NRC's WCD Update (75 *Federal Register* (FR) 81,032 and 75 FR 81,037). The court decision was based on grounds relating to aspects of the National Environmental Policy Act (NEPA). The court decision held that the WCD Update is a major Federal action necessitating either an EIS or a finding of no significant environmental impact (FONSI), and the Commission's evaluation of the risks associated with the storage of spent nuclear fuel for at least 60 years beyond the licensed life for reactor operation is deficient.

In response to the court's ruling, the Commission, in CLI-12-16 (NRC 2012), determined that it would not issue licenses dependent upon the WCD until the issues identified in the court's decision are appropriately addressed. In CLI-12-16, the Commission also noted that this determination extends only to final license issuance; all current licensing reviews and proceedings should continue to move forward.

In addition, the Commission directed (SRM-COMSECY-12-0016) the NRC staff to proceed with a rulemaking that includes the development of an EIS to support an updated WCD within 24 months (by September 2014). The Commission indicated that the EIS used to support the revised rule should build on the information already documented in various NRC studies and reports on the impacts associated with the storage of spent nuclear fuel that were developed as part of the 2010 WCD Update. It should primarily focus additional analyses on the deficiencies identified in the D.C. Circuit's decision. The NRC considers the WCD to be a generic issue that is best addressed through rulemaking and that the NRC rulemaking process provides an appropriate forum for public review and comment on both the draft EIS and the proposed WCD.

The updated rule and supporting EIS will provide the necessary NEPA analyses of waste confidence-related human health and environmental issues. As directed by the Commission, the NRC will not issue a renewed license prior to the resolution of waste confidence-related issues. This will ensure that there would be no irretrievable or irreversible resource commitments or potential harm to the environment before waste confidence impacts have been addressed.

If the results of the WCD EIS identify information that requires a supplement to this EIS, the NRC staff will perform any appropriate additional NEPA review for those issues before the NRC makes a final licensing decision.

6.2 Greenhouse Gas Emissions

This section discusses the potential impacts from GHGs emitted from the nuclear fuel cycle. The GEIS does not directly address these emissions, and its discussion is limited to an inference that substantial carbon dioxide emissions may occur if coal- or oil-fired alternatives to license renewal are carried out.

6.2.1 Existing Studies

Since the development of the GEIS, the relative volumes of GHGs emitted by nuclear and other electricity generating methods have been widely studied. However, estimates and projections of the carbon footprint of the nuclear power lifecycle vary depending on the type of study done. Additionally, considerable debate also exists among researchers on the relative effects of nuclear and other forms of electricity generation on GHG emissions. Existing studies on GHG emissions from nuclear power plants generally take two different forms:

(1) qualitative discussions of the potential to use nuclear power to reduce GHG emissions and mitigate global warming, and

(2) technical analyses and quantitative estimates of the actual amount of GHGs generated by the nuclear fuel cycle or entire nuclear power plant life cycle and comparisons to the operational or life cycle emissions from other energy generation alternatives.

Qualitative Studies. The qualitative studies consist primarily of broad evaluations, large-scale public policy evaluations, or investment evaluations of whether an expansion of nuclear power is likely to be a technically, economically, or politically workable means of achieving global GHG reductions. Studies found by the staff during the subsequent literature search include the following:

- Evaluations to determine if investments in nuclear power in developing countries should be accepted as a flexibility mechanism to assist industrialized nations in achieving their GHG reduction goals under the Kyoto Protocols (IAEA 2000; NEA 2002; Schneider 2000). Ultimately, the parties to the Kyoto Protocol did not approve nuclear power as a component under the clean development mechanism (CDM) due to safety and waste disposal concerns (NEA 2002).

- Analyses developed to assist governments, including the U.S. Government, in making long-term investment and public policy decisions in nuclear power (Hagen et al. 2001; Keepin 1988; MIT 2003).

Although the qualitative studies sometimes reference and critique the existing quantitative estimates of GHGs produced by the nuclear fuel cycle or life cycle, their conclusions generally rely heavily on discussions of other aspects of nuclear policy decisions and investment such as safety, cost, waste generation, and political acceptability. Therefore, these studies are typically not directly applicable to an evaluation of GHG emissions associated with the proposed license renewal for a given nuclear power plant.

Quantitative Studies. A large number of technical studies, including calculations and estimates of the amount of GHGs emitted by nuclear and other power generation options, are available in the literature and were useful to the staff's efforts in addressing relative GHG emission levels. Examples of these studies include—but are not limited to—Mortimer (1990), Andseta et al. (1998), Spadaro (2000), Storm van Leeuwen and Smith (2008), Fritsche (2006), Parliamentary Office of Science and Technology (POST) (2006), Atomic Energy Authority (AEA) (2006), Weisser (2006), Fthenakis and Kim (2007), and Dones (2007).

Comparing these studies and others like them is difficult because the assumptions and components of the lifecycles the authors evaluate vary widely. Examples of areas in which differing assumptions make comparing the studies difficult include the following:

- energy sources that may be used to mine uranium deposits in the future,
- reprocessing or disposal of spent nuclear fuel,
- current and potential future processes to enrich uranium and the energy sources that will power them,
- estimated grades and quantities of recoverable uranium resources,
- estimated grades and quantities of recoverable fossil-fuel resources,
- estimated GHG emissions other than carbon dioxide, including the conversion to carbon dioxide equivalents per unit of electric energy produced,
- performance of future fossil-fuel power systems,
- projected capacity factors for alternatives means of generation, and
- current and potential future reactor technologies.

In addition, studies may vary with respect to whether all or parts of a power plant's lifecycle are analyzed (i.e., a full lifecycle analysis will typically address plant construction, operations, resource extraction (for fuel and construction materials), and decommissioning, whereas a partial lifecycle analysis primarily focuses on operational differences).

In the case of license renewal, a GHG analysis for that portion of the plant's lifecycle (operation for an additional 20 years) would not involve GHG emissions associated with construction because construction activities have already been completed at the time of relicensing. In addition, the proposed action of license renewal would also not involve additional GHG emissions associated with facility decommissioning because that decommissioning must occur whether the facility is relicensed or not. However, in some of the above-mentioned studies, the specific contribution of GHG emissions from construction, decommissioning, or other portions of a plant's lifecycle cannot be clearly separated from one another. In such cases, an analysis of GHG emissions would overestimate the GHG emissions attributed to a specific portion of a plant's lifecycle. Nonetheless, these studies supply some meaningful information with respect to the relative magnitude of the emissions among nuclear power plants and other forms of electric generation, as discussed in the following sections.

In Table 6–2, Table 6–3, and Table 6–4, the staff presents the results of the above-mentioned quantitative studies to supply a weight-of-evidence evaluation of the relative GHG emissions that may result from the proposed license renewal as compared to the potential alternative use of coal-fired, natural gas-fired, and renewable generation. Most studies from Mortimer (1990) onward suggest that uranium ore grades and uranium enrichment processes are leading determinants in the ultimate GHG emissions attributable to nuclear power generation. These studies show that the relatively lower order of magnitude of GHG emissions from nuclear power, when compared to fossil-fueled alternatives (especially natural gas), could potentially disappear if available uranium ore grades drop sufficiently while enrichment processes continued to rely on the same technologies.

Summary of Nuclear Greenhouse Gas Emissions Compared to Coal. Considering that coal fuels the largest share of electricity generation in the U.S. and that its burning results in the largest emissions of GHGs for any of the likely alternatives to nuclear power generation, including South Texas Project (STP), most of the available quantitative studies focused on comparisons of the relative GHG emissions of nuclear to coal-fired generation. The quantitative estimates of the GHG emissions associated with the nuclear fuel cycle (and, in some cases, the nuclear lifecycle), as compared to an equivalent coal-fired plant, are presented in Table 6–2. The staff considered the best available information for its independent analysis. Although the following chart does not include all existing studies, it gives an illustrative range of estimates developed by various sources.

Table 6–2. Nuclear Greenhouse Gas Emissions Compared to Coal

Source	GHG Emission Results
Mortimer (1990)	Nuclear—230,000 tons CO_2[(a)] Coal—5,912,000 tons CO_2 Note: Future GHG emissions from nuclear to increase because of declining ore grade.
Andseta et al. (1998)	Nuclear energy produces 1.4% of the GHG emissions compared to coal. Note: Future reprocessing and use of nuclear-generated electrical power in the mining and enrichment steps are likely to change the projections of earlier authors, such as Mortimer (1990).
Spadaro (2000)	Nuclear—2.5–5.7 g C_{eq}/kWh Coal—264–357 g C_{eq}/kWh
Fritsche (2006) (Values estimated from graph in Figure 4)	Nuclear—33 g C_{eq}/kWh Coal—950 g C_{eq}/kWh
POST (2006) (Nuclear calculations from AEA 2006)	Nuclear—5 g C_{eq}/kWh Coal—>1,000 g C_{eq}/kWh Note: Decrease of uranium ore grade to 0.03% would raise nuclear to 6.8 g C_{eq}/kWh. Future improved technology and carbon capture and storage could reduce coal-fired GHG emissions by 90%.
Weisser (2006) (Compilation of results from other studies)	Nuclear—2.8–24 g C_{eq}/kWh Coal—950–1,250 g C_{eq}/kWh

(a) CO_2 is carbon dioxide.

6.2.1.2 Summary of Nuclear Greenhouse Gas Emissions Compared to Natural Gas

The quantitative estimates of the GHG emissions associated with the nuclear fuel cycle (and, in some cases, the nuclear lifecycle), as compared to an equivalent natural gas-fired plant, are presented in Table 6–3. In considering the best available information for its independent analysis, the staff noted that the following chart does not include all existing studies; however, it gives an illustrative range of estimates developed by various sources.

Table 6–3. Nuclear Greenhouse Gas Emissions Compared to Natural Gas

Source	GHG Emission Results
Spadaro (2000)	Nuclear—2.5–5.7 g C_{eq}/kWh Natural Gas—120–188 g C_{eq}/kWh
Storm van Leeuwen & Smith (2008)	Nuclear fuel cycle produces 20–33% of the GHG emissions compared to natural gas (at high ore grades). Note: Future nuclear GHG emissions to increase because of declining ore grade.
Fritsche (2006) (Values estimated from graph in Figure 4)	Nuclear—33 g C_{eq}/kWh Cogeneration Combined Cycle Natural Gas—150 g C_{eq}/kWh
POST (2006) (Nuclear calculations from AEA 2006)	Nuclear—5 g C_{eq}/kWh Natural Gas—500 g C_{eq}/kWh Note: Decrease of uranium ore grade to 0.03% would raise nuclear to 6.8 g C_{eq}/kWh. Future improved technology and carbon capture and storage could reduce natural gas GHG emissions by 90%.
Weisser (2006) (Compilation of results from other studies)	Nuclear—2.8–24 g C_{eq}/kWh Natural Gas—440–780 g C_{eq}/kWh
Dones (2007)	Author critiqued methods and assumptions of Storm van Leeuwen and Smith (2005) and concluded that the nuclear fuel cycle produces 15–27% of the GHG emissions of natural gas.

Summary of Nuclear Greenhouse Gas Emissions Compared to Renewable Energy Sources. The quantitative estimates of the GHG emissions associated with the nuclear fuel cycle, as compared to equivalent renewable energy sources, are presented in Table 6–4. Calculation of GHG emissions associated with these sources is more difficult than the calculations for nuclear energy and fossil fuels because of the large variation in efficiencies due to their different sources and locations. For example, the efficiency of solar and wind energy is highly dependent on the location in which the power generation facility is installed. Similarly, the range of GHG emissions estimates for hydropower varies greatly, depending on the type of dam or reservoir involved (if used at all). Therefore, the GHG emissions estimates for these energy sources have a greater range of variability than the estimates for nuclear and fossil-fuel sources. As noted in Section 6.2.1.2, the following chart gives an illustrative range of estimates developed by various sources.

Table 6–4. Nuclear Greenhouse Gas Emissions Compared to Renewable Energy Sources

Source	GHG Emission Results
Mortimer (1990)	Nuclear—230,000 tons CO_2 Hydropower—78,000 tons CO_2 Wind power—54,000 tons CO_2 Tidal power—52,500 tons CO_2 Note: Future GHG emissions from nuclear are expected to increase because of declining ore grade.
Spadaro (2000)	Nuclear—2.5–5.7 g C_{eq}/kWh Solar PV—27.3–76.4 g C_{eq}/kWh Hydroelectric—1.1–64.6 g C_{eq}/kWh Biomass—8.4–16.6 g C_{eq}/kWh Wind—2.5–13.1 g C_{eq}/kWh
Fritsche (2006) (Values estimated from graph in Figure 4)	Nuclear—33 g C_{eq}/kWh Solar PV—125 g C_{eq}/kWh Hydroelectric—50 g C_{eq}/kWh Wind—20 g C_{eq}/kWh
POST (2006) (Nuclear calculations from AEA 2006)	Nuclear—5 g C_{eq}/kWh Biomass—25–93 g C_{eq}/kWh Solar PV—35–58 g C_{eq}/kWh Wave/Tidal—25–50 g C_{eq}/kWh Hydroelectric—5–30 g C_{eq}/kWh Wind—4.64–5.25 g C_{eq}/kWh Note: Decrease of uranium ore grade to 0.03% would raise nuclear to 6.8 g C_{eq}/kWh.
Weisser (2006) (Compilation of results from other studies)	Nuclear—2.8–24 g C_{eq}/kWh Solar PV—43–73 g C_{eq}/kWh Hydroelectric—1–34 g C_{eq}/kWh Biomass—35–99 g C_{eq}/kWh Wind—8–30 g C_{eq}/kWh
Fthenakis & Kim (2007)	Nuclear—16–55 g C_{eq}/kWh Solar PV—17–49 g C_{eq}/kWh

[a] CO_2 is carbon dioxide.

<u>Conclusion</u>. The sampling of data presented in Table 6–2, Table 6–3, and Table 6–4 demonstrates the challenges of any attempt to determine the specific amount of GHG emission attributable to nuclear energy production sources, as different assumptions and calculation methods will yield differing results. The differences and complexities in these assumptions and analyses will further increase when they are used to project future GHG emissions. Nevertheless, several conclusions can be drawn from the information presented.

First, the various studies show a general consensus that nuclear power currently produces fewer GHG emissions than electrical generation based on fossil fuel. For example, the GHG emissions from a complete nuclear fuel cycle currently range from 2.5 to 55 grams of carbon equivalent per Kilowatt hour (g C_{eq}/kWh), as compared to the use of coal plants (264 to 1,250 g C_{eq}/kWh) and natural gas plants (120 to 780 g C_{eq}/kWh). The studies also give estimates of GHG emissions from five renewable energy sources based on current technology. These estimates included solar-photovoltaic (17 to 125 g C_{eq}/kWh), hydroelectric

(1 to 64.6 g C_{eq}/kWh), biomass (8.4 to 99 g C_{eq}/kWh), wind (2.5 to 30 g C_{eq}/kWh), and tidal (25 to 50 g C_{eq}/kWh). The range of these estimates is wide, but the general conclusion is that current GHG emissions from the nuclear fuel cycle are of the same order of magnitude as from these renewable energy sources.

Second, the studies show no consensus on future relative GHG emissions from nuclear power and other sources of electricity. There is substantial disagreement among the various authors about the GHG emissions associated with declining uranium ore concentrations, future uranium enrichment methods, and other factors, including changes in technology. Similar disagreement exists about future GHG emissions associated with coal and natural gas for electricity generation. Even the most conservative studies conclude that the nuclear fuel cycle currently produces fewer GHG emissions than sources based on fossil fuel and is expected to continue to do so in the near future. The primary difference between the authors is the projected cross-over date (the time at which GHG emissions from the nuclear fuel cycle exceed those sources based on fossil fuel) or whether cross-over will actually occur.

Considering the current estimates and future uncertainties, it appears that GHG emissions associated with the proposed STP relicensing action are likely to be lower than those associated with energy sources based on fossil fuel. The staff bases this conclusion on the following rationale:

- As shown in Table 6–2 and Table 6–3, the current estimates of GHG emissions from the nuclear fuel cycle are far below those for energy sources based on fossil fuel.
- License renewal of a nuclear power plant like STP may involve continued GHG emissions due to uranium mining, processing, and enrichment, but will not result in increased GHG emissions associated with plant construction or decommissioning (as the plant will have to be decommissioned at some point whether the license is renewed or not).
- Few studies predict that nuclear fuel cycle emissions will exceed those of fossil fuels within a timeframe that includes the STP periods of extended operation. Several studies suggest that future extraction and enrichment methods, the potential for higher-grade resource discovery, and technology improvements could extend this timeframe.

With respect to comparison of GHG emissions among the proposed STP license renewal action and renewable energy sources, it appears likely that there will be future technology improvements and changes in the type of energy used for mining, processing, and constructing facilities of all types. Currently, the GHG emissions associated with the nuclear fuel cycle and renewable energy sources are within the same order of magnitude. Because nuclear fuel production is the most significant contributor to possible future increases in GHG emissions from nuclear power—and because most renewable energy sources lack a fuel component—it is likely that GHG emissions from renewable energy sources would be lower than those associated with STP at some point during the period of extended operation.

The staff also supplies an additional discussion about the contribution of GHG to cumulative air quality impacts in Section 4.11.2 of this supplemental environmental impact statement (SEIS).

6.3 References

10 CFR 51. *Code of Federal Regulations*, Title 10, *Energy*, Part 51, “Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions.”

10 CFR 54. *Code of Federal Regulations*, Title 10, *Energy*, Part 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants.”

[AEA] AEA Technology. 2006. “Carbon Footprint of the Nuclear Fuel Cycle, Briefing Note.” East Kilbride, UK: British Energy Group. March 2006. Available at <http://www.british-energy.com/documents/carbon_footprint.pdf> (accessed on April 5, 2012).

Andseta S, Thompson MJ, Jarrell JP, Pendergast DR. 1998. CANDU Reactors and Greenhouse Gas Emissions. *Proceedings of the 19th Annual Conference, Canadian Nuclear Society*; 1998 October 18-21; Toronto, Ontario. Available at <http://www.computare.org/Support%20documents/Publications/Life%20Cycle.htm> (accessed on April 5, 2012).

Dones R. 2007. *Critical Note on the Estimation by Storm Van Leeuwen JW and Smith P of the Energy Uses and Corresponding CO_2 Emissions for the Complete Nuclear Energy Chain*. Villigen, Switzerland: Paul Sherer Institute. April 2007. Available at <http://gabe.web.psi.ch/pdfs/Critical%20note%20GHG%20PSI.pdf> (accessed on April 5, 2012).

Fritsche UR. 2006. *Comparison of Greenhouse-Gas Emissions and Abatement Cost of Nuclear and Alternative Energy Options from a Life-Cycle Perspective*. Freiburg, Germany: Oko-Institut. January 2006. Available at <http://www.oeko.de/oekodoc/315/2006-017-en.pdf> (accessed on April 5, 2012)

Fthenakis VM, Kim HC. 2007. Greenhouse-gas emissions from solar-electric and nuclear power: A life cycle study. *Energy Policy* 35(4):2549–2557.

[IAEA] International Atomic Energy Agency. 2000. *Nuclear Power for Greenhouse Gas Mitigation under the Kyoto Protocol: The Clean Development Mechanism (CDM)*. Vienna, Austria: IAEA. November 2000. Available at <http://www.iaea.org/Publications/Booklets/GreenhouseGas/greenhousegas.pdf> (accessed on April 5, 2012).

Mortimer N. 1990. World warms to nuclear power. *SCRAM Safe Energy Journal* Dec 89/Jan 90. Available at <http://www.no2nuclearpower.org.uk/articles/mortimer_se74.php> (accessed on April 5, 2012).

[NEA and OECD] Nuclear Energy Agency and the Organization for Economic Co-operation and Development. 2002. *Nuclear Energy and the Kyoto Protocol*. Paris, France: OECD. Available at <http://www.nea.fr/ndd/reports/2002/nea3808-kyoto.pdf> (accessed on April 5, 2012).

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

[NRC] U.S. Nuclear Regulatory Commission. *Code Manual for MACCS2: Volume 1, User’s Guide*. Washington, DC. NRC. NUREG/CR–6613. May 1998. ADAMS No. ML063550020.

[NRC] U.S. Nuclear Regulatory Commission. 1999. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*, Main Report, “Section 6.3, Transportation, Table 9.1, Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants, Final Report.” NUREG-1437, Volume 1, Addendum 1, Washington, DC.

[NRC] U.S. Nuclear Regulatory Commission. 2012. Commission, Memorandum and Order CLI-12-16, ADAMS No. ML12220A094.

[POST] Parliamentary Office of Science and Technology. 2006. Carbon footprint of electricity generation. *Postnote* 268. October 2006. Available at <http://www.parliament.uk/documents/post/postpn268.pdf> (accessed on April 5, 2012).

Schneider M. 2000. *Climate Change and Nuclear Power*. Gland, Switzerland: WWF-World Wildlife Fund for Nature. April 2000. Available at <http://assets.panda.org/downloads/fullnuclearreprotwwf.pdf> (accessed on April 5, 2012).

Spadaro JV, Langlois L, Hamilton B. 2000. "Greenhouse Gas Emissions of Electricity Generation Chains: Assessing the Difference." Vienna, Austria: International Atomic Energy Agency. Available at <http://www.iaea.org/Publications/Magazines/Bulletin/Bull422/article4.pdf>.

[STPNOC] STP Nuclear Operating (STPNOC). 2010. *License Renewal Application, South Texas Project, Units 1 and 2*, Appendix E, Applicant's Environmental Report, Operating License Renewal Stage. ADAMS No. ML103010257.

Storm van Leeuwen JW, Smith P. 2008. *Nuclear Power—The Energy Balance*. Chaam, Netherlands: Ceedata Consultancy. February 2008. Available at <http://www.stormsmith.nl/> (accessed on April 5, 2012).

Weisser D. 2006. A guide to life-cycle greenhouse gas (GHG) emissions from electric supply technologies. *Energy* 32(9): 1543–1559. Available at <http://www.iaea.org/OurWork/ST/NE/Pess/assets/GHG_manuscript_pre-print_versionDanielWeisser.pdf> (accessed on April 5, 2012).

7.0 ENVIRONMENTAL IMPACTS OF DECOMMISSIONING

Environmental impacts from the activities associated with the decommissioning of any reactor before or at the end of an initial or renewed license are evaluated in Supplement 1 of NUREG-0586, *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities Regarding the Decommissioning of Nuclear Power Reactors* (NRC 2002). The U.S. Nuclear Regulatory Commission (NRC) staff's (the staff's) evaluation of the environmental impacts of decommissioning—presented in NUREG-0586, Supplement 1—notes a range of impacts for each environmental issue.

Additionally, the incremental environmental impacts associated with decommissioning activities resulting from continued plant operation during the renewal term are discussed in NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) (NRC 1996, 1999). The GEIS includes a determination of whether the analysis of the environmental issue could be applied to all plants and whether additional mitigation measures would be warranted. Issues were then assigned a Category 1 or a Category 2 designation. Section 1.4 of this supplemental environmental impact statement (SEIS) explains the criteria for Category 1 and Category 2 issues and defines the impact designations of SMALL, MODERATE, and LARGE. The staff analyzed site-specific issues (Category 2) for South Texas Project (STP) and assigned them a significance level of SMALL, MODERATE, or LARGE, or not applicable to STP because of site characteristics or plant features. There are no Category 2 issues related to decommissioning.

7.1 Decommissioning

Table 7–1 lists the Category 1 issues in Table B–1 of Title 10 of the *Code of Federal Regulations* (CFR) Part 51, Subpart A, Appendix B, that are applicable to STP decommissioning following the renewal term.

Table 7–1. Issues Related to Decommissioning

Issues	GEIS Sections	Category
Radiation doses	7.3.1; 7.4	1
Waste management	7.3.2; 7.4	1
Air quality	7.3.3; 7.4	1
Water quality	7.3.4; 7.4	1
Ecological resources	7.3.5; 7.4	1
Socioeconomic impacts	7.3.7; 7.4	1

Decommissioning would occur whether STP were shut down at the end of its current operating license or at the end of the period of extended operation. There are no site-specific issues related to decommissioning.

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, 10 CFR Part 51, for each of the issues follows:

Radiation Doses. Based on information in the GEIS, the NRC noted that "[d]oses to the public will be well below applicable regulatory standards regardless of which decommissioning method is used. Occupational doses would increase no more than 1 person-rem (1 person-mSv) caused by buildup of long-lived radionuclides during the license renewal term."

Waste Management. Based on information in the GEIS, the NRC noted that "[d]ecommissioning at the end of a 20-year license renewal period would generate no more solid wastes than at the end of the current license term. No increase in the quantities of Class C or greater than Class C wastes would be expected."

Air Quality. Based on information in the GEIS, the NRC noted that "[a]ir quality impacts of decommissioning are expected to be negligible either at the end of the current operating term or at the end of the license renewal term."

Water Quality. Based on information in the GEIS, the NRC noted that "[t]he potential for significant water quality impacts from erosion or spills is no greater whether decommissioning occurs after a 20-year license renewal period or after the original 40-year operation period, and measures are readily available to avoid such impacts."

Ecological Resources. Based on information in the GEIS, the NRC noted that "[d]ecommissioning after either the initial operating period or after a 20-year license renewal period is not expected to have any direct ecological impacts."

Socioeconomic Impacts. Based on information in the GEIS, the NRC noted that "[d]ecommissioning would have some short-term socioeconomic impacts. The impacts would not be increased by delaying decommissioning until the end of a 20-year relicense period, but they might be decreased by population and economic growth."

The staff has not found any new and significant information during its independent review of South Texas Project Nuclear Operating Company's (STPNOC's) Environmental Report (ER) (STPNOC 2010), the site audit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes that there are no impacts related to these issues, beyond those discussed in the GEIS (NRC 1996, 1999). For all of these issues, the NRC staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

7.2 References

10 CFR 51. *Code of Federal Regulations*, Title 10, *Energy*, Part 51, "Environmental protection regulations for domestic licensing and related regulatory functions."

[NRC] U.S. Nuclear Regulatory Commission. 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. Washington, DC: NRC. NUREG-1437. May 1996. ADAMS Nos. ML040690705 and ML040690738.

[NRC] U.S. Nuclear Regulatory Commission. 1999. Section 6.3, Transportation, Table 9.1, Summary of findings on NEPA issues for license renewal of nuclear power plants. In: *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. Washington, DC: NRC. NUREG-1437, Volume 1, Addendum 1. August 1999. ADAMS No. ML04069720.

[NRC] U.S. Nuclear Regulatory Commission. 2002. *Final Generic Environmental Impact Statement on Decomissioning of Nuclear Facilities Regarding the Decommissioning of Nuclear*

Power Reactors. Washington, DC. NRC. NUREG-0586, Supplement 1. November 2002. ADAMS No. ML023470304 and ML023500295.

[STPNOC] South Texas Plant Nuclear Operating Company. 2010. “South Texas Project, Applicant’s Environmental Report—Operating License Renewal Stage, South Texas Project Units 1 & 2.” September 2010. ADAMS No. ML103010263.

8.0 ENVIRONMENTAL IMPACTS OF ALTERNATIVES

The National Environmental Policy Act (NEPA) requires the consideration of a range of reasonable alternatives to the proposed action in an environmental impact statement (EIS). In this case, the proposed action is whether to issue renewed licenses for South Texas Project (STP), Units 1 and 2, which will allow the plant to operate for 20 years beyond the current license expiration dates. A license is just one of many authorizations that an applicant must obtain in order to operate its nuclear plant. Energy-planning decisionmakers and the owners of the nuclear power plant ultimately decide if the plant will operate. Economic and environmental considerations play a primary role in this decision. The U.S. Nuclear Regulatory Commission's (NRC's) responsibility is to ensure the safe operation of nuclear power facilities, not to formulate energy policy or encourage or discourage the development of alternative power generation (or replacement power alternatives).

The license renewal process is designed to assure safe operation of the nuclear power plant during the license renewal term. Under the NRC's environmental protection regulations in Title 10, Part 51, of the *Code of Federal Regulations* (10 CFR Part 51), which implement Section 102(2) of NEPA, renewal of a nuclear power plant operating license requires the preparation of an EIS.

To support the preparation of these EISs, the NRC prepared the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)*, NUREG-1437, in 1996. The license renewal GEIS was prepared to assess the environmental impacts of continued nuclear power plant operations during the license renewal term. The intent was to determine which environmental impacts would result in essentially the same impact at all nuclear power plants and which ones could result in different levels of impacts at different plants and would require a plant-specific analysis to determine the impacts. For those issues that could not be generically addressed, the NRC develops a plant-specific supplemental environmental impact statement (SEIS) to the GEIS.

NRC regulations in 10 CFR 51.71(d) for license renewal require that a SEIS do the following:

> Consider and weigh the environmental effects of the proposed action [license renewal]; the environmental impacts of alternatives to the proposed action; and alternatives available for reducing or avoiding adverse environmental effects.

While the GEIS reached generic conclusions regarding many environmental issues associated with license renewal, it did not determine which alternatives are reasonable or reach conclusions about site-specific environmental impact levels. As such, the NRC must evaluate environmental impacts of alternatives on a site-specific basis.

As stated in Chapter 1 of this SEIS, alternatives to renewing STPNOC's operating licenses must meet the purpose and need for the proposed action. They must "provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, and, where authorized, Federal (other than NRC) [decisionmakers]."

The NRC ultimately makes no decision about which alternative (or the proposed action) to carry out because that decision falls to the appropriate energy-planning decisionmakers.

Comparing the environmental effects of these alternatives will help the NRC decide if the adverse environmental impacts of license renewal are great enough to deny the option of license renewal for energy-planning decisionmakers (10 CFR 51.95(c)(4)). If the NRC acts to issue a renewed license, all of the alternatives, including the proposed action, will be available to energy-planning decisionmakers. If NRC decides not to renew the license (or takes no action at all), then energy-planning decisionmakers may no longer elect to continue operating STP and will have to resort to another alternative—which may or may not be one of the alternatives considered in this section—to meet their energy needs now being satisfied by STP.

Alternatives Evaluated In-Depth:

- new nuclear,
- natural gas-fired combined-cycle (NGCC),
- supercritical coal,
- combination alternative (NGCC, wind, and energy efficiency and conservation), and
- purchased power.

Other Alternatives Considered:

- offsite nuclear-, gas-, or coal- generation,
- energy efficiency and conservation,
- wind power,
- solar power,
- hydroelectric power,
- wave and ocean energy,
- geothermal power,
- municipal solid waste,
- biomass,
- biofuels,
- oil-fired power,
- fuel cells, and
- delayed retirement.

In evaluating alternatives to license renewal, the NRC considered energy technologies or options currently in commercial operation, as well as some technologies not currently in commercial operation but likely to be commercially available by the time the current STP operating licenses expire. The current operating licenses for STP, Units 1 and 2, will expire on August 20, 2027, and December 15, 2028, respectively. The NRC's analysis assumed that an alternative must be available (able to be constructed, permitted, and connected to the grid) by the time the current STP licenses expire.

NRC eliminated alternatives that cannot meet future system needs by providing the amounts of baseload power equivalent to the STP current generating capacity (2,500 megawatts electric (MWe)) and whose costs or benefits do not justify inclusion in the range of reasonable alternatives from detailed studies. NRC evaluated the remaining alternatives, which are discussed in-depth in this section. Each alternative eliminated from detailed study is briefly discussed, and a basis for its removal is provided at the end of this section. In total, 18 energy technology options and alternatives to the proposed action were considered (see text box) and then narrowed to the 5 alternatives considered in Sections 8.1 through 8.5. The no-action alternative is considered in Section 8.7.

The GEIS presents an overview of some energy technologies but does not reach any conclusions about which alternatives are most appropriate. Since 1996, many energy technologies have evolved significantly in capability and cost, while regulatory structures have changed to either promote or impede development of particular alternatives.

As a result, the analyses include updated information from the following sources:

- Energy Information Administration (EIA),
- other offices within the Department of Energy (DOE),
- U.S. Environmental Protection Agency (EPA),
- Electric Reliability Council of Texas (ERCOT),
- industry sources and publications, and
- information submitted by the applicant in the STP Nuclear Operating Company's (STPNOC) Environmental Report (ER).

The evaluation of each alternative considers the environmental impacts across several impact categories: air quality, groundwater use and quality, surface water use and quality, aquatic resources, terrestrial resources, human health, land use, socioeconomics, transportation, aesthetics, archaeological and historic resources, environmental justices, and waste management. A three-level standard of significance—SMALL, MODERATE, or LARGE—is used to indicate the intensity of environmental effects for each alternative undergoing in-depth evaluation. The order of presentation is not meant to imply increasing or decreasing level of impact. Nor does it imply that an energy-planning decisionmaker would select one or another alternative.

For each alternative where it is feasible to do so, the NRC considers the environmental effects of locating the alternative at the existing STP site, as well as at an alternate site. Selecting the existing plant site allows for the maximum use of existing transmission and cooling system infrastructures and minimizes the overall environmental impact.

Energy Outlook

Each year, the EIA—part of the DOE—issues its updated Annual Energy Outlook (AEO). AEO 2011, affirms that natural gas, renewable, and coal are likely to fuel most new electrical capacity through 2035, with some growth in nuclear capacity (EIA 2011a), although all projections are subject to future developments in fuel price, electrical demand, and regulatory changes.

"Natural gas-fired plants account for 60 percent of capacity additions between 2010 and 2035 in the *AEO2011* Reference case, compared with 25 percent for renewables, 11 percent for coal-fired plants, and 3 percent for nuclear. Escalating construction costs have the largest impact on capital-intensive technologies, including nuclear, coal, and renewables. However, Federal tax incentives, State energy programs, and rising prices for fossil fuels increase the competitiveness of renewable and nuclear capacity. In contrast, uncertainty about future limits on GHG [greenhouse-gas] emissions and other possible environmental regulations reduces the competitiveness of coal-fired plants…." (EIA 2011a).

In addition, to ensure that the alternatives analysis was consistent with State or regional energy policies, the NRC reviewed energy relevant statutes, regulations, and policies. The NRC also considered the current generation capacity mix and electricity production data within the ERCOT service area, in which STP, Units 1 and 2, are located. ERCOT is one of eight regional reliability councils in North America and operates under the reliability and safety standards set by the North American Electric Reliability Council (STPNOC 2010a). ERCOT is the independent system operator for the electric grid for most of Texas and manages the flow of electric power to approximately 23 million Texas customers, representing 85 percent of the State's electric load and 75 percent of the State's land area. ERCOT is unique because it is located entirely within the boundaries of the State of Texas. As such, the NRC considered the current generation capacity mix and electricity production data within the ERCOT service area in the evaluation of reasonable alternatives. In 2010, electric generators in ERCOT had an installed generating capacity of approximately 84,400 MWe. This capacity included units fueled by natural gas (57 percent), coal (23 percent), wind (12 percent), nuclear (6 percent), and other sources (2 percent). In 2010, the electric generators in ERCOT provided approximately 319 million megawatt-hours of electricity. Electricity produced was dominated by coal (40 percent) followed by natural gas (38 percent), nuclear (13 percent), wind (8 percent), and other sources (1 percent) (ERCOT 2011a).

Sections 8.1 through 8.5 describe the environmental impacts of alternatives to license renewal. These alternatives include a new nuclear generation option in Section 8.1; a new NGCC in Section 8.2; a new coal-fired plant in Section 8.3; a combination alternative of NGCC, wind, and energy conservation and efficiency in Section 8.4; and purchased power in Section 8.5. In Section 8.6, alternatives considered but eliminated from detailed study are briefly discussed. Finally, the environmental effects that may occur if the NRC takes no action and does not issue renewed licenses for STP are described in Section 8.7. Section 8.8 summarizes, in detail, the impacts of each of the alternatives considered.

8.1 New Nuclear Generation

In this section, the NRC staff evaluates the environmental impacts of a new nuclear generation option at the STP site.

The NRC considers the construction of two new nuclear plants to be a reasonable alternative to STP license renewal for Units 1 and 2 because nuclear generation currently provides baseload power in the ERCOT region, ERCOT expects additional nuclear generation in the future, and the technology to provide nuclear generation is readily available (ERCOT 2011a). In addition, on September 30, 2007, STPNOC submitted combined license (COL) applications to construct and operate two new advanced boiling water reactor (ABWR) nuclear plants (Units 3 and 4) on the STP site (NRC 2011). In its ER for Units 3 and 4, STPNOC's schedule included 5 years from when NRC issues its licenses to when commercial operations could begin (STPNOC 2010b). Therefore, there is sufficient time for STPNOC to prepare and submit an application and build and operate two new nuclear units before the licenses for Units 1 and 2 expire in 2027 and 2028, respectively. This section presents the environmental impacts of the new nuclear generation alternative, which includes constructing and operating two new nuclear plants at the STP site.

In evaluating the new nuclear alternative, based on best available information, the NRC presumed that new reactors would be installed on the STP site, allowing for the maximum use of existing ancillary facilities such as the transmission and cooling systems. The NRC further presumed that the new reactors would be two ABWR reactors similar to what the NRC analyzed in its environmental analysis for Units 3 and 4 in its final EIS (NRC 2011). As of September 2012, NRC is continuing to review the STP application for Units 3 and 4. While the licenses have not been granted as of September 2012, the NRC staff is using the results from its final EIS for Units 3 and 4 because it provides a site-specific analysis of two new nuclear plants at the STP site.

For the purpose of this analysis, each of the two ABWR reactors would have a net electrical output of approximately 1,300 MWe, which is slightly more than the generating capacity (2,500-MWe capacity) of STP, Units 1 and 2 (STPNOC 2010a). STPNOC (2010a) estimated that the power block and ancillary facilities (excluding the cooling-water system) for the new reactors would require approximately 540 ac (219 ha) and that sufficient contiguous acreage was available on the STP site. Because the heat-rejection demands are similar for Units 1 and 2 and proposed Units 3 and 4, the NRC estimated that the existing cooling system—including the existing intake and discharge structures on the main cooling reservoir (MCR) and the Colorado River—would meet the heat-rejection demands of the two new reactors without any modifications. In STPNOC's ER for Units 3 and 4, STPNOC assumed minor modifications would be required to increase operations from two units to four units at the STP site. For the purposes of this analysis, the two new reactors would replace Units 1 and 2 rather than add two new units to the site; therefore, it is unlikely that modification would be required. Construction materials would be delivered via rail, truck, or barge. To accommodate such shipments, STPNOC would need to dredge near the current barge slip, and the rail spur would require upgrades (STPNOC 2010b).

NRC assumed that construction of two new nuclear units at the STP site would generally follow the same timeframe as that described in STPNOC's ER for the construction of Units 3 and 4. This schedule included 12 months for site preparation, 45 months after NRC issues the licenses to complete construction and fuel loading, 6 months from fuel loading to initial power generation for Unit 3, and an additional 12 months for Unit 4 (STPNOC 2010b).

The NRC also considered the installation of multiple small and modular reactors at the STP site as an alternative to renewing the licenses for STP, Units 1 and 2. NRC established the Advanced Reactor Program in the Office of New Reactors due to considerable interest in small and modular reactors along with anticipated license applications by vendors. As of September 2012 (based on best available information), NRC has not received any applications. Because there are no applications to construct and operate small modular reactors on a commercial scale, this analysis focused on nuclear generation by larger nuclear units.

8.1.1 Air Quality

As discussed in Section 2.2.2.1, the STP site is located in central Matagorda County, Texas, at the southern edge of the Metropolitan Houston-Galveston Intrastate Air Quality Control Region (40 CFR 81.38). The Corpus Christi-Victoria Intrastate Air Quality Control Region (40 CFR 81.136) lies immediately south and west of Matagorda County. EPA has designated all of the counties in these Air Quality Control Regions adjacent to the STP site as in compliance with the National Ambient Air Quality Standards (40 CFR 81.344) except Brazoria County to the north; Brazoria County is classified Nonattainment/Severe relative to the 8-hour ozone standard (EPA 2011b).

Construction activities would cause some localized temporary air effects as a result of equipment emissions and fugitive dust from the operation of the earth-moving and material-handling equipment. Emissions from workers' vehicles and motorized construction equipment exhaust would be temporary. Construction crews would use dust-control practices to control and reduce fugitive dust, as proposed for Units 3 and 4 (STPNOC 2010b), and because §111.145 of the Texas Commission for Environmental Quality's (TCEQ) regulations require dust suppression control during the construction of facilities and parking lots.

During operations, two new nuclear plants would have similar air emissions to those of existing STP, Units 1 and 2, and those expected from proposed Units 3 and 4; air emissions would be primarily from backup diesel generators. Because air emissions would be similar for the new nuclear plants, the NRC expects similar air permitting conditions and regulatory requirements as that for Units 3 and 4. In STPNOC's ER for Units 3 and 4, STPNOC stated that "[a]ir emissions sources would be managed in accordance with Federal, Texas, and local air quality control laws and regulations." Permitting would likely include a prevention of significant deterioration (PSD) review and an operating permit from TCEQ.

STPNOC estimated air emissions during the operation of Units 3 and 4 as part of its COL application (NRC 2011; STPNOC 2010b). The largest stationary sources of emissions would be from three standby diesel generators and a single combustion turbine generator, each of which would be operated about 4 hours per month. Table 8–1 lists the expected annual emissions from these sources. NRC assumed that there would be similar air emissions from two new nuclear units.

Table 8–1. Expected Annual Emissions from the Largest Stationary Sources of Emissions

	Diesel Generators (lb/yr)	Combustion Turbine (lb/yr)
Particulates	2,500	44
Sulfur Oxides	9,200	3,800
Carbon Monoxide	9,200	1,800
Hydrocarbons	6,100	120
Nitrogen Oxides	57,900	4,000

Source: STPNOC 2010b

The operation of nuclear power plants involves the emission of some greenhouse gases, primarily carbon dioxide. NRC (2011) estimated that the total carbon footprint for actual plant operations of Units 3 and 4 for 40 years is on the order of 650,000 metric tons (MT) (720,000 tons) of carbon dioxide equivalent (an emissions rate of about 16,000 MT (18,000 tons) annually, averaged over the period of operation). Periodic testing of diesel generators and other activities during plant operations accounts for about 60 percent of the total, or about 190,000 MT (210,000 tons) for each unit. Workforce transportation accounts for the most of the remaining 40 percent, or about 130,000 MT (140,000 tons) for each unit. NRC (2011) based these carbon footprint estimates on information included in Appendix I of the final EIS and emissions data contained in the ER for Units 3 and 4 (STPNOC 2010b). Equipment maintenance and measures taken to mitigate transportation impacts, such as properly maintained asphalt or concrete roads and appropriate speed limits (STPNOC 2010b), would also reduce carbon dioxide emissions, while reducing other emissions. For example, STPNOC (2010b) states that fugitive dust generated by the commuting workforce would be minimized by properly maintaining hard-surfaced access roads and setting appropriate speed limits.

Subpart P of 40 CFR Part 51 contains the visibility protection regulatory requirements, including the review of new sources to be constructed in attainment or unclassified areas and that may affect visibility in any Federal Class I area. If a new nuclear plant were located close to a mandatory Class I area, additional air pollution control requirements may be required. As noted in Section 2.2.2.1, there are no Mandatory Class I Federal areas within 100 mi (161 km) of the STP site where visibility is an important value.

Because construction and operations of two new nuclear units at the STP site would not noticeably alter air quality, air quality impacts would be SMALL.

8.1.2 Surface Water Resources

The NRC presumes that two new nuclear units would be designed to maximize use of existing facilities, including the existing intake and discharge structures on the MCR and the Colorado River. STPNOC did not propose using any surface water during the construction of Units 3 and 4 (NRC 2011); therefore, NRC expects that none would be used during construction for the new nuclear alternative.

Impacts to surface water quality could result from dredging activities in the Colorado River near the reservoir makeup pumping facility (RMPF) and the barge slip. Dredging can disturb sediments and potentially increase turbidity near and downstream of the dredged site. The NRC staff (NRC 2011) determined that the hydrological alterations resulting from site development would be localized and temporary. Permits and certifications from the U.S. Army

Corps of Engineers (USACE) and other agencies would require the implementation of best management practices (BMPs) to minimize impacts.

Runoff from construction areas would be controlled under a State-issued Texas Pollutant Discharge Elimination System (TPDES) general permit that would require implementation of a stormwater pollution prevention plan and associated BMPs to prevent or significantly mitigate soil erosion and contamination of stormwater runoff from construction activities. Runoff from construction areas would be limited to the duration of the construction.

During normal operations, STPNOC would intermittently withdraw and discharge water from and to the Colorado River to maintain the water quality and quantity in the MCR (NRC 2011). This would continue to occur in accordance with STPNOC's existing water rights and a new or revised State-issued TPDES permit, respectively, under this alternative. Water use would be similar to that of Units 1 and 2. The NRC staff (NRC 2011) estimated current water use for Units 1 and 2 during normal operations to be 3 percent of Texas Water Development Board (TWDB)-estimated Region K water supplies in 2010 (TWDB 2007). Therefore, the impact on surface water use in the Colorado River basin would be minimal.

In consideration of the information above, the impacts on surface water use and quality from construction and operations under the new nuclear generation alternative would be SMALL.

8.1.3 Groundwater Resources

The NRC presumes that the two new nuclear units would use existing ancillary facilities at the STP site, including use of the onsite groundwater production wells. To build Units 3 and 4, STPNOC (2010b) proposed withdrawing groundwater from the Deep Aquifer during construction. The NRC staff (NRC 2011) determined that STPNOC's projected drawdown during building activities and the current presence of a sufficient confining head would maintain the Deep Aquifer as a confined aquifer. For construction of the new nuclear units under this alternative, it is assumed that STPNOC's existing wells would be used to supply the relatively small amounts of water (i.e., up to 491 gpm (1,860 L/min)) required for potable and sanitary uses, concrete production, dust suppression and soil compaction, and other uses during construction of the new units (NRC 2011).

Excavation for the new reactor foundations could extend to depths of approximately 70 ft (21 m) below ground surface (BGS), and dewatering of the Upper and Lower Shallow Chicot aquifers would be required. However, slurry walls and wells were proposed for use to minimize potential adverse effects from dewatering both on site and off site (NRC 2011). Further, application of BMPs in accordance with a State-issued National Pollutant Discharge Elimination System (NPDES) general permit, including appropriate waste management and spill prevention practices, would prevent or minimize any groundwater quality impacts during construction.

During operations of Units 3 and 4, STPNOC proposed to use groundwater for power block operational uses, fire protection systems, and potable and sanitary systems, and to use the existing onsite groundwater production wells at STP. However, one or more additional wells could also be installed to decrease pumping rates at existing wells and to better distribute drawdown impacts in the Deep Aquifer and ensure sufficient withdrawal capacity under STPNOC's existing groundwater permit (NRC 2011). Groundwater use for operation of the two replacement units was presumed to be somewhat higher than for existing STP, Units 1 and 2, but well within the groundwater operating permit held by STPNOC. The groundwater operating permit issued by the Coast Plains Groundwater Conservation District (see Section 2.1.7.2) is for approximately 1,860 gpm (7,040 L/min); STP, Units 1 and 2, use approximately 768 gpm (2,910 L/min) of groundwater; and the new units would require approximately 975 gpm (3,690 L/min) under normal operating conditions (NRC 2011). The NRC concludes that groundwater use and quality impacts are likely to be similar to those observed for STP, Units 1 and 2.

Based on this information, the overall impact on groundwater use and quality from construction and operations under the new nuclear generation alternative would be SMALL.

8.1.4 Aquatic Ecology

The NRC presumed that two new nuclear units would be designed to maximize use of existing facilities, including the existing intake and discharge structures on the MCR and the Colorado River.

Construction activities for two new reactors (such as construction of heavy haul roads and the power blocks) could affect drainage areas or other onsite aquatic features due to site runoff. NRC assumed that STPNOC would install temporary and permanent erosion and sediment control measures to minimize the flow of disturbed soils into ditches and wetlands. Such BMPs would likely be described in a Texas Pollutant Discharge Elimination System (TPDES) general permit relating to stormwater discharges for construction activities.

To bring new materials to the site, NRC assumed construction crews would dredge near the barge slip on the Colorado River to transport some materials using barges, which are activities that STPNOC (2010b) proposed for the construction of Units 3 and 4. Permits and certifications from the USACE and other agencies would require the implementation of BMPs to minimize impacts. NRC (2011) determined that such activities would be temporary and unlikely to cause noticeable impacts to aquatic resources.

Plant operators would withdraw water from the Colorado River to maintain the proper water quality and quantity in the MCR during operations of two new ABWR units. Aquatic organisms would be impinged and entrained as water is drawn through the RMPF. Biota most vulnerable to entrainment and impingement would be the same as those described in Section 4.5 during the period of continued operations for Units 1 and 2. The low approach velocity at the RMPF (less than or equal to approximately 0.5 ft/s), the use of a pond-based heat-dissipation cooling system, the population status of biota most likely to be impinged and entrained, and the reproductive potential of fish and shellfish most vulnerable to impingement and entrainment would result in minimal adverse impacts to the aquatic ecosystem in the Colorado River near STP.

Plant operators would discharge water from the MCR to the Colorado River to maintain water quality within the MCR. Discharge impacts would be similar to those described in Section 4.5 for continued operations of STP, Units 1 and 2. Discharges are unlikely to noticeably impact aquatic resources near STP for the following reasons:

- STPNOC's TPDES permit would limit the amount and timing of discharges.
- Modeling studies indicate that mobile aquatic species could avoid the thermal plume by swimming at a lower depth or different side of the river (NRC 2011).
- Species or life-stages that are less mobile organisms would not be able to swim away to avoid the thermal plume, such as eggs, larvae, and mollusks. However, most species observed in this area generally have high fecundity, and the number of organisms lost would be insignificant compared to their population in the lower Colorado River.

- Cooling water would not be regularly discharged into the Colorado River because STP uses a cooling pond-based heat-dissipation system that reuses water from the MCR.

The NRC staff determined that the impacts to aquatic resources on the STP site and in the Colorado River would be SMALL because modifications on site and to the river, such as dredging, would be temporary, and impingement, entrainment, and heat shock would not noticeably impact aquatic resources.

8.1.5 Terrestrial Ecology

STPNOC (2010a) estimated that the power block and ancillary facilities (excluding the cooling-water system) for the new reactors would require approximately 540 ac (219 ha). Construction activities, such as building the heavy haul road and new facilities, would permanently convert approximately 300 ac (121 ha) (STPNOC 2010b). Construction would likely affect a variety of habitats and land uses, including industrial land (buildings, parking areas, and mowed-maintained fields), drainage ditches, scattered small palustrine wetlands, scrub-shrub habitat, and mixed grassland habitat where abandoned farm lands previously existed prior to construction of Units 1 and 2 (NRC 2011; STPNOC 2010b). Most of these areas have been mildly to extensively disturbed during the construction and operations of Units 1 and 2 and other human activities. After the completion of the new units, plant operators would likely grade, landscape, and replant the areas used for temporary building support (STPNOC 2010b). The majority of permanently affected areas would be maintained land (e.g., mowed) or other industrial areas. NRC (2011) determined that the change in habitat availability would unlikely increase fragmentation of onsite habitats available for wildlife. STPNOC would likely implement BMPs to minimize impacts to wetlands. STPNOC would be required to comply with the USACE 404 permits (NRC 2011).

Construction activities could also adversely affect onsite wildlife through noise, increased light pollution, and increased traffic. However, NRC (2011) determined that these impacts would be temporary and minor.

STPNOC (2010b) did not observe Federally or State-listed threatened or endangered species, critical habitat, or suitable habitats in the proposed disturbance area for Units 3 and 4. NRC (2011) determined that the impacts to special status species from the construction and operation of Units 3 and 4 would be negligible.

Because many construction-related impacts would be temporary, and because the majority of long-term construction impacts would occur within previously disturbed areas, impacts on terrestrial resources would be SMALL.

8.1.6 Human Health

The human health effects from two new nuclear power plants would be similar to those of the existing STP, Units 1 and 2, and the proposed Units 3 and 4 (NRC 2011). Human health issues related to construction would be equivalent to those associated with the construction of any major complex industrial facility and would be controlled to acceptable levels through the application of BMPs and STPNOC’s compliance with Federal and State worker protection regulations. Human health impacts from operation of the new nuclear reactors would be equivalent to those associated with continued operation of the existing reactors and the proposed Units 3 and 4 (NRC 2011).

Both continuous and intermittent noise impacts can be expected at offsite locations, including at the closest residences. However, confining noise-producing activities to core hours of the day

(7:00 a.m. to 6:00 p.m.) and notifying potentially affected parties beforehand of such events would control noise impacts to acceptable levels. Noise impacts would be of short duration and would be SMALL.

Based on the above information, human health impacts for the construction and operation of two new nuclear units would be SMALL.

8.1.7 Land Use

The GEIS generically evaluates the impacts of constructing and operating various replacement power plant alternatives on land use, both on and off each plant site. The analysis of land use impacts focuses on the amount of land area that would be affected by the construction and operation of a new nuclear power plant at the STP site.

STPNOC (2010a) estimated that the power block and ancillary facilities (excluding the cooling-water system) for the two new reactors would require approximately 540 ac (219 ha) and that sufficient contiguous acreage was available on the STP site. A sufficient amount of land is available on site, and most of the area is already in industrial use. Therefore, onsite land use impacts from the construction and operation of two new reactors at the STP site would be SMALL.

The amount of land required to mine uranium and fabricate nuclear fuel to support the new nuclear alternative would be similar to the amount of land required to support STP, Units 1 and 2, although an additional amount of land would be required to support uranium fuel requirements during the license renewal term. According to GEIS estimates, approximately 2,560 ac (1,036 ha) would be needed for the mining and processing of uranium fuel during the operating life of the new nuclear plant. Overall, offsite land use impacts from two new nuclear reactors would be SMALL.

8.1.8 Socioeconomics

Socioeconomic impacts are defined in terms of changes to the demographic and economic characteristics and social conditions of a region. For example, the number of jobs created by the construction and operation of a power plant could affect regional employment, income, and expenditures.

Two types of jobs would be created by this alternative: (1) construction jobs, which are transient, short in duration, and less likely to have a long-term socioeconomic impact; and (2) power plant operation jobs, which have the greater potential for permanent, long-term socioeconomic impacts. Workforce requirements for the construction and operation of the new nuclear generation alternative were evaluated to measure their possible effects on current socioeconomic conditions.

STPNOC estimated a construction workforce of up to 5,950 (maximum) workers would be required to build Units 3 and 4 at the STP site (STPNOC 2010b). The relative economic impacts of this many workers on the local economy and tax base would vary, with the greatest impacts occurring in the communities where the majority of construction workers would reside and spend their income. As a result, local communities could experience a short-term economic “boom” from increased tax revenue and income generated by construction expenditures and the increased demand for temporary (rental) housing and business services. Some construction workers could relocate to Matagorda and surrounding counties in order to be closer to the construction work site. However, given the proximity of STP to the Houston metropolitan area, many construction workers could commute to the STP site, thereby lessening the need for additional rental housing near STP. After completing the installation of the two new reactor units, local communities could experience a return to pre-construction economic conditions.

Based on this information, and given the magnitude of the estimated number of workers, socioeconomic impacts during construction in communities near the STP site could range from SMALL to LARGE.

STPNOC also estimated that STP, Units 3 and 4, would require 733 operations workers and an additional 1,100 workers during refueling outages (STPNOC 2010b). The number of operation workers would include some of the 1,378 workers from STP, Units 1 and 2. Socioeconomic impacts during operations could range from SMALL to MODERATE as the STP site transitions to the new reactor units. The potential reduction in overall employment at STP could affect property tax revenue and income in local communities and businesses. In addition, the permanent housing market could also experience increased vacancies and decreased prices if operations workers and their families move out of the region.

8.1.9 Transportation

Transportation impacts associated with the construction and operation of a new two-unit nuclear power plant would consist of commuting workers and truck deliveries of construction materials and equipment to the power plant site. During periods of peak construction activity, up to 5,950 workers could be commuting daily to the STP site (STPNOC 2010b). Workers commuting to the STP site would primarily use two-lane roads. The volume of traffic on these roads, and especially Farm-to-Market (FM) 521, would increase substantially. In addition to commuting workers, trucks would be transporting construction materials and equipment to the worksite, further increasing the amount of traffic on local roads. The increase in vehicular traffic would peak during shift changes, resulting in temporary levels of service impacts and delays at intersections. Some power plant components and materials could also be delivered by train or barge (STPNOC 2010a). Train deliveries could cause additional traffic delays at railroad crossings. Based on this information, traffic-related transportation impacts during construction could range from MODERATE to LARGE.

Traffic-related transportation impacts would be greatly reduced after completing the installation of the two new reactor units. Transportation impacts would include daily commuting by the operating workforce, equipment and materials deliveries, and the removal of commercial waste material to offsite disposal or recycling facilities by truck. During reactor operations, the estimated number of operations workers commuting to and from STP would be 733 workers (STPNOC 2010b). Traffic-related transportation impacts would be less than current operations because the new units would employ approximately half as many workers as STP, Units 1 and 2. However, overall transportation impacts (related to plant operating workers and potential Units 1 and 2 decommissioning workers) would range from SMALL to MODERATE during power plant operations.

8.1.10 Aesthetics

The analysis of aesthetic impacts focuses on the degree of contrast between the new nuclear alternative and the surrounding landscape and the visibility of the new power plant. The new power block would look very similar to the STP, Units 1 and 2, power block.

During construction, all of the clearing and excavation would occur on the STP site. These activities may be visible from offsite roads, particularly FM 521. Since the STP site already appears industrial, construction of the new units would appear similar to onsite activities during refueling outages.

During reactor operations, the visual appearance of the STP site would not change since the power block for the new nuclear reactors would look virtually identical to the existing STP, Units 1 and 2, power block. Adding two new reactor units would increase the overall size of the existing STP facility if STP, Units 1 and 2, remained. Given the industrial appearance of the STP site and the similarity of the new units to the existing units, the new reactor units would blend in with the surroundings. In addition, the amount of noise generated during reactor operations would be the same as those generated during STP, Units 1 and 2, operations, which consists predominantly of the noise from routine industrial processes and communications. In general, aesthetic changes would be limited to the immediate vicinity of the STP site, and any impacts would be SMALL.

8.1.11 Historic and Archaeological Resources

Cultural resources are the indications of human occupation and use of the landscape, as defined and protected by a series of Federal laws, regulations, and guidelines. Prehistoric resources are physical remains of human activities that predate written records; they generally consist of artifacts that may alone or collectively yield information about the past. Historic resources consist of physical remains that postdate the emergence of written records; in the U.S., they are architectural structures or districts, archaeological objects, and archaeological features dating from 1492 and later. Ordinarily, sites less than 50 years old are not considered historic, but exceptions can be made for such properties if they are of particular importance, such as structures associated with the development of nuclear power (e.g., Shippingport Atomic Power Station) or Cold War themes. American Indian resources are sites, areas, and materials important to American Indians for religious or heritage reasons. Such resources may include geographic features, plants, animals, cemeteries, battlefields, trails, and environmental features. The cultural resource analysis encompassed the power plant site and adjacent areas that could potentially be disturbed by the construction and operation of replacement plant alternatives.

The potential for historic and archaeological resources can vary greatly depending on the location of the proposed site. To consider a project's effects on historic and archaeological resources, any affected areas would need to be surveyed to identify and record historic and archaeological resources, identify cultural resources (e.g., traditional cultural properties), and develop possible mitigation measures to address any adverse effects from ground-disturbing activities.

As described in Section 2.2.10, much of the STP site has been previously disturbed by the construction of STP, Units 1 and 2. In addition, in preparation for the COL application for Units 3 and 4, STPNOC conducted a cultural resources assessment of the STP site. STPNOC reviewed existing information for the STP site and the area within a 10-mi (16-km) radius. STPNOC concluded that any cultural resource sites that may have existed on site would no longer retain their integrity because the area was heavily disturbed during the construction of Units 1 and 2 (STPNOC 2010b). In December 2006, STPNOC reported these findings to the SHPO at the Texas Historical Commission. The SHPO concurred that there would be no impacts to historic properties in January 2007 (STPNOC 2006; THC 2007).

There is a low potential for cultural resources to be located in previously undisturbed portions of the STP site. However, if the new nuclear units were to be sited within undisturbed areas or within areas of known cultural sensitivity (historic grave site located on the property and described in Section 2.2.10), these areas would need to be surveyed by a professional archaeologist to identify and develop possible mitigation measures to address any adverse effects from project activities. NRC assumes STPNOC would follow similar procedures to those described in the final EIS for STP, Units 3 and 4, if any historic or cultural resources were discovered during ground-disturbing activities associated with building the new units

(NRC 2011). In the final EIS for STP, Units 3 and 4, the staff concludes that the cumulative impacts to historic and archaeological resource would be SMALL.

The NRC staff determined that the impact of new nuclear plants at the STP site on historic and archaeological resources would be SMALL for the following reasons:

- NRC (2011) and STPNOC (2010a, 2010b) did not identify any cultural resources that could be affected by Units 3 and 4.
- The SHPO determined that construction for Units 3 and 4 would not affect cultural and historic resources.
- STPNOC has established environmental compliance procedures for new ground-disturbing activities.

8.1.12 Environmental Justice

The environmental justice impact analysis evaluates the potential for disproportionately high and adverse human health and environmental effects on minority and low-income populations that could result from the construction and operation of a new power plant. Adverse health effects are measured in terms of the risk and rate of fatal or nonfatal adverse impacts on human health. Disproportionately high and adverse human health effects occur when the risk or rate of exposure to an environmental hazard for a minority or low-income population is significant and exceeds the risk or exposure rate for the general population or for another appropriate comparison group. Disproportionately high environmental effects refer to impacts or risk of impact on the natural or physical environment in a minority or low-income community that are significant and appreciably exceed the environmental impact on the larger community. Such effects may include biological, cultural, economic, or social impacts. Some of these potential effects have been identified in resource areas discussed in this SEIS. For example, increased demand for rental housing during power plant construction could disproportionately affect low-income populations. Minority and low-income populations are subsets of the general public living near the STP site, and all are exposed to the same hazards generated from constructing and operating two new nuclear plants. Section 4.9.7, “Environmental Justice,” presents demographic information about minority and low-income populations residing in the vicinity of the STP site.

Potential impacts to minority and low-income populations from the construction and operation of a new nuclear power plant at the STP site would mostly consist of environmental and socioeconomic effects (e.g., noise, dust, traffic, employment, and housing impacts). Noise and dust impacts during construction would be short-term and primarily limited to onsite activities. Minority and low-income populations residing along site access roads would be directly affected by increased commuter vehicle and truck traffic. However, because of the temporary nature of construction, these effects would only occur at certain hours of the day and are unlikely to be high and adverse. Increased demand for rental housing during construction could also affect low-income populations living near STP. However, given the proximity of STP to the Houston metropolitan area, many construction workers could commute to the STP site, thereby lessening the need for additional rental housing.

Based on this information, and the analysis of human health and environmental impacts presented in this SEIS, the construction and operation of a new nuclear power plant would not have disproportionately high and adverse human health and environmental effects on minority and low-income populations residing in the vicinity of the STP site.

8.1.13 Waste Management

During the construction stage of the new nuclear plants, land clearing and other construction activities would generate waste that could be recycled, disposed of on site, or shipped to an offsite waste disposal facility. Because the new nuclear plants would be constructed on the previously disturbed STP site, the amounts of waste produced during land clearing would be reduced.

During the operational stage, normal plant operations, routine plant maintenance, and cleaning activities would generate nonradioactive waste as well as mixed waste, low-level waste, and high-level waste. Quantities of nonradioactive waste (discussed in Section 2.3.1 of this SEIS) and radioactive waste (discussed in Section 6.1 of this SEIS) generated by Units 1 and 2 would be comparable to that generated by the new nuclear plants.

According to the GEIS (NRC 1996), the generation and management of solid nonradioactive and radioactive waste during the period of renewed licenses are not expected to result in significant environmental impacts. Two new nuclear plants would generate waste streams similar to the two existing nuclear plants. Based on this information, waste impacts would be SMALL for two new nuclear plants located at the STP site.

8.1.14 Summary of Impacts of New Nuclear Generation

Table 8–2 summarizes the environmental impacts of the new nuclear alternative compared to continued operation of STP.

Table 8–2. Summary of Environmental Impacts of the New Nuclear Alternative Compared to Continued Operation of STP, Units 1 and 2

Category	New Nuclear Generation (proposed infrastructure)	Continued STP Operation
Air quality	SMALL	SMALL
Surface water	SMALL	SMALL
Groundwater	SMALL	SMALL
Aquatic resources	SMALL	SMALL
Terrestrial resources	SMALL	SMALL
Human health	SMALL	SMALL to MODERATE
Land use	SMALL	SMALL
Socioeconomics	SMALL to LARGE	SMALL
Transportation	MODERATE to LARGE	SMALL
Aesthetics	SMALL	SMALL
Historic & archaeological	SMALL	SMALL
Waste management	SMALL	SMALL

8.2 Natural Gas-Fired Combined-Cycle Generation

In this section, the NRC staff evaluates the environmental impacts of natural gas-fired combined-cycle (NGCC) generation at the STP site.

Natural gas accounted for 38 percent of all electricity generated in the ERCOT service area in 2010, accounting for the second greatest share of electrical power (ERCOT 2011a). Development of new natural gas-fired plants may be affected by perceived or actual action to limit greenhouse gas emissions, although they produce markedly fewer greenhouse gases per unit of electrical output than coal-fired plants. Natural gas-fired plants are a feasible, commercially available option for providing electrical generating capacity beyond STPNOC's current license expiration. NRC examined NGCC because NGCC can operate with high thermal efficiency (approximately 60 percent for some units) and is capable of economically providing baseload power. Therefore, NRC considered NGCC generation a reasonable alternative to STP license renewal.

NGCC plants differ significantly from coal-fired boilers and existing nuclear plants. NGCC plants derive the majority of their electrical output from a gas-turbine cycle and then generate additional power—without burning any additional fuel—through a second, steam-turbine cycle. The first gas turbine stage (similar to a large jet engine) burns natural gas, which turns a driveshaft that powers an electric generator. The exhaust gas from the gas turbine is still hot enough to boil water to steam. Ducts carry the hot exhaust to a heat-recovery steam generator, which produces steam to drive a steam turbine and produce additional electrical power. The combined-cycle approach is significantly more efficient than any one cycle on its own; thermal efficiency can exceed 60 percent. Because the NGCC alternative derives much of its power from a gas turbine cycle, and because it wastes less heat than the existing STP units, it requires significantly less cooling water than the coal-fired alternative or the existing STP.

To replace the 2,500 MWe power that STP generates, NRC considered four hypothetical gas-fired units, each with a net capacity of 640 MWe. For purposes of this analysis, the hypothetical units would be similar to General Electric's (GE's) H-class gas fired combined-cycle units. While any number of commercially available combined-cycle units could be installed in a variety of combinations to replace the power currently produced by STP, GE's H-class units are highly efficient models that would be used to minimize environmental impacts. Other manufacturers, like Siemens, offer similarly high efficiency models.

GE's H-class combined-cycle generating units operate at a heat rate of 5,690 British thermal units per kilowatt hours (BTU/kWh), or nearly 60 percent thermal efficiency (GE 2011). As noted above, this NGCC alternative would require much less cooling water than STP because the NGCC units operate at a higher thermal efficiency and because they require much less water for steam cycle condenser cooling. Therefore, the NRC staff assumed that the existing cooling water system, including the intakes and discharges on the MCR and the Colorado River, would be sufficient for this alternative.

Construction of onsite visible structures would include the natural gas turbine buildings and heat-recovery steam generators (which may be enclosed in a single building), exhaust stacks, and, if necessary, equipment associated with a natural gas pipeline, such as a compressor station. The NGCC alternative at the STP site would use the existing STP transmission system. Based on GEIS estimates, the plant would require approximately 312 ac (126 ha), which includes a new pipeline that would run approximately 2 mi (3 km) from the STP site to an existing pipeline.

This 2,560 MWe NGCC plant would consume 110 billion cubic feet (ft^3) (3,111 million cubic meters (m^3)) of natural gas annually, assuming an average heat content of 1,029 BTU/ft^3 (EIA 2009). Natural gas would be extracted from the ground through wells, then treated to remove impurities (like hydrogen sulfide), and blended to meet pipeline gas standards before being piped through the state pipeline system to the plant site. This NGCC alternative would produce relatively little waste, primarily in the form of spent catalysts used for emissions controls.

To build the NGCC plant, site crews would clear vegetation from the site, prepare the site surface, and begin excavation before other crews begin actual construction on the plant or any associated infrastructure, including the 2 mi (3 km) pipeline. The NGCC alternative at the STP site would use the existing STP transmission system. Construction materials would be delivered via rail spur, truck, or barge. For the proposed construction of Units 3 and 4, STPNOC proposed dredging near the current barge slip and upgrading the existing rail spur to accommodate shipments of construction materials (STPNOC 2010b). The NRC staff finds this to be reasonable and assumed that dredging and rail spur upgrades would be required for the NGCC alternative.

8.2.1 Air Quality

As discussed in Section 2.2.2.1, the STP site is located in central Matagorda County, Texas, at the southern edge of the Metropolitan Houston-Galveston Intrastate Air Quality Control Region (40 CFR 81.38). The Corpus Christi-Victoria Intrastate Air Quality Control Region (40 CFR 81.136) lies immediately south and west of Matagorda County. EPA has designated all of the counties in these Air Quality Control Regions adjacent to the STP site as in compliance with the National Ambient Air Quality Standards (40 CFR 81.344) except Brazoria County to the north; Brazoria County is classified Nonattainment/Severe relative to the 8-hour ozone standard (EPA 2011b).

Construction activities would cause some localized temporary air quality effects because of emissions and fugitive dust from operation of earth-moving and material-handling equipment. Emissions from workers' vehicles and motorized construction equipment would be temporary. NRC assumed that construction crews would use dust-control practices to control and reduce fugitive dust. STPNOC proposed such activities during construction of proposed Units 3 and 4 (STPNOC 2010b), and §111.145 of TCEQ's regulations require dust suppression control during the construction of facilities and parking lots.

A new NGCC plant would qualify as a new major-emitting industrial facility and would be subject to PSD requirements under the Clean Air Act (CAA) (EPA 2011c). The NGCC plant would need to comply with the standards of performance for electric utility steam generating units set forth in 40 CFR Part 60 Subpart KKKK. The plant would also require an operating permit from TCEQ. In STPNOC's ER for Units 3 and 4, STPNOC stated that "[a]ir emissions sources would be managed in accordance with Federal, Texas, and local air quality control laws and regulations." Likewise, NRC assumed that the NGCC plant would also operate in accordance with Federal, Texas, and local air quality control laws and regulations.

Subpart P of 40 CFR Part 51 contains the visibility protection regulatory requirements, including the review of new sources that would be constructed in the attainment or unclassified areas and may affect visibility in any Federal Class I area. If an NGCC alternative was located close to a mandatory Class I area, additional air pollution control requirements would be required. As noted in Section 2.2.2.1, there are no mandatory Class I Federal areas within 50 mi of the STP site.

The NRC projects the following emissions based on data published by the EIA, EPA, and on performance characteristics and emissions controls:

- sulfur oxides—192 tons (174 MT) per year,
- nitrogen oxides—839 tons (761 MT) per year,

- carbon dioxide—6,068,000 tons (5,995,000 MT) per year,
- carbon monoxide—847 tons (768 MT) per year,
- total suspended particles (TSP)—373 tons (338 MT) per year, and
- particulate matter ≤10 μm or PM_{10}—373 tons (338 MT) per year.

8.2.1.1 Sulfur Oxide and Nitrogen Oxide

A new NGCC plant would have to comply with Title IV of the CAA (42 USC 7651) reduction requirements for sulfur oxides and nitrogen oxides, which are the main precursors of acid rain and the major cause of reduced visibility. Title IV establishes maximum sulfur oxide and nitrogen oxide emission rates from existing plants and a system of sulfur oxide emission allowances that can be used, sold, or saved for future use by new plants. In addition, in August 2011, EPA published the Cross-State Air Pollution Rule, which included reductions of sulfur oxides and nitrogen oxides in Texas. According to the rule, NGCC plants would need to comply with the new reductions by 2012.

As stated above, the new NGCC alternative would produce 192 tons (174 MT) per year of sulfur oxides and 839 tons (761 MT) per year of nitrogen oxides based on the use of the dry low-nitrogen oxide combustion technology and use of the selective catalytic reduction (SCR) to significantly reduce nitrogen oxide emissions. The new plant would be subjected to the continuous monitoring requirements for sulfur oxides and nitrogen oxides, as specified in 40 CFR Part 75. The current State Implementation Plan (SIP) for Texas includes a cap and trade program for sulfur and nitrogen oxides. To operate the NGCC plant, sulfur dioxide allowance would need to be purchased from the open market or an existing fossil-fired plant would need to be shut down and those credits would need to be applied to the new plants (STPNOC 2010a). Thus, provided the plant operator is able to purchase sufficient allowances to operate, the NGCC alternative would not add to the net regional sulfur or nitrogen oxide emissions, although it might do so locally.

8.2.1.2 Greenhouse Gases

The new plant would release greenhouse gases, such as carbon dioxide and methane. The plant would be subjected to the continuous monitoring requirements for carbon dioxide, as specified in 40 CFR Part 75. The NGCC plant would emit approximately 6.1 million tons (approximately 6.0 million MT) per year of carbon dioxide emissions.

On July 12, 2012, EPA issued a final rule tailoring the applicability criteria that determine which stationary sources and modification to existing projects become subject to permitting requirements for greenhouse emissions under the PSD and Title V Programs of the CAA (77 FR 41051). According to the Tailoring Rule, greenhouse gases are a regulated new source review pollutant under the PSD major source permitting program if the source is otherwise subject to PSD (for another regulated new source review pollutant) and has a greenhouse gas potential to emit equal to or greater than 75,000 tons (68,000 MT) per year of carbon dioxide equivalent ("carbon dioxide equivalent" adjusting for different global warming potentials for different greenhouse gases). Such sources would be subject to best available control technology (BACT), although EPA has yet to determine BACT for greenhouse gases.

EPA issued a Federal Implementation Plan (FIP) on May 3, 2011, to permit greenhouse gas-emitting sources in states that do not have measures to lower greenhouse gases in their SIP. Because Texas has not updated its SIP to include greenhouse gases, EPA will be the official permitting authority for greenhouse gas-emitting sources in Texas if the SIP is not updated before the NGCC plant begins operations.

8.2.1.3 Particulates

The new NGCC alternative would produce 373 tons (338 MT) per year of TSP, all of which would be emitted as PM_{10}. STPNOC (2010a) indicated that all PM_{10} emissions would be particulate matter, ≤2.5 μm or $PM_{2.5}$. DOE (2007) evaluated the emissions from a hypothetical 560 MWe NGCC unit using BACT to meet the emission requirements of the 2006 New Source Performance Standards. DOE concluded that emissions from particulates would be negligible because NGCC uses natural gas as fuel; therefore, NGCC plants would not require emissions controls equipment or features to reduce these emissions.

During the construction of an NGCC plant, onsite activities would also generate fugitive dust. Vehicles and motorized equipment would create exhaust emissions during the construction process. These impacts would be intermittent and short-lived; however, to minimize dust generation, construction crews would use applicable dust-control measures, as described above.

8.2.1.4 Hazardous Air Pollutants

In December 2000, EPA issued regulatory findings (65 FR 79825) on emissions of hazardous air pollutants (HAPs) from electric utility steam-generating units, which said that natural gas-fired plants emit HAPs such as arsenic, formaldehyde, and nickel and stated the following:

> Also in the utility RTC (Report to Congress), the EPA indicated that the impacts due to HAP emissions from natural gas-fired electric utility steam generating units were negligible based on the results of the study. The Administrator finds that regulation of HAP emissions from natural gas-fired electric utility steam generating units is not appropriate or necessary.

As a result of EPA's conclusion, the NRC staff finds no significant air quality effects from HAPs.

8.2.1.5 Conclusion

Based on this information, the overall air quality impacts of a new NGCC plant located at the STP site would be SMALL to MODERATE. Impacts would not be noticeable for sulfur and nitrogen oxides because the Texas SIP requires a Cap and Trade Program, and there would be no net increase in sulfur and nitrogen oxide emissions. Based on analyses from DOE (2007) and EPA (2000, 65 FR 79825), TSPs and HAPs would have negligible impacts. Greenhouse gas emissions would be noticeable; carbon dioxide emissions would be two orders of magnitude larger than the threshold in EPA's tailoring rule for greenhouse gas (75,000 tons or 68,000 MT) per year of carbon dioxide equivalent), which would trigger a regulated new source review.

8.2.2 Surface Water Resources

STPNOC did not propose using any surface water during the construction of Units 3 and 4 (NRC 2011). As a new NGCC plant would occupy a much smaller footprint relative to new nuclear units, and its construction would entail less extensive excavation and earthwork, NRC expects that surface water would not be used during construction for the NGCC alternative.

Some temporary impacts to surface water quality may result from dredging activities in the Colorado River near the barge slip and from increased sediment loading in stormwater runoff from active construction areas. Due to the short-term nature of the dredging activities, the hydrologic alterations and sedimentation would be localized and temporary. Dredging would also be conducted under a permit from the USACE requiring the implementation of BMPs to minimize impacts. Runoff from construction areas would be controlled under a State-issued TPDES general permit that would require implementation of a stormwater pollution prevention plan and associated BMPs to prevent or significantly mitigate soil erosion and contamination of stormwater runoff from construction activities.

For facility operations, the NGCC alternative would require much less cooling water than STP, Units 1 and 2, and consumptive water use would be much less. It is expected that use of the existing intake and discharge infrastructure on the MCR and the Colorado River would be sufficient to support this alternative. Surface water withdrawals would be subject to, and would remain well within, STPNOC's existing water rights, and effluent discharges and stormwater discharges associated with industrial activity would subject to a revised State-issued TPDES permit under this alternative.

In consideration of the above, the impacts on surface water use and quality from construction and operations under the NGCC alternative would be SMALL.

8.2.3 Groundwater Resources

Construction-related ground disturbance and excavation work would be substantially less than that described for the new nuclear alternative. Although groundwater dewatering of foundation excavations for a new NGCC plant would likely be required, slurry walls and wells were proposed for use to minimize potential adverse effects from dewatering both on site and off site (NRC 2011). Application of BMPs in accordance with a state-issued NPDES general permit, including appropriate waste management and spill prevention practices, would prevent or minimize any groundwater quality impacts during construction.

STPNOC assumed that a fossil-fuel-fired generation facility would be located adjacent to the STP, Units 1 and 2, site to use the existing infrastructure, including continued use of existing onsite groundwater production wells at STP. Groundwater use for construction of a new NGCC plant would be substantially less than the volume required for new nuclear units under this alternative by virtue of the smaller footprint involved for excavation, earthwork, and structural work. This would encompass such uses as potable and sanitary uses, concrete production, dust suppression and soil compaction, and other uses.

For NGCC plant operations, NRC assumed that the NGCC alternative would entail the same relative ratio of groundwater use to surface water use as that used at STP, Units 1 and 2. This includes the use of groundwater for freshwater and service water makeup, potable and sanitary uses, and fire protection. Consequently, it is expected that total groundwater usage and associated aquifer effects would likely be much less under this alternative than those under current STP operations. This is because of the fewer number of auxiliary systems requiring groundwater and the much smaller workforce under the NGCC alternative.

Based on this information, the overall impact on groundwater use and quality from construction and operations under the NGCC alternative would be SMALL.

8.2.4 Aquatic Ecology

Construction activities for the NGCC alternative (such as construction of heavy haul roads and the power blocks) could affect drainage areas or other onsite aquatic features. NRC assumed that the plant operator would install temporary and permanent erosion and sediment control measures to minimize the flow of disturbed soils into ditches and wetlands. Such BMPs would likely be described in a TPDES general permit relating to stormwater discharges for construction activities. To bring new materials to the site, NRC assumed the plant operator would dredge near the barge slip to transport some materials using barges. Permits and certifications from the USACE and other agencies would require the implementation of BMPs to minimize impacts.

Due to the short-term nature of the dredging activities, the hydrological alterations to aquatic habitats would be localized and temporary.

During operations, the NGCC alternative would require less cooling water to be withdrawn from the Colorado River than STP, Units 1 and 2, requires. Therefore, the number of fish and other aquatic organisms affected by impingement and entrainment would be less for an NGCC alternative than for those associated with license renewal. The NGCC alternative would also discharge less thermal effluent because less cooling water would be required. STPNOC's TPDES permit limits the daily discharge to 144 million gpd and shall not exceed 12.5 percent of the flow of the Colorado River at the discharge point (TCEQ 2005). STPNOC has discharged to the Colorado River once during the operation of STP in 1997 as part of a system test (STPNOC 2010a). Because the thermal discharge would be smaller than STP, Units 1 and 2, the number of fish and other aquatic organisms affected by heat shock would be less for an NGCC alternative than for those associated with license renewal.

The NGCC plant emission has specific impacts to the aquatic ecology. The cooling system for a new NGCC plant would have similar chemical discharges as STP, but the air emissions from the NGCC plant would emit particulates that would settle onto the river surface and introduce a new source of pollutants that would not exist if STP continued operating. However, the flow of the Colorado River would dissipate pollutants, which would decrease the concentration of pollutants and minimize the exposure of fish and other aquatic organisms to pollutants.

Construction activities would require BMPs; dredging would be short-term; the surface water withdrawal and discharge for this alternative would be less than for STP, Units 1 and 2; and pollutants would dissipate within the Colorado River (minimizing exposure concentrations to aquatic resources). Therefore, impacts on aquatic ecology would be SMALL.

8.2.5 Terrestrial Ecology

Constructing the NGCC alternative would require approximately 312 ac (126 ha), which includes a new pipeline that would run approximately 2 mi (3 km) from the STP site to an existing pipeline. These land disturbances form the basis for impacts on terrestrial ecology.

If the NGCC alternative was constructed at the STP site, construction would likely affect a variety of habitats and land uses, including industrial land (buildings, parking areas, and mowed-maintained fields), drainage ditches, scattered small palustrine wetlands, scrub-shrub habitat, and mixed grassland habitat where abandoned farm lands previously existed prior to construction of Units 1 and 2. Most of these areas have been mildly to extensively disturbed during the construction and operation of Units 1 and 2 and other human activities. After the completion of the new units, the plant operator would likely grade, landscape, and replant the areas used for temporary building support, which is similar to what STPNOC proposed to do after completion of proposed new nuclear Units 3 and 4 (STPNOC 2010b). The majority of permanently affected areas would be maintained (e.g., mowed) and industrial areas. The plant operator would likely implement BMPs to minimize impacts to wetlands, and the plant operator would be required to comply with the USACE 404 permits. Construction activities could also adversely affect onsite wildlife through noise, increased light pollution, and increased traffic. However, these impacts would be temporary and minor.

Gas extraction and collection would also affect terrestrial ecology in offsite gas fields, although much of this land is likely already disturbed by gas extraction, and the incremental effects of this alternative on gas field terrestrial ecology are difficult to gauge.

Construction of the 2-mi (3-km) natural gas pipeline could also increase habitat fragmentation. To the extent possible, STPNOC would route the pipeline through previously disturbed areas

(STPNOC 2010a). Threatened and endangered species may also be affected by construction of the natural gas pipeline. Long-linear projects, such as pipelines, can often be sited to avoid sensitive areas. Once construction is completed, impacts would be minimal, especially in previously disturbed areas.

Because many construction-related impacts would be temporary, and because the majority of long-term construction impacts would occur within previously disturbed areas, impacts on terrestrial resources would be SMALL.

8.2.6 Human Health

An NGCC plant would emit criteria air pollutants, but generally in smaller quantities than a coal-fired plant (except nitrogen oxide, which requires additional controls to reduce emissions). The human health effects of NGCC generation are generally low, although in Table 8–2 of the GEIS (NRC 1996), the NRC identified cancer and emphysema as potential health risks from natural gas-fired plants. Nitrogen oxide emissions contribute to ozone formation, which in turn contributes to human health risks. Emission controls on this NGCC alternative maintain nitrogen oxide emissions well below air quality standards established for the purposes of protecting human health, and emissions trading or offset requirements mean that overall nitrogen oxide in the region would not increase. Health risks to workers may also result from handling spent catalysts that may contain heavy metals.

Overall, human health risks to occupational workers and to members of the public from NGCC plant emissions sited at the STP site would likely be SMALL.

Noise during plant operations would be limited to industrial processes and communications. Pipelines delivering natural gas fuel could be audible off site near compressor stations. Pipeline companies would need to adhere to local ordinances regarding maximum noise levels during construction and at compressor stations. Therefore, impacts from noise would likely be SMALL.

8.2.7 Land Use

The GEIS generically evaluates the impact of constructing and operating various replacement power plant alternatives on land use, both on and off each plant site. The analysis of land use impacts focuses on the amount of land area that would be affected by the construction and operation of a four-unit NGCC plant at the STP site.

Based on scaled GEIS estimates and information provided by STPNOC in its ER, approximately 312 ac (126 ha) of land would be needed to support an NGCC alternative to replace STP. This amount of land use would include other plant structures and associated infrastructure, such as the new 2-mi (3-km) pipeline, and is unlikely to exceed 312 ac (126 ha), excluding land for natural gas wells and collection stations.

In addition to onsite land requirements, land would be required off site for natural gas wells and collection stations. Scaling from GEIS estimates, approximately 9,600 ac (3,885 ha) would be required for wells and collection stations to bring the gas to the plant. Gas well and collection stations could noticeably alter land use in those areas, although most of this land requirement would occur in areas where gas extraction already occurs.

The elimination of uranium fuel for STP could partially offset offsite land requirements. Scaling from GEIS estimates approximately 2,560 ac (1,036 ha) would not be needed for mining and processing uranium during the operating life of the plant. Overall land-use impacts from the natural gas alternative (considering the amount of additional offsite land needed for NGCC gas pipeline infrastructure and gas well and collection station development) could range from SMALL to MODERATE.

8.2.8 Socioeconomics

Socioeconomic impacts are defined in terms of changes to the demographic and economic characteristics and social conditions of a region. For example, the number of jobs created by the construction and operation of a power plant could affect regional employment, income, and expenditures. Two types of jobs would be created by this alternative: (1) construction-related jobs, which are transient, short in duration, and less likely to have a long-term socioeconomic impact; and (2) power plant operation jobs, which have the greater potential for permanent, long-term socioeconomic impacts. Workforce requirements for the construction and operation of the NGCC alternative were evaluated to measure their possible effects on current socioeconomic conditions.

Scaling from GEIS estimates, the construction workforce would peak at 3,200 workers. STPNOC projected a maximum construction workforce of 2,028 workers (STPNOC 2010a). STPNOC's estimate appears reasonable; therefore, it is used in this analysis. The relative economic impact of this many workers on the local economy and tax base would vary, with the greatest impacts occurring in the communities where the majority of construction workers would reside and spend their income. As a result, local communities could experience a short-term economic "boom" from increased tax revenue and income generated by construction expenditures and the increased demand for temporary (rental) housing and business services. Some construction workers could relocate to Matagorda and surrounding counties in order to be closer to the construction work site. However, given the proximity of STP to the Houston metropolitan area, many construction workers could commute to the STP site, thereby lessening the need for additional rental housing near STP.

After completing the installation of the four-unit NGCC plant, local communities could experience a return to pre-construction economic conditions. Based on this information, and given the number of workers, socioeconomic impacts during construction in communities near the STP site could range from SMALL to MODERATE.

Scaling from GEIS estimates, the plant operation workforce would be 400 workers. STPNOC estimated a plant operations workforce of approximately 97 workers. The STPNOC estimate appears to be reasonable and is consistent with trends toward lowering labor costs by reducing the size of plant operations workforces. The amount of property taxes paid under the NGCC alternative may increase if additional land is required off site to support this alternative. Socioeconomic impacts during operations could range from SMALL to MODERATE as the STP site transitions to the new NGCC power plant. The potential reduction in overall employment at STP could affect property tax revenue and income in local communities and businesses. In addition, the permanent housing market could also experience increased vacancies and decreased prices if operations workers and their families move out of the region.

8.2.9 Transportation

Transportation impacts associated with construction and operation of a four-unit, NGCC plant would consist of commuting workers and truck deliveries of construction materials to the STP site. During periods of peak construction activity, up to 2,028 workers could be commuting daily to the site (STPNOC 2010a). Workers commuting to the STP site would primarily use two-lane roads. The volume of traffic on these roads, and especially FM 521, would increase substantially. In addition to commuting workers, trucks would be transporting construction materials and equipment to the worksite, thus increasing the amount of traffic on local roads.

The increase in vehicular traffic would peak during shift changes, resulting in temporary levels of service impacts and delays at intersections. Pipeline construction and modification to existing natural gas pipeline systems could also have a temporary impact. Some power plant components and materials could also be delivered by train or barge. Train deliveries could cause additional traffic delays at railroad crossings. Based on this information, traffic-related transportation impacts during construction could range from SMALL to MODERATE.

Traffic-related transportation impacts would be greatly reduced after completing the installation of the new NGCC units. Transportation impacts would include daily commuting by the operating workforce, equipment and materials deliveries, and the removal of commercial waste material to offsite disposal or recycling facilities by truck. During operations, the estimated number of operations workers commuting to and from STP would be 97 workers (STPNOC 2010a). Since fuel is transported by pipeline, the transportation infrastructure would experience little to no increased traffic from plant operations. Traffic-related transportation impacts would be considerably less than current operations because the new NGCC power plant would employ far fewer workers than STP, Units 1 and 2. Overall, transportation impacts would be SMALL during plant operations.

8.2.10 Aesthetics

The analysis of aesthetic impacts focuses on the degree of contrast between the NGCC alternative and the surrounding landscape and the visibility of the NGCC plant. During construction, all of the clearing and excavation would occur on the STP site. These activities may be visible from offsite roads, particularly FM 521. Since the STP site already appears industrial, construction of the NGCC power plant would appear similar to onsite activities during refueling outages.

The four NGCC units could be approximately 100 ft (30 m) tall, with two exhaust stacks up to 175 ft (53 m) tall. The facility would be visible off site during daylight hours, and some structures may require aircraft warning lights. The power plant would be smaller and less noticeable than STP, Units 1 and 2, which has a reactor building height of approximately 250 ft (76 m) (STPNOC 2010b). Noise generated during NGCC power plant operations would be limited to routine industrial processes and communications. Pipelines delivering natural gas fuel could be audible off site near gas compressor stations.

In general, given the industrial appearance of the STP site, the new NGCC power plant would blend in with the surroundings if the existing STP, Units 1 and 2, remains. Aesthetic changes would be limited to the immediate vicinity of the existing STP site, and any impacts would be SMALL.

8.2.11 Historic and Archaeological Resources

The same considerations, discussed in Section 8.1.11, for the impact of the construction of a new nuclear plant on historic and archaeological resources apply to the construction activities that would occur on the STP site for an NGCC plant. As described in Section 2.2.10, much of the STP site has been previously disturbed by the construction of STP, Units 1 and 2. In addition, in preparation for the COL application for Units 3 and 4, STPNOC conducted a cultural resources assessment of the STP site. STPNOC reviewed existing information for the STP site and the area within a 10-mi (16-km) radius. STPNOC concluded that any cultural resource sites that may have existed on site would no longer retain their integrity because the area was heavily disturbed during the construction of Units 1 and 2 (STPNOC 2010b). In December 2006, STPNOC reported these findings to the SHPO at the Texas Historical Commission. The SHPO concurred, in January 2007, that there would be no impacts to historic properties (STPNOC 2006; THC 2007).

There is a low potential for cultural resources to be located in previously undisturbed portions of the STP site. However, if the NGCC units were to be sited within undisturbed areas or within areas of known cultural sensitivity (historic grave site located on the property and described in Section 2.2.10), these areas would need to be surveyed by a professional archaeologist to identify and develop possible mitigation measures to address any adverse effects from project activities. NRC assumes the plant operator would follow similar procedures to those described in the final EIS for STP, Units 3 and 4 (NRC 2011), if the plant operator discovered any historic or cultural resources during ground-disturbing activities associated with building the new units.

Studies would be needed for all areas of potential disturbance at the proposed plant site and along associated corridors where new construction would occur (e.g., the new 2-mi pipeline, roads, transmission corridors, rail lines, or other rights-of-way (ROWs)). In most cases, long-linear projects can be sited to avoid areas of greatest sensitivity.

The NRC staff determined that the impact of the NGCC alternative at the STP site on historic and archaeological resources would be SMALL for the following reasons:

- NRC (2011) and STPNOC (2010a, 2010b) did not identify any cultural resources that could be affected by Units 3 and 4.
- The SHPO determined that construction for Units 3 and 4 would not affect cultural and historic resources.
- Long-linear projects (e.g., pipelines) can usually be sited to avoid sensitive areas.
- NRC assumes that the plant operator would follow environmental compliance procedures for new ground-disturbing activities.

8.2.12 Environmental Justice

The environmental justice impact analysis evaluates the potential for disproportionately high and adverse human health, environmental, and socioeconomic effects on minority and low-income populations that could result from the construction and operation of a new power plant. As previously discussed in Section 8.1.12, such effects may include human health, biological, cultural, economic, or social impacts. Some of these potential effects have been identified in resource areas discussed in this SEIS. For example, increased demand for rental housing during plant construction could disproportionately affect low-income populations. Minority and low-income populations are subsets of the general public living near the STP site, and all are exposed to the same hazards generated from constructing and operating a new NGCC plant. Section 4.9.7, “Environmental Justice,” presents demographic information about minority and low-income populations residing in the vicinity of the STP site.

Potential impacts to minority and low-income populations from the construction and operation of a new NGCC plant at the STP site would mostly consist of environmental and socioeconomic effects (e.g., noise, dust, traffic, employment, and housing impacts). Noise and dust impacts during construction would be short-term and primarily limited to onsite activities. Minority and low-income populations residing along site access roads would be directly affected by increased commuter vehicle and truck traffic. However, because of the temporary nature of construction, these effects would only occur during certain hours of the day and are unlikely to be high and adverse. Increased demand for rental housing during construction could also affect low-income populations living near STP. However, given the proximity of STP to the Houston metropolitan area, many construction workers could commute to the STP site, thereby lessening the additional need for rental housing.

Based on this information, and the analysis of human health and environmental impacts presented in this SEIS, the construction and operation of a new NGCC power plant would not have disproportionately high and adverse human health and environmental effects on minority and low-income populations residing in the vicinity of the STP site.

8.2.13 Waste Management

During the construction stage of the NGCC generation alternative, land clearing and other construction activities would generate waste that could be recycled, disposed of on site, or shipped to an offsite waste disposal facility. Because the alternative would be constructed on or near the previously disturbed STP site, the amounts of waste produced during land clearing would be reduced.

During the operational stage, spent SCR catalysts, which are used to control nitrogen oxide emissions from the NGCC plants, would make up the majority of the waste generated by this alternative.

According to the GEIS (NRC 1996), an NGCC plant would generate minimal waste. Waste impacts would therefore be SMALL for an NGCC alternative located at the STP site.

8.2.14 Summary of Impacts for the NGCC Generation Alternative

Table 8–3 summarizes the environmental impacts of the NGCC alternative compared to continued operation of STP.

Table 8–3. Summary of Environmental Impacts of the NGCC Alternative Compared to Continued Operation of STP

Category	Natural Gas Combined-Cycle Generation	Continued STP Operation
Air quality	SMALL to MODERATE	SMALL
Surface water	SMALL	SMALL
Groundwater	SMALL	SMALL
Aquatic resources	SMALL	SMALL
Terrestrial resources	SMALL	SMALL
Human health	SMALL	SMALL to MODERATE
Land use	SMALL to MODERATE	SMALL
Socioeconomics	SMALL to MODERATE	SMALL
Transportation	SMALL to MODERATE	SMALL
Aesthetics	SMALL	SMALL
Historic & archaeological	SMALL	SMALL
Waste management	SMALL	SMALL

8.3 Supercritical Coal-Fired Generation

In this section, the NRC staff evaluates the environmental impacts of supercritical coal-fired generation at the STP site.

Coal-fired generation accounted for 40 percent of all electricity generated in the ERCOT service area in 2010, accounting for the greatest share of electrical power (ERCOT 2011a). Furthermore, the EIA projects that coal-fired power plants will account for the greatest share of capacity additions through 2035—more than natural gas, nuclear, or renewable generation options (EIA 2011a). Development of new coal-fired plants may be affected by perceived or actual action to limit greenhouse gas emissions. TCEQ has recently granted permits to several recently proposed coal-fired plants (TCEQ 2011). Supercritical coal-fired plants are feasible, commercially available options for providing electrical generating capacity beyond STPNOC's current license expiration. Therefore, NRC considered supercritical coal fired-generation a reasonable alternative to STP license renewal.

Supercritical technologies are increasingly common in new coal-fired plants. Supercritical facilities operate at higher temperatures and pressures than most existing coal-fired plants. At the critical point, there is no change of state when pressure is increased or if heat is added. For states above the critical point, the steam is supercritical. Operating at higher temperatures and pressures allows the supercritical coal-fired alternative to operate at a higher thermal efficiency than subcritical coal-fired power plants. While supercritical facilities are more expensive to construct, they consume less fuel for a given output, reducing environmental impacts. Based on technology forecasts from EIA, the NRC staff expects that a new, supercritical coal-fired plant would operate at a heat rate of 8,740 Btu/kWh (EIA 2011b).

In a supercritical coal-fired power plant, burning coal heats pressurized water. As the supercritical steam and water mixture moves through plant pipes to a turbine generator, the pressure drops. The mixture flashes to steam. The heated steam expands across the turbine stages, which then spin and turn the generator to produce electricity. After passing through the turbine, any remaining steam is condensed back to water in the plant's condenser.

To replace the 2,500 MWe of power that STP generates, the NRC staff considered four hypothetical coal-fired units, each with a net capacity of 640 MWe. The hypothetical coal-fired plant would require a similar amount of water as STP, Units 1 and 2. Therefore, the NRC staff assumed that the existing cooling water system, including the intakes and discharges on the MCR and the Colorado River, would be sufficient for this alternative. The coal-fired alternative at the STP site would also use the existing STP transmission system.

The hypothetical 2,560 MWe power plant would consume 11.4 million tons (10.4 MT) of coal annually, based an average heat content of 8,200 British thermal units per pound (Btu/lb) (STPNOC 2010a). EPA (2011a) reported that the majority of coal plants within the ERCOT region use subbituminous coal. The other coal plants used lignite or combined subbituminous coal with lignite. While lignite is the most common type of coal found in Texas, NRC assumed that the hypothetical coal plant for this alternative would use subbituminous coal because when combusted, it releases lower levels of Federal CAA criteria pollutants, such as carbon dioxide, nitrous oxides, sulfuric oxides, and particulate matter (TCPA 2008).

Texas coal plants commonly use Power River Basin coal (STPNOC 2010a; TCPA 2008). Given current coal mining operations in Wyoming, the coal used in this alternative would likely be mined in surface mines, then mechanically processed and washed, before being transported—likely by rail—to the power plant site. Limestone for scrubbers would also likely arrive by rail (STPNOC 2010a). This coal-fired alternative would produce roughly 446,000 tons (405,000 MT) of ash, and 43 percent (193,000 tons (175,000 MT)) of the ash would be recycled for beneficial use (STPNOC 2010a). STPNOC (2010a) estimated that approximately 88,000 tons (80,000 MT) of scrubber sludge would be disposed of on site each year, which was based on an assumed annual lime usage of approximately 107,000 tons (97 MT). Approximately 200 ac (81 ha) would be required to dispose of the ash and scrubber waste on site over a 40-year plant life (STPNOC 2010a).

Construction of onsite visible structures would include the boilers and heat-recovery steam generators (which may be enclosed in a single building), exhaust stacks, and an electrical switchyard. Based on GEIS estimates, the plant would require approximately 4,629 ac (1,873 ha) of land. STPNOC (2010a) estimates that 353 ac (143 ha) of land would be required. This estimate appears reasonable; therefore, it is used for this analysis.

To build the coal-fired alternative, site crews would clear the plant site of vegetation, prepare the site surface, and begin excavation before other crews begin actual construction on the plant and any associated infrastructure. Construction materials would be delivered via rail spur, truck, or barge. For the proposed construction of Units 3 and 4, STPNOC proposed dredging near the current barge slip and upgrading the existing rail spur to accommodate shipments of construction materials (STPNOC 2010b). The NRC staff finds this to be reasonable and assumed that dredging and rail spur upgrades would be required for the coal-fired alternative.

The NRC also considered an integrated gasification combined cycle (IGCC) coal-fired plant. IGCC is an emerging technology for generating electricity with coal that combines modern coal gasification technology with both gas turbine and steam turbine power generation. The technology is cleaner than conventional pulverized coal plants because major pollutants can be removed from the gas stream before combustion. The IGCC alternative also generates less solid waste than the pulverized coal-fired alternative. The largest solid waste stream produced by IGCC installations is slag, a black, glassy, sand-like material that is potentially a marketable byproduct. The other large-volume byproduct produced by IGCC plants is sulfur, which is extracted during the gasification process and can be marketed rather than placed in a landfill. IGCC units do not produce ash or scrubber wastes. In spite of the preceding advantages, the NRC concluded in the final EIS for the proposed Units 3 and 4 (NRC 2011) that a new IGCC plant is not a reasonable alternative for the following reasons:

- IGCC plants are more expensive than comparable pulverized coal plants (NETL 2007).
- The few existing IGCC plants in the U.S. have considerably smaller capacity (approximately 250 MWe each) than STP, Units 1 and 2.
- System reliability of existing IGCC plants has been lower than pulverized coal plants.
- The existing IGCC plants have had an extended (though ultimately successful) operational testing period (NPCC 2005).
- A lack of overall plant performance warranties for IGCC plants has hindered commercial financing (NPCC 2005).

At present, the NRC continues to finds this determination reasonable. While the capacity of some of the proposed IGCC plants has grown slightly, most proposed IGCC plants are still considerable smaller than STP, Units 1 and 2. For example, on September 27, 2011, DOE approved a loan to Summit Texas Clean Energy, LLC, for a 400 MWe IGCC plant to be built west of Midland-Odessa, Texas (DOE 2011a). Although NRC considered an IGCC plant as an alternative for the Shearon Harris license renewal SEIS, whose license would also have expired in 2027, the Shearon Harris nuclear plant is much smaller than STP, Units 1 and 2 (955 MWe as compared to 2,500 MWe) (NRC 2008). Because of the small capacity of proposed IGCC plants, the NRC did not find IGCC to be a reasonable alternative for STP, Units 1 and 2. For these reasons, IGCC plants are not considered further in this SEIS.

8.3.1 Air Quality

Air quality impacts from coal-fired generation can be substantial because it emits a significant quantity of sulfur oxides, nitrogen oxides, particulates, carbon monoxide, and HAPs such as mercury; however, many of these pollutants can be effectively controlled by various technologies.

As discussed in Section 2.2.2.1, STP is located in central Matagorda County, Texas, at the southern edge of the Metropolitan Houston–Galveston Intrastate Air Quality Control Region (40 CFR 81.38). The Corpus Christi–Victoria Intrastate Air Quality Control Region (40 CFR 81.136) lies immediately south and west of Matagorda County. EPA has designated all of the counties in these Air Quality Control Regions adjacent to the STP site as in compliance with the National Ambient Air Quality Standards (40 CFR 81.344) except Brazoria County to the north; Brazoria County is classified Nonattainment/Severe relative to the 8-hour ozone standard (EPA 2011b).

Construction activities would cause some localized temporary air-quality effects because of emissions and fugitive dust from operation of the earth-moving and material-handling equipment. Emissions from workers' vehicles and motorized construction equipment exhaust would be temporary. NRC assumed that construction crews would use dust-control practices to control and reduce fugitive dust. STPNOC proposed such activities during construction of proposed Units 3 and 4 (STPNOC 2010b), and §111.145 of TCEQ's regulations require dust suppression control during the construction of facilities and parking lots.

A new coal-fired plant would qualify as a new major-emitting industrial facility and would be subject to PSD requirements of the CAA (EPA 2011c). The coal-fired plant would need to comply with the standards of performance for electric utility steam generating units set forth in 40 CFR Part 60 Subpart Da and GG. The plant would also require an operating permit from TCEQ. In STPNOC's ER for Units 3 and 4, STPNOC stated that "[a]ir emissions sources would be managed in accordance with Federal, Texas, and local air quality control laws and regulations." Likewise, NRC assumed that the coal-fired plant would be operated in accordance with Federal, Texas, and local air quality control laws and regulations.

Subpart P of 40 CFR Part 51 contains the visibility protection regulatory requirements, including the review of new sources that would be constructed in the attainment or unclassified areas and may affect visibility in any Federal Class I area. If a coal-fired alternative was located close to a mandatory Class I area, additional air pollution control requirements would be required. As noted in Section 2.2.2.1, there are no mandatory Class I Federal areas within 50 mi (80 km) of the STP site.

The emissions from the coal-fired alternative at the STP site, projected by the NRC staff based on published EIA data, EPA emission factors, and based on performance characteristics for this alternative and likely emission controls, would be:

- sulfur oxides—3,260 tons (2,958 MT) per year,
- nitrogen oxides—2,869 tons (2,595 MT) per year,
- carbon monoxide—784 tons (711 MT) per year,

- particulate matter PM_{10}—446 tons (405 MT) per year, and
- particulate matter $PM_{2.5}$—223 tons (202 MT) per year.

8.3.1.1 Sulfur Oxides

The coal-fired alternative at the STP site would likely use wet, limestone-based scrubbers to remove sulfur oxides. EPA indicates that this technology can remove more than 95 percent of sulfur oxides from flue gases. The staff projects total sulfur oxide emissions would be 3,260 tons (2,958 MT) per year. Sulfur oxide emissions from a new coal-fired power plant would be subject to the requirements of the CAA (42 U.S.C. § 7651 et seq.). These regulations were enacted to reduce emissions of sulfur dioxide and nitrogen oxide, the two principal precursors of acid rain, by restricting emissions of these pollutants from power plants. The current SIP for Texas includes a Cap and Trade Program for sulfur dioxide. To operate the coal-fired plant, the plant operator would have to purchase sulfur dioxide allowances from the open market or shut down existing fossil-fired plant(s) and apply the credits to the new plant (STPNOC 2010a). Thus, provided the plant operator is able to purchase sufficient allowances to operate, the coal-fired alternative would not add to net regional sulfur dioxide emissions, although it might do so locally.

In addition, in August 2011, EPA published the Cross-State Air Pollution Rule, which included reductions of sulfur dioxide in Texas. According to the rule, coal-fired plants would need to comply with the new reductions by 2012.

8.3.1.2 Nitrogen Oxides

A coal-fired alternative at the STP site would most likely employ various available nitrogen oxide-control technologies, which can be grouped into two main categories—combustion modifications and post-combustion processes. Combustion modifications include low-nitrogen oxide burners, overfire air, reburning, flue gas recirculation, and operational modifications. Post-combustion processes include SCR, selective noncatalytic reduction, and hybrid processes. Effective combination of the combustion modifications and post-combustion processes reduces nitrogen oxide emissions by up to 95 percent (EPA 1998). STPNOC indicated in its ER that it would use low-nitrogen oxide burners, overfire air, selective catalytic reduction, and scrubbers to reduce nitrogen oxide emissions from this alternative (STPNOC 2010a). Assuming the use of such technologies at the STP site, nitrogen oxide emissions after scrubbing would be approximately 2,869 tons (2,595 MT) annually.

Section 407 of the CAA establishes technology-based emission limitations for nitrogen oxide emissions. A new coal-fired power plant would be subject to the new source performance standards for such plants as indicated in 40 CFR 60.44 Subpart Da(a)(1). This regulation limits the discharge of any gases that contain nitrogen oxides to 200 nanograms (ng) of nitrogen oxides per joule (J) of gross energy output (equivalent to 1.6 pounds per megawatt-hours (lb/MWh), based on a 30-day rolling average.

The current SIP for Texas includes a Cap and Trade Program for nitrogen oxides. To operate the coal-fired plant, the plant operator would have to purchase nitrogen oxide allowances from the open market or shut down existing fossil-fired plant(s) and apply the credits to the new plant (STPNOC 2010a). Thus, provided the plant operator is able to purchase sufficient allowances to operate, the coal-fired alternative would not add to net regional nitrogen oxide emissions, although it might do so locally.

8.3.1.3 Greenhouse Gases

A coal-fired plant would also have carbon dioxide emissions during operations, as well as during coal mining, processing, and transportation. The coal-fired plant would emit between

19.3 million tons (17.5 million MT) and 19.9 million tons (18.1 million MT) of carbon dioxide per year from coal combustion, depending on the type and quality of the coal burned.

On July 12, 2012, EPA issued a final rule tailoring the applicability criteria that determine which stationary sources and modification to existing projects become subject to permitting requirements for greenhouse emissions under the PSD and Title V Programs of the CAA (77 FR 41051). According to the Tailoring Rule, greenhouse gases are a regulated new source review pollutant under the PSD major source permitting program if the source is otherwise subject to PSD (for another regulated new source review pollutant) and has a greenhouse gas potential to emit equal to or greater than 75,000 tons (68,000 MT) per year of carbon dioxide equivalent ("carbon dioxide equivalent" adjusting for different global warming potentials for different greenhouse gases). Such sources would be subject to BACT, although EPA has yet to determine BACT for greenhouse gases.

EPA issued a Federal Implementation Plan (FIP) on May 3, 2011, to permit greenhouse gas-emitting sources in states that do not have measures to lower greenhouse gases in their SIP. Because Texas has not updated its SIP to include greenhouse gases, EPA will be the official permitting authority for greenhouse gas-emitting sources in Texas if the SIP is not updated before the coal-fired plant begins operations.

8.3.1.4 Particulates

The new coal-fired power plant would use fabric filters to remove particulates from flue gases (STPNOC 2010a). The fabric filters would remove 99.9 percent of PM (STPNOC 2010a). EPA notes that filters are capable of removing in excess of 99 percent of PM and that sulfur dioxide scrubbers further reduce PM emissions (EPA 2008); therefore, the NRC staff believes the STPNOC removal factor is appropriate. Based on this information, the new supercritical coal-fired plant would emit approximately 446 tons (405 MT) per year of particulate matter having an aerodynamic diameter less than, or equal to, 10 microns (PM_{10}) annually. In addition, coal burning would also result in approximately 223 tons (202 MT) of particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$). Coal-handling equipment would introduce fugitive dust emissions when fuel is being transferred to onsite storage and then reclaimed from storage for use in the plant.

During the construction of a coal-fired plant, onsite activities would also generate fugitive dust. Vehicles and motorized equipment would create exhaust emissions during the construction process. These impacts would be intermittent and short-lived; however, to minimize dust generation, construction crews would use applicable dust-control measures, as described above.

8.3.1.5 Carbon Monoxide

Based upon EPA emission factors (EPA 1998), the NRC staff estimates that total carbon monoxide emissions would be approximately 784 tons (711 MT) per year.

8.3.1.6 Conclusion

While the GEIS analysis mentions global warming from carbon dioxide emissions and acid rain from sulfur and nitrogen oxide emissions as potential impacts, it does not quantify emissions from coal-fired power plants; however, the GEIS analysis does imply that air impacts would be substantial (NRC 1996). The above analysis shows that emissions of air pollutants—including sulfur oxides, nitrogen oxides, carbon monoxide, particulates, and carbon dioxide—exceed those produced by the existing nuclear power plant, as well as those of the other alternatives considered in this section. The NRC analysis for a coal-fired alternative suggests that impacts from the coal-fired alternative would have clearly noticeable effects, but given existing regulatory regimens, permit requirements, and emissions controls, the coal-fired alternative would not destabilize air quality. Based on this information, the overall air quality impacts of a new coal-fired plant located at the STP site would be MODERATE.

8.3.2 Surface Water Resources

STPNOC did not propose using any surface water during the construction of Units 3 and 4 (NRC 2011). As a new coal-fired plant would occupy a smaller footprint relative to new nuclear units, its construction would enable less extensive excavation and earthwork than new nuclear units.

However, onsite construction of an engineered solid waste disposal facility (landfill), totaling 200 ac (80 ha), would also be required for disposal of coal ash and air pollution control scrubber sludge from 20 years of operations. The combined acreage of the coal-fired plant and ash disposal facility would slightly exceed that required for the new nuclear generation alternative. Nevertheless, NRC would still expect that surface water would not be used to support construction activities under this alternative.

As for the aforementioned replacement-power alternatives, some temporary impacts to surface water quality may result from dredging activities in the Colorado River near the barge slip and from increased sediment loading in stormwater runoff from active construction areas. Due to the short-term nature of the dredging activities, the hydrologic alterations and sedimentation would be localized and temporary. Dredging would also be conducted under a permit from the USACE requiring the implementation of BMPs to minimize impacts. Runoff from construction areas, including construction of the disposal facility, would be controlled under a State-issued TPDES general permit that would require implementation of a stormwater pollution prevention plan and associated BMPs to prevent or significantly mitigate soil erosion and contamination of stormwater runoff from construction activities.

During operations, the coal-fired alternative would require a similar amount of cooling water as STP, Units 1 and 2. Because a similar amount of cooling water would be required, NRC expects that the existing intake and discharges on the MCR and the Colorado River would be sufficient to support this alternative. Surface water withdrawals would be subject to, and would remain well within, STPNOC's existing water rights, and effluent discharges and stormwater discharges associated with industrial activity would be subject to a revised State-issued TPDES permit under this alternative. In accordance with the applicable TPDES permit, implementation of a stormwater pollution prevention plan for industrial activities would address stormwater run-on and runoff issues associated with coal storage and handling, as well as other stockpiles (e.g., lime) at the plant. These requirements would also encompass the handling, storage, and disposal of coal ash and scrubber wastes so as to mitigate the potential water quality impacts of contaminated runoff and infiltration.

In consideration of the information above, the impacts on surface water use and quality from construction and operations under the coal-fired generation alternative would be SMALL.

8.3.3 Groundwater Resources

Construction-related ground disturbance and excavation work would be somewhat less than that described for the new nuclear alternative, mainly due to a reduction in deep excavation work and less intensive structural work. However, construction and excavation for a coal ash and scrubber residue disposal facility would have additional potential impacts on groundwater. Although groundwater dewatering of foundation excavations for a new coal-fired plant would likely be required, slurry walls and wells were proposed for use to minimize potential adverse effects from dewatering both on site and off site (NRC 2011). Construction of the coal ash and scrubber residue disposal facility would have to be carefully managed and sited to minimize the need for construction dewatering due to the shallow depth of groundwater across many areas of the STP site. Application of BMPs in accordance with a state-issued NPDES general permit, including appropriate waste management and spill prevention practices, would prevent or minimize groundwater quality impacts during construction.

STPNOC assumed that a fossil-fuel-fired generation facility would be located adjacent to the STP, Units 1 and 2, site to use the existing infrastructure, including continued use of the existing onsite groundwater production wells at STP. Groundwater use for construction of a new coal-fired plant is expected to be similar to the volume required for new nuclear units under this alternative. This would encompass such uses as potable and sanitary uses, concrete production, dust suppression and soil compaction, and other uses.

For coal-fired plant operations, NRC assumed that the coal-fired generation alternative would entail the same relative ratio of groundwater use to surface water use as that used at STP, Units 1 and 2. This includes the use of groundwater for freshwater and service water makeup, potable and sanitary uses, and fire protection. It is expected that total groundwater usage and associated aquifer effects would likely be less than those under current STP operations. This is because of the fewer number of auxiliary systems requiring groundwater and the smaller workforce under the coal-fired generation alternative.

Disposal of coal ash and air pollution control scrubber wastes in an onsite landfill would have the potential to impact groundwater quality due to the generation and infiltration of leachate to the environment. NRC assumes that any disposal facility would incorporate a liner to prevent infiltration and would be operated with a leachate monitoring and collection system and ambient groundwater monitoring system. These systems and measures would ensure that facility operations would not impact groundwater quality. Operation of the facility would also be subject to a state-issued landfill permit.

Based on this information, the overall impact on groundwater use and quality from construction and operations under the coal-fired generation alternative would be SMALL.

8.3.4 Aquatic Ecology

Construction activities for the coal-fired alternative (such as construction of heavy haul roads and the power blocks) could affect drainage areas or other onsite aquatic features due to site runoff. NRC assumed that the plant operator would install temporary and permanent erosion and sediment control measures to minimize the flow of disturbed soils into ditches and wetlands. Such BMPs would likely be described in a TPDES general permit relating to stormwater discharges for construction activities. To bring new materials to the site, NRC assumed the plant operator would dredge near the barge slip to transport some materials using barges. Permits and certifications from the USACE and other agencies would require the implementation of BMPs to minimize impacts. Due to the short-term nature of the dredging activities, the hydrological alterations to aquatic habitats would be localized and temporary.

During operations, the coal-fired alternative would require a similar amount of cooling water to be withdrawn from the Colorado River at STP, Units 1 and 2, and the thermal discharge would also be similar to STP, Units 1 and 2. Therefore, the number of fish and other aquatic organisms affected by impingement, entrainment, and heat shock would be similar for a coal-fired alternative as for license renewal. The cooling system for a new coal-fired plant would have similar chemical discharges as STP, but the air emissions from the coal-fired plant would emit particulates that would settle onto the river surface and introduce a new source of pollutants that would not exist if STP continued operating. However, the flow of the Colorado

River would dissipate pollutants, which would decrease the concentration of pollutants and minimize the exposure of fish and other aquatic organisms to pollutants.

Construction activities would require BMPs; dredging would be short-term; the surface water withdrawal and discharge for this alternative would be less than for STP, Units 1 and 2; and pollutants would dissipate with the Colorado River (minimizing exposure concentrations to aquatic resources). Therefore, impacts on aquatic ecology would be SMALL.

8.3.5 Terrestrial Ecology

Coal-fired operations would affect terrestrial ecology both on the STP site and in offsite coal mining areas.

If the coal-fired alternative is constructed at the STP site, construction would likely affect a variety of habitats and land uses, including industrial land (buildings, parking areas, and mowed-maintained fields), drainage ditches, scattered small palustrine wetlands, scrub-shrub habitat, and mixed grassland habitat where abandoned farm lands previously existed prior to construction of Units 1 and 2. Most of these areas have been mildly to extensively disturbed during the construction and operations of Units 1 and 2 and other human activities. After the completion of the new units, construction crews would likely grade, landscape, and replant the areas used for temporary building support, which is similar to what STPNOC proposed to do after completion of proposed new nuclear Units 3 and 4 (STPNOC 2010b). The majority of permanently affected areas would be maintained (e.g., mowed) and industrial areas. The plant operator would likely implement BMPs to minimize impacts to wetlands. The plant operator would be required to comply with the USACE’s 404 permits. Construction activities could also adversely affect onsite wildlife through noise, increased light pollution, and increased traffic. However, these impacts would be temporary and minor.

Coal mining would affect terrestrial resources at offsite coals mines, although much of this land is likely already disturbed by mining, and the incremental effects of this alternative on coal mine terrestrial ecology are difficult to gauge.

STPNOC estimates that 253,000 tons of coal ash and 88,000 tons of scrubber sludge would be disposed of on site annually (STPNOC 2010a). Over a 40-year period, this would require approximately 200 ac for land disposal (STPNOC 2010a). As described above, these areas could affect terrestrial ecology, especially if they are located in habitats that are currently used by wildlife on the STP site. Once the disposal area is reclaimed, the habitats may be useable by wildlife that inhabits open areas.

Deposition of acid rain resulting from nitrogen or sulfur oxide emissions, and the deposition of other pollutants, can also affect terrestrial ecology both on and off site. Given the emission regulations discussed in Section 8.3.1, air deposition impacts may be noticeable but are unlikely to be destabilizing.

Because of the potential habitat disturbances and potential pollutant deposition, impacts to terrestrial resources from a coal-fired alternative would be MODERATE.

8.3.6 Human Health

Coal-fired power plants introduce worker risks from coal and limestone mining, coal and limestone transportation, plant operations, and disposal of coal combustion and scrubber wastes. In addition, there are public risks from the inhalation of stack emissions (as addressed in Section 8.3.1) and the secondary effects of eating foods grown in areas subject to deposition from plant stacks.

Human health risks of coal-fired power plants are described, in general, in Table 8–2 of the GEIS (NRC 1996). Cancer and emphysema, as a result of the inhalation of toxins and particulates, are identified as potential health risks to occupational workers and members of the public (NRC 1996). The human health risks of coal-fired power plants, both to occupational workers and to members of the public, are greater than those of the current STP due to exposures to chemicals such as mercury; sulfur oxides; nitrogen oxides; radioactive elements, such as uranium and thorium contained in coal and coal ash; and polycyclic aromatic hydrocarbon (PAH) compounds, including benzo(a)pyrene.

Regulations restricting emissions—enforced by EPA or state agencies—have acted to significantly reduce potential health effects but do not entirely eliminate them. These agencies also impose site-specific emission limits as needed to protect human health. Even if the coal-fired alternative were located in a non-attainment area, emission controls and trading or offset mechanisms could prevent further regional degradation; however, local effects could be visible. Many of the byproducts of coal combustion responsible for health effects are largely controlled, captured, or converted in modern power plants (as described in Section 8.3.1), although some level of health effects may remain.

Aside from emission impacts, the coal-fired alternative introduces the risk of coal pile fires, and for those plants that use coal combustion liquid and sludge waste impoundments, the release of the waste due to a failure of the impoundment. Although there have been several instances of this occurring in recent years, these types of events are still relatively rare.

Despite the range of potential threats to human health, extensive health-based regulations exist to mitigate the risks to workers and the public. As a result, the NRC staff expects human health impacts to be characterized as SMALL.

Noise during construction activities and from plant operations may be detectable off site. The plant operator would need to adhere to local ordinances regarding maximum noise levels during construction and operations. Therefore, impacts from noise would likely be SMALL.

8.3.7 Land Use

The GEIS generically evaluates the impact of constructing and operating various replacement power plant alternatives on land use, both on and off each plant site. The analysis of land use impacts focuses on the amount of land area that would be affected by the construction and operation of a supercritical coal-fired generation at the STP site.

Based on scaled GEIS estimates, the plant would require approximately 4,629 ac (1,873 ha) of land. STPNOC estimates that 353 ac (143 ha) of land would be required (STPNOC 2010a). This estimate appears reasonable; therefore, it is used for this analysis. STPNOC estimates that an additional 200 ac (80 ha) of land area would be required on site for waste disposal (STPNOC 2010a). Land would also be required on site for frequent coal and limestone deliveries by rail or barge.

Offsite land use impacts would occur from coal mining, in addition to land use impacts from the construction and operation of the new power plant. Scaling from GEIS estimates, approximately 59,906 ac (24,244 ha) of land could be affected by mining coal and waste disposal to support the coal-fired alternative during its operational life (NRC 1996); however, most of the land in existing coal mining areas has already experienced some level of disturbance. The elimination of the need for uranium mining to supply fuel for the STP would partially offset this offsite land use impact. Scaling from GEIS estimates, approximately 2,560 ac (1,036 ha) would not be needed for mining and processing uranium during the operating life of the plant.

Since a substantial amount of onsite land at the STP site would be converted for coal and limestone delivery and waste disposal, land use impacts would be MODERATE.

8.3.8 Socioeconomics

As previously discussed, socioeconomic impacts are defined in terms of changes to the demographic and economic characteristics and social condition of a region. For example, the number of jobs created by the construction and operation of a power plant could affect regional employment, income, and expenditures. Two types of jobs would be created by this alternative: (1) construction jobs, which are transient, short in duration, and less likely to have a long-term socioeconomic impact; and (2) power plant operation jobs, which have the greater potential for permanent, long-term socioeconomic impacts. Workforce requirements of power plant construction and operation for the coal-fired alternative were determined to measure their possible effects on current socioeconomic conditions.

Scaling from GEIS estimates, the construction workforce would peak at 6,808 workers. STPNOC projected a peak construction workforce of 3,955 employees (STPNOC 2010a). STPNOC's estimate appears reasonable; therefore, it is used in this analysis. The relative economic impact of this many workers on the local economy and tax base would vary, with the greatest impacts occurring in the communities where the majority of construction workers would reside and spend their income. As a result, local communities could experience a short-term "boom" from increased tax revenue and income generated by construction expenditures and the increased demand for temporary (rental) housing and business services. Some construction workers could relocate to Matagorda and surrounding counties in order to be closer to the construction work site. However, given the proximity of STP to the Houston metropolitan area, many construction workers could commute to the STP site, thereby lessening the need for additional rental housing near STP.

After completing the installation of the supercritical coal-fired power plant, local communities could experience a return to pre-construction economic conditions. Based on this information, and given the number of workers, socioeconomic impacts during construction in communities near the STP site could range from SMALL to MODERATE.

Scaling from GEIS estimates, the plant operation workforce would be 681 workers. STPNOC estimated a plant operation workforce of approximately 348 workers. The STPNOC estimate appears to be reasonable and is consistent with trends toward lowering labor costs by reducing the size of plant operations workforces. The amount of property taxes paid under the coal-fired alternative may increase if additional land is required off site to support this alternative. Socioeconomic impacts during operations could range from SMALL to MODERATE as the STP site transitions to the new supercritical coal-fired power plant. The potential reduction in overall employment at STP could affect property tax revenue and income in local communities and businesses. In addition, the permanent housing market could also experience increased vacancies and decreased prices if operations workers and their families move out of the region.

8.3.9 Transportation

Transportation impacts associated with construction and operation of a four-unit, coal-fired plant would consist of commuting workers and truck deliveries of construction materials to the STP site. During periods of peak construction activity, up to 3,955 workers could be commuting daily to the site (STPNOC 2010a). Workers commuting to the STP site would primarily use two-lane roads. The volume of traffic on these roads, especially FM 521, would increase substantially. In addition to commuting workers, trucks would be transporting construction materials and equipment to the worksite, thus increasing the amount of traffic on local roads. The increase in vehicular traffic would peak during shift changes, resulting in temporary levels of service impacts and delays at intersections. Some power plant components and materials could also be delivered by train or barge. Train deliveries could cause additional traffic delays at railroad crossings. Based on this information, traffic-related transportation impacts during construction could range from MODERATE to LARGE.

Traffic-related transportation impacts would be greatly reduced after completing the installation of the coal-fired units. Transportation impacts would include daily commuting by the operating workforce, equipment and materials deliveries, and the removal of commercial waste material to offsite disposal or recycling facilities by truck. During operations, the estimated number of operations workers commuting to and from the STP site would be 348 workers. Frequent deliveries of coal and limestone by rail would add to the overall transportation impact by causing traffic delays at railroad crossings. Onsite coal storage would make it possible to receive several trains per day. Limestone delivered by rail could also add additional traffic (though considerably less traffic than that generated by coal deliveries). Traffic-related transportation impacts would be considerably less than current operations because the new supercritical coal-fired power plant would employ far fewer workers than STP, Units 1 and 2. Overall, transportation impacts would be SMALL during power plant operations.

8.3.10 Aesthetics

The analysis of aesthetic impacts focuses on the degree of contrast between the coal-fired alternative and the surrounding landscape and the visibility of the coal-fired power plant. During construction, all of the clearing and excavation would occur on the STP site. These activities may be visible from offsite roads, particularly FM 521. Since the STP site already appears industrial, construction of the coal-fired power plant would appear similar to onsite activities during refueling outages.

The coal-fired alternative would be up to 200 ft (61 m) tall with an exhaust stack up to 500 ft (152 m), which may be visible off site in daylight hours. The coal-fired plant, however, would be shorter and less noticeable than the current STP reactor building, which has a height of approximately 250 ft (76 m) (STPNOC 2010b). Lighting on plant structures may be detectable off site. Noise generated during power plant operations would be limited to routine industrial processes and communications.

In general, given the industrial appearance of the STP site, the new coal-fired power plant would blend in with the surroundings if the existing STP, Units 1 and 2, remains. Aesthetic changes would be limited to the immediate vicinity of the existing STP site, and any impacts would be SMALL.

8.3.11 Historic and Archaeological Resources

The same considerations, discussed in Section 8.1.11, for the impact of the construction of a new nuclear plant on historic and archaeological resources apply to the construction activities that would occur on the STP site for a coal-fired plant. As described in Section 2.2.10, much of the STP site has been previously disturbed by the construction of STP, Units 1 and 2. In addition, in preparation for the COL application for Units 3 and 4, STPNOC conducted a cultural resources assessment of the STP site. STPNOC reviewed existing information for the STP site and the area within a 10-mi (16-km) radius. STPNOC concluded that any cultural resource sites that may have existed on site would no longer retain their integrity because the area was heavily disturbed during the construction of Units 1 and 2 (STPNOC 2010b). In December 2006, STPNOC reported these findings to the SHPO at the Texas Historical Commission. The SHPO concurred, in January 2007, that there would be no impacts to historic properties (STPNOC 2006; THC 2007).

There is a low potential for cultural resources to be located in previously undisturbed portions of the STP site. However, if the coal-fired units were to be sited within undisturbed areas or within areas of known cultural sensitivity (historic grave site located on the property and described in Section 2.2.10), these areas would need to be surveyed by a professional archaeologist to identify and develop possible mitigation measures to address any adverse effects from project activities. NRC assumes the plant operator would follow similar procedures to those described in the final EIS for STP, Units 3 and 4 (NRC 2011), if the plant operator discovered any historic or cultural resources during ground-disturbing activities associated with building the new units.

The NRC staff determined that the impact of the coal-fired alternative at the STP site on historic and archaeological resources would be SMALL for the following reasons:

- NRC (2011) and STPNOC (2010a, 2010b) did not identify any cultural resources that could be affected by Units 3 and 4.
- The SHPO determined that construction for Units 3 and 4 would not affect cultural and historic resources.
- NRC assumes that the plant operator would follow environmental compliance procedures for new ground-disturbing activities.

8.3.12 Environmental Justice

The environmental justice impact analysis evaluates the potential for disproportionately high and adverse human health, environmental, and socioeconomic effects on minority and low-income populations that could result from the construction and operation of a new power plant. As previously discussed in Section 8.1.12, such effects may include human health, biological, cultural, economic, or social impacts. Some of these potential effects have been identified in resource areas discussed in this SEIS. For example, increased demand for rental housing during plant construction could disproportionately affect low-income populations. Minority and low-income populations are subsets of the general public residing in the vicinity of the STP site, and all are exposed to the same hazards generated from constructing and operating a new coal-fired plant. Section 4.9.7, "Environmental Justice," presents demographic information about minority and low-income populations residing in the vicinity of the STP site.

Potential impacts to minority and low-income populations from the construction and operation of a new coal-fired plant at the STP site would mostly consist of environmental and socioeconomic effects (e.g., noise, dust, traffic, employment, and housing impacts). Noise and dust impacts during construction would be short-term and primarily limited to onsite activities. Minority and low-income populations residing along site access roads would be directly affected by increased commuter vehicle and truck traffic. However, because of the temporary nature of construction, these effects would only occur during certain hours of the day and are unlikely to be high and adverse. Increased demand for rental housing during construction could affect low-income populations living near STP. However, given the proximity of the STP site to the Houston metropolitan areas, many construction workers could commute to the STP site, thereby lessening the additional need for rental housing.

Based on this information, and the analysis of human health and environmental impacts presented in this SEIS, the construction and operation of a new coal-fired power plant would not have disproportionately high and adverse human health and environmental effects on minority and low-income populations residing in the vicinity of the STP site.

8.3.13 Waste Management

During the construction stage of the coal-fired alternative, land clearing and other construction activities would generate waste that could be recycled, disposed of on site, or shipped to an offsite waste disposal facility. Because the alternative would be constructed on or near the previously disturbed STP site, the amounts of waste produced during land clearing would be reduced.

Coal combustion generates several waste streams including ash (a dry solid) and sludge (a semi-solid by-product of emission control system operation). This coal-fired alternative would produce roughly 446,000 tons (405,000 MT) of ash, and 43 percent (193,000 tons (175,000 MT)) of the ash would be recycled for beneficial use (STPNOC 2010a). STPNOC (2010a) estimated that approximately 88,000 tons (80,000 MT) of scrubber sludge would be disposed of on site each year, which was based on an assumed annual lime usage of approximately 107,000 tons (97 MT). Approximately 200 ac (81 ha) would be required to dispose of the ash and scrubber waste on site over a 40-year plant life (STPNOC 2010a). All waste disposal would occur on site.

The impacts from waste generated during operation of this coal-fired alternative would be MODERATE because the impacts would be clearly visible but would not destabilize important resources.

8.3.14 Summary of Impacts for the Supercritical Coal-Fired Generation Alternative

Table 8–4 provides a summary of the environmental impacts of the supercritical coal-fired alternative compared to continued operation of STP.

Table 8–4. Summary of Environmental Impacts of the Supercritical Coal-Fired Alternative Compared to Continued Operation of STP, Units 1 and 2

	Supercritical Coal-Fired Generation	Continued STP Operation
Air quality	MODERATE	SMALL
Surface water	SMALL	SMALL
Groundwater	SMALL	SMALL
Aquatic resources	SMALL	SMALL
Terrestrial resources	MODERATE	SMALL
Human health	SMALL	SMALL to MODERATE
Land use	MODERATE	SMALL
Socioeconomics	SMALL to MODERATE	SMALL
Transportation	SMALL to LARGE	SMALL
Aesthetics	SMALL	SMALL
Historic & archaeological	SMALL	SMALL
Waste management	MODERATE	SMALL

8.4 Combination Alternative

In this section, the NRC staff evaluates the environmental impacts of a combination of alternatives. This combination includes 640 MWe supplied by one NGCC unit similar to the units identified in Section 8.2, 1,620 MWe supplied by wind energy projects, and 300 MWe of energy conservation and efficiency (also known as demand-side management). Because wind is an intermittent resource, wind energy projects would be interconnected to one another on the transmission grid, and the NGCC unit could be used, if needed, to be a baseload resource. Interconnecting wind farms through the transmission grid increase the probability that at least one site experiences sufficient wind to produce electricity. Thus, as more sites are added to the transmission grid, the interconnected wind farms provide electricity that is comparable to a single wind farm providing near constant deliverable wind power. Archer and Jacobson (2007) looked at 19 wind energy sites in the southeast, including 2 sites in Texas, and determined that the 19 interconnected wind farms could guarantee 312 kWe of power for 79 percent of time. Based on this data, NRC assumed that to provide 1,620 MWe of wind energy, the installed capacity would need to be at least 7,714 MWe. NRC included this contribution from wind power because Texas has significant wind energy resources and leads the Nation in wind-powered generation capacity. As of June 30, 2011, the installed wind capacity in Texas was 10,135 MWe (DOE 2011b). In addition, wind energy projects totaling 36,124 MWe are currently under ERCOT's review (ERCOT 2011a), and the installed wind capacity in Texas has been increasing annually by 500 MWe to 3,000 MWe in each of the past 7 years (DOE 2011b). Therefore, NRC considers 1,620 MWe of wind energy (with an installed capacity of 7,714 MWe) to be a reasonable amount by the time the STP licenses expire in 2027 and 2028. Section 8.6.3 discusses the status of wind energy technology and implementation in greater detail.

NRC assumed that one new NGCC unit of the type described in Section 8.2 would be constructed and installed at the STP site with a total capacity of 640 MWe. The appearance of an NGCC unit would be similar to that of the full NGCC alternative considered in Section 8.2, although only one unit would be constructed. The NRC estimates that it would require about one-fourth of the space necessary for the alternative considered in Section 8.2 and that construction and operational effects would scale accordingly.

NRC assumed that the wind turbines could be constructed at multiple sites scattered over large distances to minimize the likelihood that all sites would be exposed to the same weather events at the same time. Some of these sites could potentially be offshore, although no turbines currently operate offshore anywhere in the U.S. NRC assumed that the contribution from offshore wind energy would be relatively small because offshore wind capacity of the magnitude analyzed in this alternative exceeds by a factor of 10 or more the amount of offshore wind projected by the EIA for the entire U.S. by the year 2035 (EIA 2011a). Assuming each turbine has a capacity of 2 MWe, construction and operation of approximately 3,877 turbines would be required. In addition, new transmission lines would likely be needed to connect the wind energy projects to one another and the distribution system.

STPNOC estimated that a utility-scale wind plant requires 60 ac of land per MWe of installed capacity in open, flat terrain (STPNOC 2010a). Approximately 462,900 ac (187,300 ha) of land would be required for the installed capacity of 7,714 MWe. A small percentage of this area would be occupied by turbines, access roads, and other infrastructure, with the rest of the area potentially available for compatible other uses, such as agriculture. For example, NREL (2009) estimates that 0.7 ha (1.7 ac) of land would be temporarily disturbed per MWe of installed capacity and that 0.3 ha (0.7 ac) of land would be permanently disturbed per MWe of installed capacity. For this alternative, approximately 2,185 ac (884 ha) would be temporarily disturbed, and 937 ac (379 ha) would be permanently disturbed.

For the combination alternative, the NRC assumed that an Energy Efficiency and Conservation Program would replace 300 MWe of current STP output. As discussed in Section 8.6.2, beginning in 2009, all electric transmission and distribution utilities within the ERCOT market—including CPS Energy and Austin Energy (two of the owners of STP, Units 1 and 2)—were required to implement energy efficiency and conservation programs to reduce their customers' energy consumption by a minimum of 20 percent of the utility's annual growth in 2009, 25 percent in 2012, and 30 percent in 2013 and beyond. CPS Energy and Austin Energy currently implement programs to promote energy efficiency and conservation. The 300 MWe reduction in energy use for this alternative would be beyond the required energy efficiency and conservation programs currently implemented by CPS Energy and Austin Energy. No major construction would be necessary for the energy efficiency and conservation component of the combination alternative.

8.4.1 Air Quality

As discussed in Section 2.2.2.1, the STP site is located in central Matagorda County, Texas, at the southern edge of the Metropolitan Houston–Galveston Intrastate Air Quality Control Region (40 CFR 81.38). The Corpus Christi–Victoria Intrastate Air Quality Control Region (40 CFR 81.136) lies immediately south and west of Matagorda County. EPA has designated all of the counties in these Air Quality Control Regions adjacent to the STP site as in compliance with the National Ambient Air Quality Standards (40 CFR 81.344) except Brazoria County to the north; Brazoria County is classified Nonattainment/Severe relative to the 8-hour ozone standard (EPA 2011b).

Construction activities for both the NGCC plant and wind energy components would cause some localized temporary air quality effects because of equipment emissions and fugitive dust from operation of earth-moving and material-handling equipment. Emissions from workers' vehicles and motorized construction equipment exhaust would be temporary. NRC assumed that construction crews would use dust-control practices to control and reduce fugitive dust because § 111.145 of TCEQ's regulations require dust suppression control during the construction of facilities and parking lots. Impacts from wind turbine installation would be spread across multiple locations, but these impacts would be short in duration. In its programmatic final EIS, which analyzed the impacts of offshore wind projects generically within U.S. waters, U.S. Minerals Management Service (MMS, which is currently Bureau of Ocean Energy Management) determined that construction of offshore wind projects could result in air quality impacts, mainly from fugitive dust emissions, and emissions of sulfur dioxide and ozone precursors (MMS 2007).

New air emission sources in Texas must comply with Federal, Texas, and local air quality control laws. The NGCC component of this combination alternative would qualify as a new major-emitting industrial facility and would be subject to PSD requirements under CAA (EPA 2011c). The NGCC unit would need to comply with the standards of performance for electric utility steam generating units set forth in 40 CFR Part 60 Subpart KKKK. The plant would also require an operating permit from TCEQ.

Subpart P of 40 CFR Part 51 contains the visibility protection regulatory requirements, including the review of new sources that would be constructed in the attainment or unclassified areas and may affect visibility in any Federal Class I area. If an NGCC plant was located close to a mandatory Class I area, additional air pollution control requirements would be required. As noted in Section 2.2.2.1, there are no mandatory Class I Federal areas within 50 mi of the STP site.

The NRC projects the following emissions, assuming a maximum of 640 MWe power from the NGCC component of this combination alternative based on data published by the EIA, EPA, and on performance characteristics and emissions controls:

- sulfur oxides—50 tons (46 MT) per year,
- nitrogen oxides—219 tons (199 MT) per year,
- carbon dioxide—1,727,000 tons (1,567,000 MT) per year,
- carbon monoxide—222 tons (201 MT) per year,
- TSP—97 tons (88 MT) per year, and
- particulate matter PM_{10}—97 tons (88 MT) per year.

During operations, the wind energy projects would not produce emissions. However, workforce transportation and eventual decommissioning could result in carbon dioxide emissions.

For the Energy Efficiency and Conservation Program, the GEIS notes that the environmental impacts are likely to be centered on indoor air quality (NRC 1996). This is due to increased weatherization of the home in the form of extra insulation and reduced air turnover rates from the reduction in air leaks. However, the actual impact is highly site-specific and not yet well-established.

8.4.1.1 Sulfur Oxide and Nitrogen Oxide

The new NGCC plant would have to comply with Title IV of the CAA (42 USC 7651) reduction requirements for sulfur and nitrogen oxides, which are the main precursors of acid rain and the major cause of reduced visibility. Title IV establishes maximum sulfur and nitrogen oxide emission rates from existing plants and a system of sulfur oxide emission allowances that can be used, sold, or saved for future use by new plants. In addition, in August 2011, EPA published the Cross-State Air Pollution Rule, which included reductions of sulfur and nitrogen oxides in Texas. According to the rule, NGCC plants would need to comply with the new reductions by 2012.

As stated above, the new NGCC plant would produce 50 tons (46 MT) per year of sulfur oxides and 219 tons (199 MT) per year of nitrogen oxides based on the use of the dry low-nitrogen oxide combustion technology and use of SCR to significantly reduce nitrogen oxide emissions. The new plant would be subjected to the continuous monitoring requirements for sulfur and nitrogen oxides. The current SIP for Texas includes a Cap and Trade Program for sulfur and nitrogen oxide emissions. To operate the NGCC plant, the plant operator would have to purchase sulfur dioxide allowances from the open market or shut down existing fossil-fired plant(s) and apply the credits to the new plant (STPNOC 2010a). Thus, provided the plant operator is able to purchase sufficient allowances to operate, the NGCC portion of this alternative would not add to net regional sulfur dioxide or nitrogen oxide emissions, although it might do so locally.

8.4.1.2 Greenhouse Gases

The new plant would release greenhouse gases, such as carbon dioxide and methane. The plant would be subjected to the continuous monitoring requirements for carbon dioxide, as specified in 40 CFR Part 75. The NGCC plant would emit approximately 1.7 million tons (approximately 1.6 million MT) per year of carbon dioxide emissions.

On July 12, 2012, EPA issued a final rule tailoring the applicability criteria that determine which stationary sources and modification to existing projects become subject to permitting requirements for greenhouse emissions under the PSD and Title V Programs of the CAA

(77 FR 41051). According to the Tailoring Rule, greenhouse gases are a regulated new source review pollutant under the PSD major source permitting program if the source is otherwise subject to PSD (for another regulated new source review pollutant) and has a greenhouse gas potential to emit equal to or greater than 75,000 tons (68,000 MT) per year of carbon dioxide equivalent ("carbon dioxide equivalent" adjusting for different global warming potentials for different greenhouse gases). Such sources would be subject to BACT, although EPA has yet to determine BACT for greenhouse gases.

EPA issued a FIP on May 3, 2011, to permit greenhouse gas-emitting sources in states that do not have measures to lower greenhouse gases in their SIP. Because Texas has not updated its SIP to include greenhouse gases, EPA will be the official permitting authority for greenhouse gas-emitting sources in Texas if the SIP is not updated before the NGCC plant begins operations.

8.4.1.3 Particulates

The new NGCC plant would produce 97 tons (88 MT) per year of TSP, all of which would be emitted as PM_{10}. STPNOC (2010a) indicated that all PM_{10} emissions would be $PM_{2.5}$. DOE (2007) evaluated the emissions from a hypothetical 560 MWe NGCC unit using BACT to meet the emission requirements of the 2006 New Source Performance Standards. DOE concluded that emissions from particulates would be negligible because NGCC use natural gas as fuel; therefore, NGCC plants would not require emissions controls equipment or features to reduce these emissions.

8.4.1.4 Hazardous Air Pollutants

In December 2000, EPA issued regulatory findings (65 FR 79825) on emissions of HAPs from electric utility steam-generating units, which said that natural gas-fired plants emit HAPs such as arsenic, formaldehyde, and nickel, and stated the following:

> Also in the utility RTC (Report to Congress), the EPA indicated that the impacts due to HAP emissions from natural gas-fired electric utility steam generating units were negligible based on the results of the study. The Administrator finds that regulation of HAP emissions from natural gas-fired electric utility steam generating units is not appropriate or necessary.

As a result of EPA's conclusion, the NRC staff finds no significant air quality effects from HAPs from the NGCC component of this alternative. The wind and energy efficiency and conservation components of this alternative release no HAPs.

8.4.1.5 Conclusion

Based on the NRC staff's analysis, the overall air quality impacts of a combination alternative that includes a new NGCC plant located at the STP site, wind energy projects, and the Energy Efficiency and Conservation Program would be SMALL to MODERATE. Emissions from the wind energy projects and the Energy Efficiency and Conservation Program would not be noticeable. Emissions from the NGCC portion of this alternative would be noticeable for greenhouse gases; carbon dioxide emissions would be two orders of magnitude larger than the threshold in EPA's tailoring rule for greenhouse gas (75,000 tons (68,000 MT) per year of carbon dioxide equivalent) that would trigger a regulated new source review. Impacts would not be noticeable for sulfur and nitrogen oxides because the Texas SIP requires a Cap and Trade Program, and there would be no net increase in sulfur and nitrogen oxide emissions. Based on analyses from DOE (2007) and EPA (2000, 65 FR 79825), TSPs and HAPs from the NGCC unit would have negligible impacts.

8.4.2 Surface Water Resources

STPNOC did not propose using any surface water during the construction of Units 3 and 4 (NRC 2011). Because a single NGCC unit occupies a smaller footprint, and its construction would entail substantially less excavation and earthwork at the STP site as compared to Units 3 and 4, NRC expects that surface water would not be used during construction for the NGCC component of this alternative.

As further described in Section 8.5.2 for the NGCC alternative, some temporary impacts to surface water quality may result from dredging activities in the Colorado River near the barge slip and from increased sediment loading in stormwater runoff from active construction areas. These activities would be conducted under a permit from the USACE requiring the implementation of BMPs to minimize impacts. Runoff from construction areas would be controlled under a State-issued TPDES general permit that would require implementation of a stormwater pollution prevention plan and associated BMPs.

Small amounts of water would be required during the construction phase for each of the 3,877 wind turbines for dust suppression and compaction during site clearing and for concrete production for pad and piling construction, as appropriate. Although surface water from nearby water bodies may be used for pad site construction at some locations, it is likely that water would be procured from offsite sources and trucked to the point of use on an as needed basis. Use of ready-mix concrete would also reduce the need for onsite use of nearby water sources.

Further, the installation of land-based wind turbines would require installation of access roads and possibly transmission lines (especially for turbine sites not already proximal to transmission line corridors). Access road construction would also require some water for dust suppression and roadbed compaction and would have the potential to result in soil erosion and stormwater runoff from cleared areas. Water would likely be trucked to the point of use from offsite locations along with road construction materials. Construction activities would be conducted in accordance with State-issued TPDES or equivalent permits for stormwater discharges associated with construction activity, which would require the implementation of appropriate BMPs to prevent or mitigate water quality impacts.

Construction of offshore wind turbines, including the offshore foundation and pilings, associated anchoring devices, undersea cables, and onshore support installation (e.g., transformers) would also have the potential to cause water quality impacts due to soil and sediment erosion and runoff. Most notably, potential impacts would include disturbance of marine sediments from pile driving and erection of cofferdams for the wind turbine superstructures. Nevertheless, such water quality impacts would be temporary, and activities would be conducted in accordance with USACE and other applicable permits and requiring the use of BMPs to minimize impacts.

For facility operations, the NGCC component of this alternative would require about one-fourth of the water required by the NGCC alternative. It is expected that use of the existing intake and discharge infrastructure on the MCR and the Colorado River would be sufficient to support the NGCC plant. Surface water withdrawals would be subject to, and would remain well within, STPNOC's existing water rights, and effluent discharges and stormwater discharges associated with industrial activity would be subject to a revised State-issued TPDES permit under this alternative. To support operations of individual wind turbine installations, only very small amounts of water would be used to periodically clean turbine blades and motors as part of routine servicing. It would be expected that water would be trucked to the point of use and procured from nearby sources.

Implementation of the Energy Efficiency and Conservation Program component of this alternative would likely entail little or no impact on surface water resources.

In consideration of the information above, the impacts on surface water use and quality from construction and operations under the combination alternative would be SMALL.

8.4.3 Groundwater Resources

For the single NGCC plant at the STP site, construction-related ground disturbance and excavation work would be substantially less than that described for the NGCC alternative. Although groundwater dewatering of foundation excavations for a new NGCC plant would likely be required, slurry walls and wells were proposed for use to minimize potential adverse effects from dewatering both on site and off site (NRC 2011). Groundwater dewatering, where required, for installation of wind turbines on land, would be minimal due to the small footprint of foundation structures. For all construction activities, appropriate BMPs, including spill prevention practices, would be employed during wind turbine construction to prevent or minimize impacts on groundwater quality.

For NGCC plant operations, NRC assumed that the NGCC alternative would entail the same relative ratio of groundwater use to surface water use as that used at STP, Units 1 and 2. As such, for a single NGCC unit, groundwater use would be about one-fourth of the water required by the NGCC alternative and easily supported by existing onsite groundwater production wells at STP. Little or no groundwater use would be expected for operation of wind turbines.

Implementation of the Energy Efficiency and Conservation Program component of this alternative would likely entail little or no impact on groundwater resources.

Based on this information, the overall impact on groundwater use and quality from construction and operations under the combination alternative would be SMALL.

8.4.4 Aquatic Ecology

Construction activities for the NGCC plant and land-based wind power projects (such as construction of heavy haul roads and support facilities) could affect drainage areas or other onsite aquatic features due to site runoff. NRC assumed that the plant operator would install temporary and permanent erosion and sediment control measures to minimize the flow of disturbed soils into ditches and wetlands. Such BMPs would likely be described in a TPDES general permit relating to stormwater discharges for construction activities.

To bring new materials to the STP site for the NGCC plant, NRC assumed the plant operator would dredge near the barge slip to transport some materials using barges. Permits and certifications from the USACE and other agencies would require the implementation of BMPs to minimize impacts. Due to the short-term nature of the dredging activities, the hydrological alterations to aquatic habitats would be localized and temporary.

During operations, the NGCC plant would require approximately one-fourth of the cooling water to be withdrawn from the Colorado River than the NGCC alternative analyzed in Section 8.2, and the thermal discharge would similarly be smaller. Therefore, the number of fish and other aquatic organisms affected by impingement, entrainment, and thermal impacts would be less for the combination alternative than for license renewal and the NGCC alternative. The cooling system for a new NGCC plant would have similar chemical discharges as STP, but the air emissions from the NGCC plant would emit particulates that would settle onto the river surface and introduce a new source of pollutants that would not exist if STP continued operating. However, the flow of the Colorado River would dissipate pollutants, which would minimize the exposure of fish and other aquatic organisms to pollutants.

Construction and operation of offshore wind projects could affect aquatic communities. In its programmatic final EIS, MMS determined that construction and operations could have moderate impacts to aquatic organisms due to pile driving for installation of the structures, removal of structures by cutting or the use of explosives, and vessel traffic to and from the site (MMS 2007). Organisms most likely to be affected would be marine mammals, sea turtles, and fish due to noise from pile driving and vessel traffic as well as benthic organisms and habitats that are directly affected during site preparation. Siting offshore wind projects away from biologically productive areas could minimize such impacts. During operations, impacts from a spill as a consequence of a vessel collision could be moderate to major (MMS 2007).

Because little water use would be required as part of the Energy Efficiency and Conservation Program component of this alternative, impacts from the Energy Efficiency and Conservation Program on aquatic resources would likely be minimal.

Because of the potential habitat disturbances and noticeable impacts on aquatic organisms during construction and operation of offshore wind projects, impacts on aquatic resources from the combination alternative would be SMALL to MODERATE. Impacts from the NGCC portion of the alternative and Energy Efficiency and Conservation Program would not be noticeable because less water withdrawal and discharge would be required than for STP, Units 1 and 2. In addition, for the NGCC portion of the alternative, the construction activities would require BMPs, dredging would be short-term, and pollutants would dissipate without the Colorado River (minimizing exposure concentrations to aquatic resources).

8.4.5 Terrestrial Ecology

Constructing the NGCC plant would require approximately 92 ac (37 ha), which includes a new pipeline that would run approximately 2 mi (3 km) from the STP site to an existing pipeline. These estimates are based on GEIS scaling factors and details provided by STPNOC in its ER (STPNOC 2010a). Impacts on terrestrial ecology from onsite construction of the one NGCC unit would be less than the impacts described for the four-unit NGCC alternative, which are described in Section 8.2.

STPNOC estimated that a utility-scale wind plant requires 60 ac of land per MWe of installed capacity in open, flat terrain (STPNOC 2010a). Approximately 462,900 ac (187,300 ha) of land would be required for the installed capacity of 7,714 MWe. Of this area, approximately 2,186 ac (884 ha) would be temporarily disturbed during construction activities, and 937 ac (379 ha) would be permanently disturbed during operations. The permanently disturbed area would be filled with turbines, access roads, and other infrastructure, and the rest of the area would potentially be available for compatible other uses, such as agriculture (ranch, pasture, or cropland).

Impacts on terrestrial ecology from construction of the wind projects, including new transmission lines, could include loss of terrestrial habitat, an increase in habitat fragmentation, and corresponding increase in edge habitat, which may affect threatened and endangered species. Construction and operations of wind power projects could result in increased mortality of birds flying along the Trans-Gulf migratory route and might also cause increased mortality of migratory and resident bats. Offshore wind power development would also affect avian and aquatic resources. MMS (2007) determined that populations of marine and coastal birds as well as migrating inland birds may experience minor to potentially major impacts due to turbine collisions offshore and that endangered species would be the most impacted.

For this combination alternative, construction of the (a) 2-mi (3-km) natural gas pipeline and (b) transmission lines to connect the wind projects to distribution systems could result in habitat fragmentation and avian collisions with transmission lines. Depending on the length of new transmission lines, impacts could potentially destabilize attributes of the terrestrial ecosystem because the transmission lines could permanently convert forested or cover habitats into open, maintained areas. To the extent possible, STPNOC would route the pipeline through previously disturbed areas (STPNOC 2010a). Threatened and endangered species may also be affected by construction of the natural gas pipeline and new transmission lines. Long-linear projects, such as pipelines and transmission lines, can often be sited to avoid sensitive areas.

Because no construction would occur for the Energy Efficiency and Conservation Program, impacts from the Energy Efficiency and Conservation Program on terrestrial resources would likely be minimal. Wind energy projects could have a noticeable impact on avian and bat communities because wind energy projects in the Trans-Gulf migratory route could result in increased mortality of migratory and resident birds and bats. Building new transmission lines would also increase habitat fragmentation. Offshore wind power could also result in increased mortality of coastal birds. Based on this information, impacts on terrestrial resources would be MODERATE.

8.4.6 Human Health

The human health risks from a combination of alternatives include the effects already discussed in Section 8.2.6 for the NGCC plant. However, the effects would be slightly less since one, rather than four, NGCC unit would be constructed and operated. For wind power, the GEIS notes that, except for a potential small number of occupational injuries, routine operations would not affect human health. For the Energy Efficiency and Conservation Program, the GEIS notes that the environmental impacts are likely to be centered on indoor air quality (NRC 1996). This is due to increased weatherization of the home in the form of extra insulation and reduced air turnover rates from the reduction in air leaks. However, the actual impact is highly site-specific and not yet well-established. Overall, human health risks to occupational workers and to members of the public from the combination alternative would likely be SMALL.

Noise during operations of NGCC plant would be limited to industrial processes and communications. Pipelines delivering natural gas fuel could be audible off site near compressor stations. Pipeline companies would need to adhere to local ordinances regarding maximum noise levels during construction and at compressor stations. Noise from the wind energy project would be audible in the immediate area but would likely be unobtrusive. Some noise impacts could occur in instances of energy conservation and efficiency upgrades to major building systems, but this impact would be intermittent and short-lived. Therefore, impacts from noise would likely be SMALL.

8.4.7 Land Use

The GEIS generically evaluates the impact of constructing and operating various replacement power plant alternatives on land use, both on and off each plant site. The analysis of land-use impacts focuses on the amount of land area that would be affected by the construction and operation of a single-unit NGCC plant at the STP site, wind energy projects, and energy conservation and efficiency.

Based on scaled GEIS estimates, constructing the single-unit NGCC unit would require approximately 92 ac (37 ha) at the STP site. This amount of land use would include other plant structures and associated infrastructure, such as the new 2-mi (3-km) pipeline, and is unlikely to exceed 92 ac (37 ha), excluding land for natural gas wells and collection stations.

In addition to onsite land requirements, land would be required off site for natural gas wells and collection stations. Scaling from GEIS estimates, approximately 2,400 ac (970 ha) would be required for wells and collection stations to bring the natural gas to the power plant. Most of this land requirement would occur on land where natural gas extraction already occurs.

STPNOC estimated that utility-scale, land-based wind energy projects would require 60 ac of land per MWe of installed capacity in open, flat terrain (STPNOC 2010a). Approximately 462,900 ac (187,300 ha) of land would be required for the installed capacity of 7,714 MWe. Of this area of land, approximately 2,186 ac (884 ha) would be temporarily disturbed during construction activities, and 937 ac (379 ha) would be permanently used for each wind turbine during operations. Land used for the wind energy projects would be filled with turbines, access roads, and other infrastructure, and the rest of the land area between the turbines would be available for other uses, such as agriculture (ranch, pasture, or cropland).

Offshore wind energy projects would need to avoid impeding navigation. For both land-based and offshore wind projects, new electrical transmission systems would need to be built to connect the wind energy projects to the electric distribution system.

The elimination of uranium fuel for STP could partially offset offsite land requirements for other energy projects. Scaling from GEIS estimates, approximately 2,560 ac (1,036 ha) would no longer be needed for the mining and processing of uranium.

The land use impacts of the Energy Efficiency and Conservation Program would be minimal. The rapid replacement and disposal of older inefficient appliances and other equipment would generate waste material and could increase the size of landfills; however, given the time for program development and implementation, the cost of replacements, and the average life of equipment, the replacement process would probably be gradual. More efficient appliances and equipment would replace older equipment (especially in the case of frequently replaced items, such as light bulbs). In addition, many items (such as home appliances and industrial equipment) have recycling value and would not be disposed of in landfills.

The wind energy portion of this combination alternative would require a substantial amount of open land, although only a small portion would be used for wind turbines, access roads, and infrastructure. Therefore, land use impacts from the combination alternative could range from SMALL to MODERATE.

8.4.8 Socioeconomics

As previously discussed, socioeconomic impacts are defined in terms of changes to the demographic and economic characteristics and social conditions of a region. For example, the number of jobs created by the construction and operation of a new NGCC plant and wind power projects could affect regional employment, income, and expenditures. Two types of jobs would be created by this alternative: (1) construction jobs, which are transient, short in duration, and less likely to have a long-term socioeconomic impact; and (2) power plant and wind energy operation jobs, which have the greater potential for permanent, long-term socioeconomic impacts. Workforce requirements for the construction and operation of the combination alternative were evaluated to measure their possible effects on current socioeconomic conditions.

Based on GEIS estimates, the construction workforce would be up to 800 (maximum) workers for the NGCC plant. Scaling from STPNOC's estimates, the estimated construction workforce would be up to 507 (maximum) workers (STPNOC 2010a). STPNOC's estimate appears reasonable; therefore, it is used in this analysis. STPNOC did not provide a construction workforce estimate for wind energy projects. In Exelon Generation Company's, LLC (Exelon) ER for Limerick Generating Station, Exelon estimated a construction workforce of 200 for approximately half the amount of wind capacity needed for this combination alternative

(Exelon 2011). This estimate includes both land-based and offshore wind energy projects. Scaling from this estimate, wind energy projects could require a construction workforce of up to 400 workers. The relative economic impacts of this many workers on the local economy and tax base would vary, with the greatest impacts occurring in the communities where the majority of construction workers would reside and spend their income. As a result, local communities could experience a short-term economic “boom” from increased tax revenue and income generated by construction expenditures and the increased demand for temporary (rental) housing and business services. Some construction workers could relocate to Matagorda and surrounding counties in order to be closer to the construction work sites. However, given the proximity of STP to the Houston and other metropolitan areas, workers could commute to the various construction sites, thereby lessening the need for additional rental housing near STP.

After completing the installation of the single NGCC unit and wind turbines, local communities could experience a return to pre-construction economic conditions. Based on this information, and the given number of workers, socioeconomic impacts during construction in communities near the STP site and wind farms could be SMALL, due to the small number of workers needed to construct the NGCC plant and because the wind energy project workers would be spread throughout the service region.

Scaled from GEIS estimates, the single-unit NGCC power plant operation workforce would be 100 workers. Based on STPNOC’s estimates, the maximum NGCC operation workforce would be 23 workers (STPNOC 2010a). STPNOC’s estimate appears reasonable; therefore, it is used in this analysis. STPNOC did not provide an operations workforce estimate for wind energy projects. In Exelon’s ER for the Limerick Generating Station, Exelon estimated a wind energy workforce of 50 workers for approximately half the amount of wind capacity needed for this combination alternative (Exelon 2011). This estimate includes both land-based and offshore wind energy projects. Scaling from this estimate, wind energy projects could require an operations workforce of up to 100 workers. The amount of property taxes paid under the combination alternative may increase if additional land is required off site to support this alternative. As noted in the GEIS, an Energy Conservation and Efficiency Program would also create jobs for additional workers (NRC 1996). Socioeconomic impacts during operations could range from SMALL to MODERATE as the STP site transitions to the new, single-unit NGCC power plant. The reduction in overall employment at STP could affect property tax revenue and income in local communities and businesses. In addition, the permanent housing market could also experience increased vacancies and decreased prices if operations workers and their families move out of the region.

8.4.9 Transportation

Construction and operation of an NGCC plant at the STP site and wind energy projects throughout the region would increase the number of vehicles on the roads near these facilities. During construction, cars and trucks would deliver workers, materials, and equipment to the worksites. Traffic volumes on local roads near these worksites would noticeably increase and peak during shift changes resulting in temporary levels of service impacts and delays at intersections. Transporting components of wind turbines via roadways could also have a noticeable impact on traffic conditions, and this effect is likely to be spread over a large area. Pipeline construction and modification to existing natural gas pipeline systems could also have a temporary impact. Based on this information, traffic-related transportation impacts during construction could range from SMALL to MODERATE depending on the location of the wind energy sites, road capacities, and traffic volumes.

Traffic volumes on local roads near construction sites after the installation of the NGCC and wind turbines would be noticeably reduced. Given the small number of workers needed to operate the energy projects in this combination alternative, the levels of service impacts on local roads during shift changes would be SMALL. In addition, wind energy project operation workers would be spread across the service region, and any traffic-related transportation effects from the energy efficiency alternative would also be widely distributed. Therefore, overall transportation impacts for this combination alternative during operations would be SMALL.

8.4.10 Aesthetics

The analysis of aesthetic impacts focuses on the degree of contrast between the surrounding landscape and the visibility of the NGCC plant and wind energy projects. In general, aesthetic changes would be limited to the immediate vicinity of the STP site and wind energy projects.

Aesthetic impacts from the NGCC plant component of the combination alternative would be essentially the same as those described for the NGCC alternative in Section 8.2.10, except there would be one unit rather than four units. During construction, all of the clearing and excavation would occur on the STP site. These activities may be visible from offsite roads, particularly FM 521. Since the STP site already appears industrial, construction of the NGCC power plant would appear similar to onsite activities during refueling outages. Power plant infrastructure would be smaller and less noticeable than STP containment and turbine buildings. Noise during plant operations would be limited to industrial processes and communications. Pipelines delivering natural gas fuel could be audible off site near gas compressor stations. In general, aesthetic changes due to the construction and operation of the single-unit NGCC would be limited to the immediate vicinity of the STP site and would be SMALL.

The wind energy projects would have the greatest visual impact. Approximately 3,877 wind turbines at over 300 ft (100 m) tall would be spread across multiple land-based sites covering 462,900 ac (187,300 ha). The turbines would dominate the view and would likely become the major focus of attention. Offshore wind projects would also be visible because of the height and size of the wind turbine generators (MMS 2007). Depending on their location, the aesthetic impacts from the construction and operation of the wind energy projects would be MODERATE to LARGE.

Impacts from the Energy Conservation and Efficiency Program would be SMALL because it would not require any visible changes to existing infrastructure.

8.4.11 Historic and Archaeological Resources

The same considerations, discussed in Section 8.2.11, for the impact of the construction of a four-unit NGCC plant on historic and archaeological resources apply to the construction activities that would occur on the STP site for a new one-unit NGCC plant. As described in Section 2.2.10, much of the STP site has been previously disturbed by the construction of STP, Units 1 and 2. In addition, in preparation for the COL application for Units 3 and 4, STPNOC conducted a cultural resources assessment of the STP site. STPNOC reviewed existing information for the STP site and the area within a 10-mi (16-km) radius. STPNOC concluded that any cultural resource sites that may have existed on site would no longer retain their integrity because the area was heavily disturbed during the construction of Units 1 and 2 (STPNOC 2010b). In December 2006, STPNOC reported these findings to the SHPO at the Texas Historical Commission. The SHPO concurred, in January 2007, that there would be no impacts to historic properties (STPNOC 2006; THC 2007).

There is a low potential for cultural resources to be located in previously undisturbed portions of the STP site. However, if the NGCC unit was to be sited within undisturbed areas or within areas of known cultural sensitivity (historic grave site located on the property and described in

Section 2.2.10), these areas would need to be surveyed by a professional archaeologist to identify and develop possible mitigation measures to address any adverse effects from project activities. NRC assumes the plant operator would follow similar procedures to those described in the final EIS for STP, Units 3 and 4 (NRC 2011), should the plant operator discover any historic or cultural resources during ground-disturbing activities associated with building the new units.

Studies would be needed for all areas of potential disturbance at the proposed plant site, wind project locations, and along associated corridors where new construction would occur (e.g., the new 2-mi pipeline, roads, transmission corridors, rail lines, or other ROWs). Any affected areas would need to be surveyed to identify and record historic and archaeological resources, identify cultural resources (e.g., traditional cultural properties), and develop possible mitigation measures to address any adverse effects from ground-disturbing activities. In most cases, long-linear projects (e.g., pipelines) can be sited to avoid areas of greatest sensitivity.

Construction of wind energy projects could affect cultural resource because areas approximately 15 to 25 ft (4.6 to 6 m) in diameter would be excavated. Wind turbines can likely be sited to avoid sensitive areas because the disturbed area is a small portion of the total amount of area required. In addition, wind turbines within the viewshed of traditional cultural properties and historic properties could have noticeable impacts to cultural and historic resources. Proper siting may be able to mitigate these potential impacts.

The NRC staff determined that the impact on historic and archaeological resources from the NGCC portion of the combination alternative would be SMALL for the following reasons:

- NRC (2011) and STPNOC (2010a, 2010b) did not identify any cultural resources that could be affected by Units 3 and 4.
- The SHPO determined that construction for Units 3 and 4 would not affect cultural and historic resources.
- Long-linear projects (e.g., pipelines) can usually be sited to avoid sensitive areas.
- NRC assumes that the plant operator would follow environmental compliance procedures for new ground-disturbing activities.

Depending on the resource richness of the site chosen for the wind energy projects, the impacts could range between SMALL to MODERATE. Impacts to historic and archaeological resources from implementing the Energy Efficiency and Conservation Program would be SMALL and would unlikely affect land use or historical or cultural resources elsewhere in Texas. Therefore, the overall impacts on historic and archaeological resources from the combination alternative could range from SMALL to MODERATE.

8.4.12 Environmental Justice

The environmental justice impact analysis evaluates the potential for disproportionately high and adverse human health and environmental effects on minority and low-income populations that could result from the construction and operation of a new NGCC power plant at the STP site, wind energy projects, and the Energy Efficiency and Conservation Program. As previously discussed in Section 8.1.12, such effects may include human health, biological, cultural, economic, or social impacts. Some of these potential effects have been identified in resource areas discussed in this SEIS. For example, increased demand for rental housing during plant construction could disproportionately affect low-income populations. Minority and low-income populations are subsets of the general public living near the STP site and wind energy project sites, and all are exposed to the same hazards generated from constructing and operating an NGCC plant and wind energy projects. Section 4.9.7, "Environmental Justice," presents demographic information about minority and low-income populations residing in the vicinity of the STP site.

Potential impacts to minority and low-income populations from the construction and operation of a new NGCC plant at the STP site and wind energy projects would mostly consist of environmental and socioeconomic effects (e.g., noise, dust, traffic, employment, and housing impacts). Noise and dust impacts during construction would be short-term and primarily limited to onsite activities. Minority and low-income populations residing along site access roads would be directly affected by increased commuter vehicle and truck traffic. However, because of the temporary nature of construction, these effects would only occur during certain hours of the day and are unlikely to be high and adverse. Increased demand for rental housing during construction of the NGCC and wind energy projects could also affect low-income populations living near STP and wind energy project sites. Given the proximity of STP to the Houston metropolitan area, many construction workers could commute to the STP and wind energy project sites, thereby lessening the additional need for rental housing near STP.

Low-income populations could benefit from weatherization and insulation in an Energy Conservation and Efficiency Program. This could have a greater beneficial effect on low-income populations than the general population because low-income households generally experience greater home energy burdens than the average household.

Based on this information, and the analysis of human health and environmental impacts presented in this SEIS, the combination alternative would not create disproportionately high and adverse human health and environmental effects on minority and low-income populations.

8.4.13 Waste Management

During the construction stage for the NGCC plant and wind projects, land clearing and other construction activities would generate wastes that could be recycled, disposed of on site, or shipped to the offsite waste disposal facility. During the operational stage, spent SCR catalysts, which control nitrogen oxide emissions from the NGCC plant, would make up the majority of the waste generated by this alternative.

There would be an increase in wastes generated during installation or implementation of energy conservation measures, such as appropriate disposal of old appliances, installation of control devices, and modifications of buildings. New and existing recycling programs would help to minimize the amount of generated waste.

The NRC concludes that overall waste impacts from the combination alternative would be SMALL.

8.4.14 Summary of Impacts of the Combination Alternative

Table 8–5 summarizes the environmental impacts of the combination alternative compared to continued operation of the STP.

Table 8–5. Summary of Environmental Impacts of the Combination Alternative Compared to Continued Operation of STP, Units 1 and 2

Category	Combination Alternative	Continued STP Operation
Air quality	SMALL to MODERATE	SMALL
Surface water	SMALL	SMALL
Groundwater	SMALL	SMALL
Aquatic resources	SMALL to MODERATE	SMALL
Terrestrial resources	MODERATE	SMALL
Human health	SMALL	SMALL to MODERATE
Land use	SMALL to MODERATE	SMALL
Socioeconomics	SMALL to MODERATE	SMALL
Transportation	SMALL to MODERATE	SMALL
Aesthetics	SMALL to LARGE	SMALL
Historic & archaeological	SMALL to MODERATE	SMALL
Waste management	SMALL	SMALL

8.5 Purchased Power

Under the purchased power alternative, STPNOC would purchase 2,500 MWe of electricity from other power generators. No new generating capacity would be built and operated by STPNOC. In its ER, STPNOC assumed that purchased power is a reasonable alternative for the following reasons:

- A wholesale electricity market currently exists in the ERCOT region.
- ERCOT implements rules to anticipate and meet electricity demands and promote competition among electricity suppliers.
- Most of ERCOT's retail customers can choose a supplier to purchase electricity.

If STPNOC purchased electricity, the source of all generated electricity would be within the ERCOT region because ERCOT operates wholly within the State of Texas and does not interconnect with neighboring reliability regions for the purpose of importing or exporting power (STPNOC 2010a). In 2010, electricity produced within the ERCOT region was dominated by coal (40 percent), followed by natural gas (38 percent), nuclear (13 percent), wind (8 percent), and other sources (1 percent) (ERCOT 2011a). As of April 2011, new energy projects under ERCOT's review included 36,124 MWe of wind power (58 percent); 12,954 MWe of natural gas-fired generation (21 percent); 5,900 MWe of nuclear power (9 percent); 4,075 MWe of coal-fired generation (7 percent); 1,454 MWe solar power (2 percent); 150 MWe of biomass-fired generation (less than 1 percent); and 1,980 MWe of other resources (3 percent) (ERCOT 2011a). Based on current and likely future electric generation, NRC assumed that the purchased power would likely come from a mixture of coal, natural gas, wind, and nuclear energy.

Because the purchased power would be limited to resources available within the ERCOT region, new energy generation facilities may need to be built to supply the electricity.

Construction impacts would be similar to those described under the new nuclear, coal, natural gas, and wind alternatives described in the previous sections. In addition to the construction impacts described in Sections 8.1 through 8.3, there could be additional impacts if new plants are built on greenfield sites. For example, impacts to aquatic and terrestrial resources and historical and cultural resources are likely to be greater due to land clearing of previously undisturbed areas. Additional impacts would also occur from construction of support infrastructure, like transmission lines and roads. Furthermore, the community would not be familiar with the appearance of a power facility, which would change the region's aesthetic character. Workers skilled in power plant or wind farm operations may not be available near a greenfield site.

During operations, impacts from new nuclear, coal-fired, and natural gas-fired plants and wind energy projects would be similar to that described under the new nuclear, coal, natural gas, and wind alternatives described in the previous sections. Impacts from the operations of existing coal- and natural gas-fired plants would likely be greater than the operations of new plants because older plants are more likely to be less efficient and without modern emissions controls. Air quality impacts from the combination of all sources would likely be greater than license renewal because a large portion of the purchased power would likely be from coal- and natural gas-fired plants.

While purchased power is a reasonable alternative, the potential impacts of constructing and operating new power generating facilities is addressed elsewhere in this chapter. In general, the impacts would likely be greater than license renewal due to potential new construction and because continued operation of older plants could result in higher emissions. Ultimately, the impacts would depend on the mix of sources used to supply the 2,500 MWe of electricity. Below is a brief summary of the impacts for each resource area.

8.5.1 Air Quality

New and existing nuclear plants and wind farms would not have noticeable impacts on air quality. New and existing natural gas- and coal-fired plants would have noticeable impacts on air quality; both natural gas- and coal-fired plants emit higher amounts of nitrogen oxides, sulfur oxides, PM, HAPs, carbon monoxide, carbon dioxide, and mercury as compared to STP, Units 1 and 2. The impacts on air quality would be SMALL to MODERATE.

8.5.2 Surface Water and Groundwater Resources

New and existing nuclear, coal-fired, and natural gas-fired plants and wind energy projects would not have noticeable impacts on water resources assuming all energy generating facilities operate within their associated water quality and water use permits. The impacts on surface water and groundwater resources would be SMALL.

8.5.3 Terrestrial and Aquatic Ecology

New and existing natural gas-fired and nuclear plants would not have noticeable impacts on aquatic and terrestrial resources assuming plants are built in areas that avoid sensitive species and habitats. New, land-based wind energy projects would not have noticeable impacts on aquatic resources assuming projects are built in areas that avoid sensitive species and habitats. New wind energy projects would have noticeable impacts on avian and bat communities and new offshore wind energy projects could have noticeable impacts on fish, whales, turtles, benthic organisms, and other marine life. New and existing coal-fired plants would have noticeable impacts on terrestrial communities primarily due to the deposition of ash and other pollutants and because of the extent of terrestrial habitat disturbance associated with coal mining. The impacts on terrestrial and aquatic ecology would be SMALL to MODERATE.

8.5.4 Human Health

New and existing nuclear, coal-fired, and natural gas-fired plants and wind energy projects would have SMALL impacts on human health due to the extent of regulations to protect public health.

8.5.5 Land Use

Purchased power from existing power plants would not cause any land use changes. New power plants would likely be constructed at existing power plant sites. Purchased power from coal- and natural gas-fired plants could have a noticeable impact on land use due to the amount of land required for coal mining and gas drilling. New wind energy projects would have a noticeable land use impact because of the large amount of land required for wind farms. Land use impacts would be SMALL to MODERATE.

8.5.6 Socioeconomics (including transportation and aesthetics)

Purchased power from existing power plants would not have any socioeconomic impact because there would be no change in power plant operations or workforce. Construction of new electrical power generating facilities could cause noticeable short-term socioeconomic and transportation impacts due to the number of construction workers required to build the new power plant. Traffic volumes would increase on local roads during shift changes.

Wind energy projects would have the greatest visual impact; wind turbines would dominate the view and would likely become the major focus of attention.

The impacts would be SMALL to LARGE.

8.5.7 Historic and Archaeological Resources

Purchased power from existing power plants would not have any impact on historic and archaeological resources. In addition, ground-disturbing maintenance activities during operations also have the potential to affect historic and archaeological resources.

Construction of new nuclear, coal-fired, and natural gas-fired plants and wind energy projects could affect archaeological and historic resources. Archaeological surveys would need to be conducted prior to any excavations at proposed power plant sites. After surveys are completed, sensitive resource areas could be avoided or mitigated prior to construction. The overall impacts on historic and archaeological resources would be SMALL to MODERATE.

8.5.8 Environmental Justice

Low-income populations could be disproportionately affected by increased utility bills due to the cost of purchased power. However, programs are available to assist low-income families in paying for increased electrical costs.

Potential impacts to minority and low-income populations from the construction and operation of new power plants would mostly consist of environmental and socioeconomic effects (e.g., noise, dust, traffic, employment, and housing impacts). Noise and dust impacts during construction would be short-term and primarily limited to onsite activities. Minority and low-income populations residing along site access roads would be directly affected by increased commuter vehicle and truck traffic. However, because of the temporary nature of construction, these effects would only occur during certain hours of the day and are unlikely to be high and adverse. Increased demand for rental housing during construction could also affect low-income populations living near the construction site. However, workers could commute to the construction site, thereby lessening the need for additional rental housing near the construction sites. Based on this information, and the analysis of human health and environmental impacts presented in this section, the purchased power alternative could disproportionately affect low-income populations, but these effects would not be high and adverse.

8.5.9 Waste Management

New and existing nuclear and natural gas-fired plants and wind energy projects would not have noticeable impacts. However, new and continued generation of coal-fired plants would have noticeable impacts due to the accumulation of ash and scrubber sludge. The overall impacts on waste management would range from SMALL to MODERATE.

8.5.10 Summary of Impacts of the Purchased Power Alternative

Table 8–6 summarizes the environmental impacts of the purchased power alternative compared to continued operation of the STP.

Table 8–6. Summary of Environmental Impacts of the Purchased Power Alternative Compared to Continued Operation of STP, Units 1 and 2

Category	Purchased Power	Continued STP Operation
Air quality	SMALL to MODERATE	SMALL
Surface water & groundwater	SMALL	SMALL
Aquatic & terrestrial resources	SMALL to MODERATE	SMALL
Human health	SMALL	SMALL to MODERATE
Land use	SMALL to MODERATE	SMALL
Socioeconomics (including transportation & aesthetics)	SMALL to LARGE	SMALL
Historic & archaeological	SMALL to MODERATE	SMALL
Waste management	SMALL to MODERATE	SMALL

8.6 Alternatives Considered but Dismissed

Alternatives to license renewal that were considered and eliminated from detailed study are presented in this section. These alternatives were eliminated due to technical, resource availability, or current commercial limitations. Many of these limitations would continue to exist when the current STP licenses expire. NRC evaluated an alternative of wind energy in combination with an NGCC plant and energy efficiency and conservation programs in Section 8.4. The evaluations of wind technology and energy conservation and efficiency appearing in this section are as discrete alternatives.

8.6.1 Offsite Nuclear-, Gas-, and Coal-Fired Capacity

While nuclear-, gas-, and coal-fired power generating alternatives like those considered in Sections 8.1 through 8.3, respectively, could be constructed offsite, the impacts would be greater than constructing these facilities and making use of existing infrastructure at the STP site. Additional impacts would occur from the construction of new water intake and discharge structures, as well as other support infrastructure, including transmission lines and roads that are already present on the STP site. Furthermore, the community around STP is already familiar with the appearance of a power generating facility, and it is an established part of the region's character. Workers skilled in power plant operations may not be available in other locations. However, support infrastructure and skilled power-plant workers may be available near existing industrial sites, but remediation may also be necessary in order to make the site ready for redevelopment. In short, an existing power plant site would present the best location for a new replacement power facility.

8.6.2 Energy Conservation and Energy Efficiency

Though often used interchangeably, energy conservation and energy efficiency are different concepts. Energy efficiency means deriving a similar level of services by using less energy while energy conservation indicates a reduction in energy consumption. Both fall into a larger category known as demand-side management. Demand-side management measures address energy end uses—unlike energy supply alternatives discussed in previous sections. Demand-side management can include measures that do the following:

- shift energy consumption to different times of the day to reduce peak loads,
- interrupt certain large customers during periods of high demand,
- interrupt certain appliances during high demand periods,
- replace older, less efficient appliances, lighting, or control systems, and
- encourage customers to switch from gas to electricity for water heating and other similar measures that utilities use to boost sales.

Unlike other alternatives to license renewal, the GEIS notes that conservation is not a discrete power-generating source; nonetheless, it represents an option that states and utilities may use to reduce their need for power generation capability, so the NRC addressed it in the GEIS (NRC 1996).

In 2010, the Public Utility Commission of Texas approved Substantive Rule § 25.181, which requires all electric transmission and distribution utilities within the ERCOT market, including CPS Energy and Austin Energy (two of the owners of STP, Units 1 and 2), to use demand-side management to reduce their customers' energy consumption by a minimum of 20 percent of the utility's annual growth. The rule further requires a minimum of 25 percent reduction in 2012 and 30 percent in 2013 and beyond.

CPS Energy and Austin Energy implement programs to promote demand-side management. These programs include load curtailment incentives during periods of peak demand; rebates and financial incentives for commercial, industrial, and residential customers for installation of energy-efficient appliances and equipment; and the adoption of updated energy codes for new building construction (STPNOC 2010a). Demand-side management programs from other Texas utilities would also help offset the 2,500 MWe produced by STP because STPNOC sells power produced at STPNOC into the ERCOT interconnection (STPNOC 2010a).

Because Substantive Rule § 25.181 already requires annual 30 percent reductions in energy consumption from demand-side management, it is unlikely that additional increases in energy efficiency in the State of Texas will have grown enough to offset the loss of 2,500 MWe produced by STP by the time the licenses expire in 2027 and 2028. Because of this, the NRC staff has not evaluated energy conservation and efficiency as a discrete alternative to license renewal. NRC evaluated an alternative with energy efficiency and conservation programs in combination with an NGCC plant and wind energy in Section 8.4.

8.6.3 Wind Power

Texas has significant wind energy resources and leads the Nation in wind-powered generation capacity (DOE 2011b). As discussed in Section 8.4, as of June 30, 2011, the installed wind capacity in Texas was 10,135 MWe (DOE 2011b). Wind resource areas in the Texas Panhandle, along the Gulf coasts south of Galveston and in the mountain passes and ridgetops of the Trans-Pecos region, offer some of the greatest wind power potential in the U.S. The Roscoe Wind Farm in Texas is the largest wind farm in the world with a total capacity of 781.5 MWe spread across approximately 100,000 ac (40,470 ha) in four counties near Roscoe in central Texas.

Newer wind turbines typically operate at approximately a 36 percent annual capacity factor (DOE 2008). Wind turbines generally can serve as an intermittent power supply (NPCC 2005). Wind power might serve as a means of providing baseload power (a) if it is combined with energy storage mechanisms, such as pumped hydroelectric or compressed air energy storage (CAES), (b) if many wind farms are interconnected to one another on the transmission grid, as described in Section 8.4, or (c) if another readily dispatchable power source is used when wind power is unavailable (e.g., hydropower).

EIA is not projecting any growth in pumped storage capacity through 2035 (EIA 2011a). As described below, the potential for new hydroelectric development in Texas is limited. Therefore, NRC concludes that the use of pumped storage in combination with wind turbines to generate 2,500 MWe is unlikely in the ERCOT region or Texas.

A CAES plant is another potential storage mechanism that could potentially serve as means for wind to provide baseload power. A CAES plant consists of motor-driven air compressors that use low cost off peak electricity to compress air into an underground storage medium. During high electricity demand periods, the stored energy is recovered by releasing the compressed air through a combustion turbine to generate electricity (NPCC 2009). Only two CAES plants are currently in operation. A 290-MWe plant near Bremen, Germany, began operating in 1978, and a 110-MWe plant located in McIntosh, Alabama, has been operating since 1991. Both facilities use salt caverns (Succar and Williams 2008). A CAES plant requires suitable geology, such as an underground cavern for energy storage, which would likely be available in Texas due to the presence of salt domes. A 268-MWe CAES plant coupled to a wind farm, the Iowa Stored Energy Park, had been proposed for construction near Des Moines, Iowa. The facility would have used a porous rock storage reservoir for the compressed air (Succar and Williams 2008). However, the project has been cancelled due to geologic concerns (ISEPA 2011). Other pilot, demonstration, prototype, and research projects involving CAES have been announced, including projects in Texas and throughout the U.S. Norton Energy Storage is proposing to construct a CAES plant that would provide up to 2,700 MWe of storage capacity in Norton, Ohio (OPSB 2011). Projects such as the Conoco-Phillips and General Compression venture may use compressed air storage directly without the combustion of fuel such as natural gas. However, NRC is not aware of a CAES project coupled with wind generation that is providing baseload power. Therefore, NRC concludes that the use of CAES in combination with wind turbines to generate 2,500 MWe in the ERCOT region is unlikely.

A significant challenge for new wind power facilities is that wind farms can be built more quickly than transmission lines. It can take a year to build a wind farm, but 5 years to build the transmission lines needed to send power to cities. Moreover, wind power developers are reluctant to build where transmission lines do not yet exist, and utilities are equally reluctant to install transmission in areas that do not yet have power generators (TSECO 2008). Archer and Jacobson (2007) examined whether wind projects interconnected to one another on the transmission grid could provide a source of baseload power, as described in Section 8.4. This study determined that interconnecting wind farms through the transmission grid increases the probability that at least one site experiences sufficient wind to produce electricity. Thus, as more sites are added to the transmission grid, the interconnected wind farms provide electricity that is comparable to a single wind farm providing near constant deliverable wind power. However, due to the amount of new transmission lines required and the cost limitations of building new transmission lines, it is unlikely that sufficient transmission lines could be built to interconnect sufficient wind projects to provide 2,500 MWe of baseload power (with an installed capacity of at least 12,000 MWe).

Offshore Wind. Wind data suggest there is potential for offshore wind farms along the coast of Texas, although project costs likely limit the future potential of large-scale projects (NRC 2011; Southern and GIT 2007). Southern Company and the Georgia Institute of Technology (GIT) studied the viability of offshore wind turbines in the southeast and determined that offshore project costs would run approximately 50 to 100 percent higher than land-based systems. Also, based on current prices for wind turbines, the 20-year levelized cost of electricity produced from an offshore wind farm would be above the current production costs from existing power generation facilities. In addition, the current commercially available offshore wind turbines are not built to withstand major hurricanes above a Category 3 or a 1-minute sustained wind speed of 124 mph. Additional details on the limitations of offshore wind power as a source of baseload power is described in the final EIS for STP, Units 3 and 4 (NRC 2011).

The National Renewable Energy Laboratory (NREL) issued a report that identified offshore wind projects in the southeast (NREL 2010). The report identified the proposed Coastal Point Energy Project (also called the Galveston Wind Project) off the Texas coast near Galveston (approximately 9 mi from shore), which is anticipated to have a capacity of 300 MWe (NREL 2010). No other wind energy projects were identified by NREL off the coast of Texas or its adjoining State (Louisiana).

Conclusion. Although wind power is an important energy resource in the ERCOT region and Texas, NRC concludes that a wind energy facility at or in the vicinity of the STP site or elsewhere in the ERCOT region would not currently be a reasonable alternative to license renewal. NRC evaluated an alternative of wind energy in combination with an NGCC plant and energy efficiency and conservation programs in Section 8.4.

8.6.4 Solar Power

Solar technologies use the sun’s energy to produce electricity at a utility scale. Solar energy can be converted to electricity using solar thermal technologies or photovoltaics. Solar thermal technologies employ concentrating devices to create temperatures suitable for power production. Concentrating thermal technologies are currently less costly than photovoltaics for bulk power production.

The ERCOT region receives 3.5 to 7.0 $kWh/m^2/day$ of direct solar radiation (STPNOC 2010a). Solar power constituted less than 1 percent of electricity produced in the ERCOT region during 2010 (ERCOT 2011a). As of April 2011, applications for energy projects under review at ERCOT included 1,454 MWe of proposed solar projects (ERCOT 2011a).

As described in the GEIS, solar power is intermittent (i.e., it does not work at night and cannot serve baseload when the sun is not shining), and the efficiency of collectors varies greatly with weather conditions. Therefore, solar power by itself would not be able to provide baseload power as an alternative to Units 1 and 2. Rather, a solar-powered alternative would require energy storage or backup power supply from other sources to potentially supply baseload power during periods when the sun is not shining. Potential storage mechanisms include pumped storage, CAES, molten salt storage, or thermal storage. As described above in Section 8.6.3 and in STP, Units 3 and 4, EIS (NRC 2011), storage possibilities in this region of Texas are limited. NRC is not aware of any storage facility coupled with solar generation that is providing baseload power.

For the term of license renewal, because solar energy is an intermittent resource, and the amount of solar capacity required to replace Units 1 and 2 far exceeds existing and planned amounts of future solar power generation within ERCOT and exceeds storage potential (if CAES or pumped storage were used), NRC does not consider solar energy to be a reasonable alternative to license renewal.

8.6.5 Hydroelectric Power

Hydropower constituted less than 1 percent of electricity produced in the ERCOT region during 2010 (ERCOT 2011a). EIA's reference case in its *Update Annual Energy Outlook 2011* projects that U.S. electricity production from hydropower plants will remain essentially stable through 2035 (EIA 2011a). Idaho National Energy and Environmental Laboratory (1998) estimated that 1,234 MWe of undeveloped potential hydroelectric resources at 89 sites occur throughout the State of Texas. Given that the available hydroelectric potential in the State of Texas constitutes less than one-tenth of the generating capacity of STP, the NRC staff did not evaluate hydropower as a reasonable alternative to license renewal.

8.6.6 Wave and Ocean Energy

Wave and ocean energy has created considerable interest in recent years. Ocean waves, currents, and tides are often predictable and reliable. Ocean currents flow consistently, while tides can be predicted months and years in advance with well-known behavior in most coastal areas. Most of these technologies are in relatively early stages of development. The potential for wave and ocean energy in Texas is limited because the Gulf of Mexico is shallow and semi-enclosed (TCPA 2008). Because most technologies are relatively undeveloped (and none are developed on the scale of STP), and because the Gulf of Mexico has limited potential for wave and ocean energy, the NRC did not consider wave and ocean energy as a reasonable alternative to STP license renewal.

8.6.7 Geothermal Power

Hydrothermal resources, reservoirs of steam or hot water that can be used for electrical generation, are available primarily in the western states, including Hawaii, Alaska, California, Utah, and Nevada (TCPA 2008). This type of geothermal energy has an average capacity factor of 90 percent and can be used for baseload power where available. Geothermal systems have a relatively small footprint and minimal emissions (MIT 2006). However, Texas does not have the sort of readily accessible, high-temperature hydrothermal resource (Virtus 2008).

Lower-temperature geothermal resources (90 °F to 160 °F) occur in the central part of Texas and along the Rio Grande. In the technical report (TCPA 2008), Texas Comptroller of Public Accounts (TCPA) suggests that such areas could provide low-temperature applications, such as space heating. Other uses could also include greenhouse cultivation, aquaculture, crop drying, and milk pasteurization. The potential for hot dry rock geothermal power in Texas is presently unknown (Virtus 2008).

Geopressured-geothermal power plants use existing, deep oil and gas wells to access hot fluids that have been co-produced from oil and gas exploration, such as geopressured reservoirs of hot water and natural gas or hot wastewater from deep oil and gas wells. This technology has future potential in Texas because hydrocarbon exploration and production industries have data on the thermal characteristics in existing wells and because areas with sufficient geothermal energy may exist where deep oil and gas wells exists (TCPA 2008). Current data suggest that wells 16,000 ft (4,877 m) or deeper in the ERCOT region contain high-temperature fluid (250 °F (121 °C) or greater), and some wells are above 400 °F (204 °C) (STPNOC 2010a). In addition, transmission lines are located near many of the existing wells (TCPA 2008).

In 1989, DOE operated a test geopressured-geothermal power plant at Pleasant Bayou, approximately 60 mi (97 km) northwest of STP. The 1 MW binary power plant operated for 6 months and produced approximately 3,500 MWh of electricity (TCPA 2008). GEA (2007) estimates that electric power production potential from oil and gas wells in Texas could produce 400 MWe in the near-term to over 2,000 MWe once the technology is refined and more widespread. Even if the oil and gas wells produced 2,000 MWe, this output would not be sufficient to make up for the 2,500 MWe produced by STP, Units 1 and 2. Additional capital and significant investment is required to develop and operate geopressured-geothermal power plants to produce a sufficient amount of baseload power.

As of 2008, no geothermal projects produced electricity on a commercial scale in Texas (TCPA 2008), but some potential exists for geopressured-geothermal power plants and low-temperature projects at smaller scales. Energy companies, Texas State Energy Conservation Office, and Southern Methodist University are currently assessing Texas's potential for various forms of geothermal technology. A significant amount of investment would be required for geothermal energy to be used in Texas (TCPA 2008). Given the immature status of geothermal technology and the limited resource availability in Texas, the NRC concludes that geothermal energy is not a reasonable alternative to STP license renewal.

8.6.8 Municipal Solid Waste

Municipal-solid-waste combustors use three types of technologies—mass burn, modular, and refuse-derived fuel. Mass burning is used most frequently in the U.S. and involves little sorting, shredding, or separation. Consequently, toxic or hazardous components present in the waste stream are combusted, and toxic constituents are exhausted to the air or become part of the resulting solid wastes. Currently, approximately 86 waste-to-energy plants operate in the U.S. These plants have a generating capacity of 2,572 MWe, or an average of 30 MWe per plant (Michaels 2010). More than 85 average-sized plants would be necessary to provide the same level of output as STP.

Estimates in the GEIS suggest that the overall level of construction impact from a waste-fired plant would be approximately the same as that for a coal-fired power plant. Additionally, waste-fired plants have the same or greater operational impacts than coal-fired technologies (including impacts on the aquatic environment, air, and waste disposal). The initial capital costs for municipal solid-waste plants are greater than for comparable steam-turbine technology at coal-fired facilities or at wood-waste facilities because of the need for specialized waste separation and handling equipment (NRC 1996).

The decision to burn municipal waste to generate energy is driven by the need for an alternative to landfills rather than energy considerations. The use of landfills as a waste disposal option is likely to increase as energy prices increase; however, it is possible that municipal waste combustion facilities may become attractive again if there is a need for an alternative to landfills or an introduction of other regulatory incentives.

Given the small average installed size of municipal solid-waste plants and the unfavorable regulatory environment, the NRC staff does not consider municipal solid-waste combustion to be a reasonable alternative to STP license renewal.

8.6.9 Biomass

Using biomass for energy consists of the direct burning of plant or animal matter, including wood waste, mill waste, agricultural residues, and energy crops. Biomass fuel provided less than 1 percent of electricity produced in the ERCOT region during 2010 (ERCOT 2011a). As of April 2011, applications for energy projects under review at ERCOT included 150 MW of proposed biomass-fuel projects (ERCOT 2011a). In Texas, the Red River Army Depot cofires biomass with fossil fuels (DOE 2004).

Biomass resources in Texas include crops (e.g., cotton, corn, and some soybeans), forests (especially in east Texas), and agricultural wastes (e.g., cattle manure, poultry litter, rice straw, peanut shells, cotton gin trash, and corn stover) (TCPA 2008). Houston Advanced Research Center estimated that Texas agricultural wastes could potentially produce 418.9 MWe (HARC 2008).

In NUREG-1437, the NRC staff determined that a wood-burning facility can provide baseload power and operate with an average annual capacity factor of around 70 to 80 percent and with 20 to 25 percent efficiency (NRC 1996). The fuels required are variable and site-specific. A significant impediment to the use of wood waste to generate electricity is the high cost of fuel delivery and high construction cost per megawatt of generating capacity. The larger woodwaste power plants typically produce 40 to 50 MWe. Estimates in NUREG-1437 suggest that the overall level of construction impacts per megawatt of installed capacity would be approximately the same as that for a coal-fired plant, although facilities using wood waste for fuel would be built at smaller scales (NRC 1996). Similar to coal-fired plants, wood waste plants require large areas for fuel storage and processing and involve the same type of combustion equipment.

One of the largest wood-fired biomass power plants began operations in June 2012 in Sacul, Texas (Southern 2012). The 100 MWe wood-fired biomass power plant uses logging residue as its main fuel source. It also uses urban wood waste (TCPA 2008). The plant owner, Southern Power, estimated that the plant will require approximately 1 million tons of biomass per year, which it plans to procure within a 75-mi (121-km) radius of the project site (Southern 2009). Nearly 26 similarly sized facilities would be necessary to replace STP, Units 1 and 2.

Because of uncertainties associated with obtaining sufficient wood, wood waste, agricultural waste, or other biomass to fuel a baseload power plant, the ecological impacts of large-scale timber cutting (e.g., soil erosion and loss of wildlife habitat), and the relatively small size of wood generation plants, the NRC staff does not consider biomass fuel to be a reasonable alternative to STP license renewal.

8.6.10 Biofuels

Biofuels include biomass that has been refined into a liquid fuel, such as ethanol, or gasified (including crops and wood waste). The use of biofuels has increased during the past decade (TCPA 2008). However, the biofuels are primarily used in the transportation sector, and limited projects have been completed to use biofuels for energy generation.

In the GEIS, the NRC staff indicated that none of the biofuel technologies progressed to the point of being competitive on a large scale or of being reliable enough to replace a baseload plant such as STP. After reevaluating current technologies, the NRC staff finds biofuel-fired alternatives as still unable to reliably replace the STP capacity. For this reason, the NRC staff does not consider biofuels to be a reasonable alternative to STP license renewal.

8.6.11 Oil-Fired Power

The EIA (2009) projects that oil-fired plants will account for very few of new generation capacity constructed in the U.S. during the 2011 to 2028 time period. Furthermore, EIA does not project that oil-fired power will account for any significant additions to capacity (EIA 2009).

The variable costs of oil-fired generation are greater than those of nuclear or coal-fired operations, and oil-fired generation has greater environmental impacts than natural gas-fired generation. In addition, EIA expects future increases in oil prices will make oil-fired generation increasingly more expensive (EIA 2009). The high cost of oil has prompted a steady decline in its use for electricity generation. Thus, the NRC staff does not consider oil-fired generation as a reasonable alternative to STP license renewal.

8.6.12 Fuel Cells

Fuel cells oxidize fuels without combustion and its environmental side effects. Power is produced electrochemically by passing a hydrogen-rich fuel over an anode and passing air (or oxygen) over a cathode and then separating the two by an electrolyte. The only byproducts (depending on fuel characteristics) are heat, water, and carbon dioxide. Hydrogen fuel can come from a variety of hydrocarbon resources by subjecting them to steam under pressure. Natural gas is typically used as the source of hydrogen.

At the present time, fuel cells are not technologically competitive with other alternatives for large-scale electricity generation. In addition, fuel cell units are likely to be small (the EIA (2009) reference plant is 10 MWe). While it may be possible to use a distributed array of fuel cells to provide an alternative to STP, it would be extremely costly to do so. Accordingly, the NRC staff does not consider fuel cells to be a reasonable alternative to STP license renewal.

8.6.13 Delayed Retirement

STPNOC is not aware of any of ERCOT's electric generating plants currently proposed or planning for retirement, and additional capacity within the ERCOT region is not expected (STPNOC 2010a). Electric generating plants that may be retired by 2028 are likely to be older, less efficient, and without modern emissions controls. As a result, delayed retirement is not a reasonable alternative to license renewal.

In response to the requirements to reduce levels of sulfur dioxide in Texas as a part of the Cross-State Air Pollution Rule, ERCOT analyzed the impact of the reliability of the ERCOT grid (ERCOT 2011b). In this analysis, ERCOT noted that several facilities may need to idle during portions of the year. ERCOT did not state that any facilities would permanently close. Statements from power generation companies, such as Luminant, also suggest that facilities may need to remain idle in order to comply with the Cross-State Air Pollution Rule (Luminant 2011). The NRC is not aware of any facilities that are currently being proposed for permanent closure as a result of the Cross-State Air Pollution Rule.

8.7 No-Action Alternative

This section examines the environmental effects that would occur if NRC takes no action. No action in this case means that NRC denies renewed operating licenses for STP, and the licenses expire at the end of the current terms, in 2027 and 2028. If NRC denies the renewed operating licenses, the plants will shut down at or before the end of the current licenses. After shutdown, plant operators will initiate decommissioning in accordance with 10 CFR 50.82.

The NRC staff notes that the no-action alternative is the only alternative that is considered in-depth that does not satisfy the purpose and need for this SEIS because it neither provides power generation capacity nor does it meet the needs currently met by STP or the alternatives evaluated in Sections 8.1 through 8.5. Assuming that a need currently exists for the power generated by STP, the no-action alternative would require the appropriate energy-planning decisionmakers to rely on an alternative (or combination of them) to replace the capacity of STP or reduce the need for power.

This section addresses only those impacts that arise directly as a result of plant shutdown. The environmental impacts from decommissioning and related activities have been addressed in several other documents, including the *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*, NUREG-0586, Supplement 1 (NRC 2002); Chapter 7 of the license renewal GEIS (NRC 1996); and Chapter 7 of this SEIS. These analyses either directly address or bound the environmental impacts of decommissioning whenever STPNOC ceases operating STP. In addition, the environmental impacts from potential replacement power alternatives are addressed in Sections 8.1 to 8.5.

The NRC staff notes that, even with renewed operating licenses, STP will eventually shut down, and the environmental effects addressed in this section will occur at that time. Since these effects have not otherwise been addressed in this SEIS, the impacts will be addressed in this section. As with decommissioning effects, the NRC staff expects the shutdown effects to be similar whether they occur at the end of the current licenses or at the end of renewed licenses.

8.7.1 Air Quality

When the STP stops operating, there will be a reduction in emissions from activities related to plant operation, such as use of diesel generators and employee vehicles. In Chapter 4, the NRC staff determined that these emissions would have a SMALL impact on air quality during the renewal term; therefore, if emissions decrease, the impact to air quality would also decrease and would be SMALL.

8.7.2 Surface Water Resources

The rate of consumptive use of surface water would decrease as STP is shut down and the reactor cooling system continues to remove the heat of decay. Wastewater discharges would also be reduced considerably. Shutdown would reduce the impacts on surface water use and quality and would remain SMALL.

8.7.3 Groundwater Resources

The use of groundwater would diminish as the plant workforce is drawn down and operations requiring groundwater cease. Some consumption of groundwater would continue to support the operation of service water and fire protection systems and to meet the potable and sanitary needs of the reduced workforce prior to decommissioning. Overall impacts would be less than during operations and would remain SMALL.

8.7.4 Aquatic Ecology

If STP were to cease operating, impacts to aquatic ecology would decrease, as the plant would withdraw and discharge less water than it does during operations. Therefore, fewer organisms would be subject to the impingement, entrainment, and heat shock. Shutdown would reduce the impacts to aquatic ecology and would remain SMALL.

8.7.5 Terrestrial Ecology

Terrestrial ecology impacts would remain SMALL. No additional land disturbances on or off site would occur.

8.7.6 Human Health

Human health risks would be smaller following plant shutdown. The plant, which is currently operating within regulatory limits, would emit less gaseous and liquid radioactive material to the environment. In addition, following shutdown, the variety of potential accidents at the plant (radiological or industrial) would be reduced to a limited set associated with shutdown events and fuel handling and storage. In Chapter 4 of this SEIS, the NRC staff concluded that the impacts of continued plant operation on human health would be SMALL. In Chapter 5, the NRC staff concluded that the impacts of accidents during operation were SMALL. Therefore, as radioactive emissions to the environment decrease, and as likelihood and variety of accidents decrease following shutdown, the NRC staff concludes that the risk to human health following plant shutdown would be SMALL.

Noise caused by plant operations would cease; therefore, impacts from noise would be SMALL.

8.7.7 Land Use

STP shutdown would not affect onsite land use. Plant structures and other facilities would remain in place until decommissioning. Most transmission lines connected to STP would remain in service after the plant stops operating. Maintenance of most existing transmission lines would continue as before. Impacts on land use from plant shutdown would be SMALL.

8.7.8 Socioeconomics

STP shutdown would have an impact on socioeconomic conditions in the region around STP. Should the plant shut down, there would be immediate socioeconomic impact from loss of jobs (some, though not all, of the 1,378 employees would begin to leave), and tax payments may be reduced. As the majority of STP employees reside in Brazoria and Matagorda, socioeconomic impacts from plant shutdown would be concentrated in these counties, with a corresponding reduction in purchasing activity and tax contributions to the regional economy. Revenue losses from STP operations would directly affect Matagorda County and other local taxing districts and communities closest to, and most reliant on, the nuclear plant’s tax revenue. The impact of the job loss, however, may not be as noticeable given the amount of time required to decontaminate and decommission existing facilities and the proximity of STP to the Houston metropolitan area. The socioeconomic impacts of plan shutdown (which may not entirely cease until after decommissioning) would, depending on the jurisdiction, range from SMALL to MODERATE.

8.7.9 Transportation

Traffic volumes on the roads in the vicinity of STP would be reduced after plant shutdown. Most of the reduction in traffic volume would be associated with the loss of jobs at the plant.

Deliveries to the plant would be reduced until decommissioning. Transportation impacts would be SMALL as a result of plant shutdown.

8.7.10 Aesthetics and Noise

Plant structures and other facilities would remain in place until decommissioning. Therefore, aesthetic and noise impacts of plant closure and the termination of operations would be SMALL.

8.7.11 Historic and Archaeological Resources

Impacts from the no-action alternative on historic and archaeological resources would be SMALL because no additional land disturbances would occur on or off the STP site.

8.7.12 Environmental Justice

Impacts to minority and low-income populations would depend on the number of jobs and the amount of tax revenues lost by communities in the immediate vicinity of the plant after STP ceases operations. Closure of STP would reduce the overall number of jobs (there are currently 1,378 people employed at the facility) and tax revenue for social services attributed to nuclear plant operations. Minority and low-income populations in the vicinity of STP could experience some socioeconomic effects from plant shutdown, but these effects would unlikely be high and adverse. See Appendix J of NUREG-0586, Supplement 1, *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities Regarding the Decommissioning of Nuclear Power Reactors* (NRC 2002), for additional discussion of these impacts.

8.7.13 Waste Management

If the no-action alternative were implemented, the generation of high-level waste would stop, and generation of low-level and mixed waste would decrease. Impacts from implementation of the no-action alternative are expected to be SMALL.

8.7.14 Summary of Impacts of No-Action Alternative

Table 8–7 provides a summary of the environmental impacts of the no-action alternative compared to continued operation of STP.

Table 8–7. Summary of Environmental Impacts of the No-Action Alternative Compared to Continued Operation of STP, Units 1 and 2

Category	No-action Alternative	Continued STP Operation
Air quality	SMALL	SMALL
Surface water	SMALL	SMALL
Groundwater	SMALL	SMALL
Aquatic resources	SMALL	SMALL
Terrestrial resources	SMALL	SMALL
Human health	SMALL	SMALL to MODERATE
Land use	SMALL	SMALL
Socioeconomics	SMALL to MODERATE	SMALL

Category	No-action Alternative	Continued STP Operation
Transportation	SMALL	SMALL
Aesthetics	SMALL	SMALL
Historic & archaeological	SMALL	SMALL
Waste management	SMALL	SMALL

8.8 Alternatives Summary

In this chapter, the NRC staff considered the following alternatives to STP license renewal: new nuclear generation; NGCC generation; supercritical coal-fired generation; a combination alternative of natural gas, wind, and energy efficiency and conservation; and a purchased-power alternative. No action by NRC and its effects were also considered. The impacts for STP license renewal and for all alternatives to STP license renewal are summarized in Table 8–8.

In conclusion, the environmentally preferred alternative is the license renewal of STP. All other alternatives capable of meeting the needs currently served by STP entail potentially greater impacts than the proposed action of license renewal of STP. In order to make up the lost generation if license renewal is denied, the no-action alternative necessitates the implementation of one or a combination of alternatives, all of which have greater impacts than the proposed action. Hence, the NRC staff concludes that the no-action alternative will have environmental impacts greater than or equal to the proposed license renewal action.

Table 8–8. Summary of Environmental Impacts of Proposed Action and Alternatives

Alternative	Impact Area							
	Air Quality	Groundwater and Surface water	Aquatic and Terrestrial Resources	Human Health	Land Use	Socioeconomics (including Transportation & Aesthetics)	Archaeological & Historic Resources	Waste Management
License renewal	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL	SMALL	SMALL
New nuclear at STP site	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL to LARGE	SMALL	SMALL
NGCC at the STP site	SMALL to MODERATE	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL	SMALL
Supercritical coal at STP site	MODERATE	SMALL	SMALL to MODERATE	SMALL	MODERATE	SMALL to LARGE	SMALL	MODERATE
Combination of alternatives	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL to LARGE	SMALL to MODERATE	SMALL
Purchased power	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL to LARGE	SMALL to MODERATE	SMALL to MODERATE
No-action alternative	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL

8.9 References

10 CFR Part 51. *Code of Federal Regulations*, Title 10, *Energy*, Part 51, "Environmental protection regulations for domestic licensing and related regulatory functions."

65 FR 79825. U.S. Environmental Protection Agency. Regulatory finding on the emissions of hazardous air pollutants from electric utility steam generating units. *Federal Register* 65(245): 79825–79831. December 20, 2000.

Archer CL, Jacobson MZ. 2007. Supplying baseload power and reducing transmission requirements by interconnecting wind farms. Journal of Applied Meteorology and Climatology 46: 1701–1717.

[DOE] U.S. Department of Energy. 2004. *Biomass Cofiring in Coal-Fired Boilers*. Washington, DC: Federal Energy Management Program/DOE. DOE/EE-0288. Available at <http://www1.eere.energy.gov/femp/pdfs/fta_biomass_cofiring.pdf> (accessed 21 November 2011).

[DOE] U.S. Department of Energy. 2007. *Cost and Performance Baseline for Fossil Energy Plants.* DOE/NETL-2007/1281. Volume 1. May 2007.

[DOE] U.S. Department of Energy. 2008. *20% Wind Energy by 2030: Increasing Wind Energy's Contribution to U.S. Electricity Supply*. Washington, DC: DOE. DOE/GO-102008-2567. ADAMS No. ML100700550.

[DOE] U.S. Department of Energy. 2011a. "Innovative Texas Clean Coal Project Takes Major Step Forward as DOE Issues Record of Decision." September 27, 2011. Available at <http://www.fossil.energy.gov/news/techlines/2011/11053-Texas_Clean_Coal_Project_Moves_For.html> (accessed 21 November 2011).

[DOE] U.S. Department of Energy. 2011b. "Wind Powering America: U.S. Installed Wind Capacity." June 30, 2011. Available at <http://www.windpoweringamerica.gov/wind_installed_capacity.asp> (accessed 20 October 2011).

[EIA] Energy Information Administration. 2009. *Annual Energy Outlook 2009 With Projections to 2030*. Washington, DC: EIA. DOE/EIA 0383(2009). Available at <http://www.eia.doe.gov/oiaf/archive/aeo09/pdf/0383(2009).pdf> (accessed 17 November 2011).

[EIA] Energy Information Administration. 2011a. *Annual Energy Outlook for 2011 with Projections to 2035*. Washington, DC: DOE/EIA. DOE/EIA-0383(2011). April 11, 2011. Available at <http://www.eia.gov/forecasts/aeo/index.cfm> (accessed 16 August 2011).

[EIA] Energy Information Administration. 2011b. *Assumptions to the Annual Energy Outlook 2011*. Washington, DC: DOE/EIA. July 2011.

[EPA] U.S. Environmental Protection Agency. 1998. *Compilation of Air Pollutant Emission Factors*. Washington, DC: EPA. Volume 1, Section 1.1.

[EPA] U.S. Environmental Protection Agency. 2008. *New Source Review (NSR)*. ADAMS No. ML083450073.

[EPA] U.S. Environmental Protection Agency. 2011a. "Clean Energy: eGRID." Available at <http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html> (accessed 17 October 2011).

[EPA] U.S. Environmental Protection Agency. 2011b. "Green Book: Currently Designated Nonattainment Areas for All Criteria Pollutants." August 30, 2011. Available at <http://epa.gov/oaqps001/greenbk/ancl.html> (accessed 17 November 2011).

[EPA] U.S. Environmental Protection Agency. 2011c. "New Source Review." July 22, 2011. Available at <http://www.epa.gov/nsr/> (accessed 17 November 2011).

[ERCOT] Electric Reliability Council of Texas. 2011a. "ERCOT Quick Facts." Available at <http://www.ercot.com/about/profile/> (accessed 18 August 2011).

[ERCOT] Electric Reliability Council of Texas. 2011b. "Impacts of the Cross-State Air Pollution Rule on the ERCOT System." September 1, 2011. Available at: <http://www.ercot.com/content/news/presentations/2011/ERCOT_CSAPR_Study.pdf> (accessed 17 November 2011).

[Exelon] Exelon Generation Company, LLC. 2011. *Operating License Renewal Stage—Limerick Generating Station, Units 1 and 2*.

[GE] General Electric. 2011. "Gas Turbine and Combined Cycle Products." Available at <http://www.ge-energy.com/products_and_services/index.jsp> (accessed 17 October 2011).

[GEA]. Geothermal Energy Association 2007. *An Assessment of Geothermal Resource Development Needs in the Western United States*. Washington, DC: GEA. January 2007. Available at <http://www.geo-energy.org/reports/States%20Guide.pdf> (accessed 12 October 2011).

[HARC] Houston Advanced Research Center. 2008. *Combined Heat and Power Potential using Texas Agricultural Wastes*. The Woodlands, Texas: HARC. January 2008. Available at <http://www.seco.cpa.state.tx.us/zzz_re/re_biomass_chp-report2008.pdf> (accessed 19 October 2011).

[ISEPA] Iowa Stored Energy Plant Agency. 2011. "Iowa Stored Energy Park Project Terminated." July 28, 2011. Available at <http://www.isepa.com/ISEP%20Press%20Release.pdf> (accessed 16 November 2011).

Luminant. 2011. "Luminant Announces Facility Closures, Job Reductions in Response to EPA Rule; Company Forced to Take Difficult Steps; Files Suit to Protect Jobs, Reliability." Available at <http://www.luminant.com/news/spotlight/detail.aspx?FtID=23> (accessed 16 November 2011).

Michaels T. 2010. *The 2010 ERC [Energy Recovery Council] Directory of Waste-to-Energy Plants*. Washington, DC: ERC (formerly Integrated Waste Services Association). December 2010. Available at <http://www.wte.org/userfiles/file/ERC_2010_Directory.pdf> (accessed 30 November 2011).

[MIT]. Massachusetts Institute of Technology. 2006. "The Future of Geothermal Energy: Impact of Enhanced Geothermal Systems (EGS) on the United States in the 21st Century: An Assessment by an MIT-Led Interdisciplinary Panel." Available at <http://geothermal.inel.gov/publications/future_of_geothermal_energy.pdf> (accessed 30 November 2011).

[MMS]. U.S. Department of the Interior, Minerals Management Service. 2007. *Programmatic EIS for Alternative Energy Development and Production and Alternate Uses of facilities on the Outer Continental Shelf*. Washington, DC: MMS. Report MMS 2007-046.

[NETL] National Energy Technology Laboratory. 2007. *Cost and Performance Baseline for Fossil Energy Plants, Volume 1: Bituminous Coal and Natural Gas to Electricity*. Washington, DC: DOE/NETL. DOE/NETL-2007/1281. ADAMS No. ML100640755.

[NRC] U.S. Nuclear Regulatory Commission. 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. Washington, DC: NRC. NUREG-1437. May 1996. ADAMS Nos. ML040690705 and ML040690738.

[NRC] U.S. Nuclear Regulatory Commission. 1999. Section 6.3–Transportation, Table 9.1, Summary of findings on NEPA issues for license renewal of nuclear power plants. In: *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. Washington, DC: NRC. NUREG-1437, Volume 1, Addendum 1. August 1999. ADAMS No. ML04069720.

[NRC] U.S. Nuclear Regulatory Commission. 2002. *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities Regarding the Decommissioning of Nuclear Power Reactors*. Washington, DC: NRC. NUREG-0586, Supplement 1. November 2002. ADAMS Nos. ML023470304 and ML023500295.

[NRC] U.S. Nuclear Regulatory Commission. 2008. *Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants: Regarding Shearon Harris Nuclear Power Plant, Unit 1*. Washington, DC: NRC. NUREG-1437, Supplement 33.

[NRC] U.S. Nuclear Regulatory Commission. 2011. *Environmental Impact Statement for the Combined Licenses (COLs) for South Texas Project Electric Generating Station, Units 3 and 4*. Washington, DC: NRC. NUREG-1937. February 2011. ADAMS No. ML11049A000.

[NPCC]. Northwest Power and Conservation Council. 2005. *The Fifth Northwest Electric Power and Conservation Plan, Volume 3*. Portland, OR. Available at <http://www.nwcouncil.org/energy/powerplan/5/Volume3.pdf> (accessed 30 November 2011).

[NPCC]. Northwest Power and Conservation Council. 2009. *Draft Northwest 6th Power Plan*. Portland, OR. Available at <http://www.nwppc.org/energy/powerplan/6/default.htm> (accessed 30 November 2011).

[NREL]. National Renewable Energy Laboratory. 2009. *Land-Use Requirements of Modern Wind Power Plants in the United States*. Golden, CP: NREL. Technical Report NREL/TP-6A2-45834. August 2009.

[NREL]. National Renewable Energy Laboratory. 2010. *Large-Scale Offshore Wind Power in the United States; Assessment of Opportunities and Barriers*. Golden, CO: NREL. Technical Report NREL/TP-500-40745.

[OMB] U.S. Office of Management and Budget. 2007. *Detailed Information on the Low Income Home Energy Assistance Program Assessment*. ADAMS No. ML082880730.

[OPSB] Ohio Power and Siting Board. 2011. "99-1626-EL-BGN: Norton Compressed Air Energy Storage, Summit County." Available at <http://www.opsb.ohio.gov/opsb/index.cfm/cases/99-1626-el-bgn-norton-energy-storage-compressed-air-energy-storage/> (accessed 30 November 2011).

[Southern] Southern Company. 2009. *Southern Company Breaks Ground on Biomass Plant*. Atlanta, GA: Southern Company. November 10, 2009. ADAMS No. ML100700543.

[Southern] Southern Company. 2012. "Southern Company Highlights." Available at http://www.southerncompany.com/smart_energy/smart_power_highlights.html (accessed 5 September 2012).

[Southern and GIT] Southern Company and Georgia Institute of Technology. 2007. *Southern Winds: Summary Project Report 2007, A Study of Wind Power Generation Potential off the Georgia Coast*. Atlanta, GA: GIT. Available at <http://www.energy.gatech.edu/research/Summary-Southern-Winds.pdf> (accessed 28 November 2011).

[STPNOC] South Texas Project Nuclear Operating Company. 2006. Letter from SL Dannhardt, STPNOC, to B Martin, THC. Subject: South Texas Project, Units 3 and 4. December 12, 2006. ADAMS No. ML092100145.

[STPNOC] South Texas Project Nuclear Operating Company. 2010a. *Operating License Renewal Stage South Texas Project, Units 1 and 2.* September 2010. ADAMS No. ML103010257.

[STPNOC] South Texas Project Nuclear Operating Company. 2010b. *South Texas Project, Units 3 and 4, Combined License Application.* Bay City, TX: STPNOC. Part 3, "Environmental Report," Revision 4. ADAMS No. ML102860592.

Succar S, Williams RH. 2008. *Compressed Air Energy Storage: Theory, Resources, and Applications for Wind Power*. Princeton, NJ: Princeton University Energy Systems Analysis Group. Available at <http://www.princeton.edu/~ssuccar/caesReport.html> (accessed 17 October 2011).

[TCEQ] Texas Commission on Environmental Quality. 2005. *TPDES Permit No. WQ0001908000*. Austin, TX.

[TCEQ] Texas Commission on Environmental Quality. 2011. "Status of Air Permits and Permit Applications." Available at <http://www.tceq.texas.gov/permitting/air/nav/air_status_permits.html> (accessed 26 October 2011).

[TCPA]. Texas Comptroller of Public Accounts. 2008. *The Energy Report 2008*. Austin, TX. Available at <http://www.window.state.tx.us/specialrpt/energy/> (accessed 17 October 2011).

[THC]. Texas Historical Commission. 2007. Response from WA Martin for FL Oaks, THC, to SL Dannhardt, STPNOC. Stamped Reply: "No Historic Properties Affected Project May Proceed." January 19, 2007. ADAMS No. ML092100145.

[TSECO]. Texas State Energy Conservation Office. 2008. *Wind Energy Transmission*. Austin, TX. ADAMS No. ML100700550.

[TWDB] Texas Water Development Board. 2007. *State Water Plan—Water for Texas 2007*. Austin, TX: TWDB. Document No. GP-8-1.

[Virtus] Virtus Energy. 2008. *Texas Renewable Energy Assessment: Geothermal*. Austin, TX. Available at <http://www.vera.com/re_b_psdoc_07.htm.> (accessed 17 October 2011).

9.0 CONCLUSION

This supplemental environmental impact statement (SEIS) contains the environmental review of STP Nuclear Operating Company's (STPNOC's) application for renewed operating licenses for South Texas Project, Units 1 and 2 (STP) as required by Title 10 of the *U.S. Code of Federal Regulations* (CFR) Part 51 (10 CFR Part 51), the U.S. Nuclear Regulatory Commission's (NRC's) regulations that implement the National Environmental Policy Act (NEPA). This chapter presents conclusions and recommendations from the site-specific environmental review of STP and summarizes site-specific environmental issues of license renewal that the NRC staff (staff) identified during the review. Section 9.1 summarizes the environmental impacts of license renewal; Section 9.2 presents a comparison of the environmental impacts of license renewal and energy alternatives; Section 9.3 discusses unavoidable impacts of license renewal, energy alternatives, and resource commitments; and Section 9.4 presents conclusions and NRC staff (staff) recommendations.

9.1 Environmental Impacts of License Renewal

Based on the staff's review of site-specific environmental impacts of license renewal presented in this SEIS, the staff concludes that issuing renewed licenses would have mostly SMALL impacts. The site-specific review included 12 Category 2 issues and 2 uncategorized issues. The staff considered mitigation measures for each Category 2 issue, as applicable. The staff concluded that no additional mitigation measure is warranted.

Additionally, the staff independently reviewed STPNOC's SAMA. The staff agrees with STPNOC's conclusion that none of the candidate SAMAs are potentially cost-beneficial.

The staff also considered cumulative impacts of past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes them. The staff concluded in Section 4.11 that cumulative impacts would be SMALL to MODERATE depending on the resource area. However, except for the electromagnetic fields-acute effects, the incremental contribution from STP during the period of extended operation would be SMALL.

9.2 Comparison of Alternatives

In the conclusion to Chapter 8, the staff considered the following alternatives to STP license renewal:

- new nuclear generation,
- natural gas-fired combined-cycle generation (NGCC),
- supercritical coal-fired generation,
- combination alternative (the combination includes 640 MWe supplied by one NGCC unit; 1,620 MWe supplied by wind energy projects; and 300 MWe of energy conservation and efficiency, also known as demand-side management), and
- purchased power.

In addition, the staff also considered many other alternatives that were subsequently dismissed for reasons of technical, resource availability, or commercial limitations.

Conclusion

As summarized in Table 8–7, the staff concluded that the alternatives of supercritical coal at STP, purchased power, or combination alternative would have environmental impacts ranging from SMALL to LARGE. The alternatives of new nuclear at STP, NGCC at STP, and the no-action alternative would have impacts ranging from SMALL to MODERATE. In comparison to other alternatives, the STP license renewal alternative would have mostly SMALL impacts in all areas of the environmental analysis. Based on the staff's independent review, the staff concluded that the STP license renewal is the environmentally preferred alternative.

9.3 <u>Resource Commitments</u>

9.3.1 Unavoidable Adverse Environmental Impacts

Unavoidable adverse environmental impacts are impacts that would occur after implementation of all workable mitigation measures. Carrying out any of the energy alternatives considered in this SEIS, including the proposed action, would result in some unavoidable adverse environmental impacts.

Minor unavoidable adverse impacts on air quality would occur due to emission and release of various chemical and radiological constituents from power plant operations. Nonradiological emissions resulting from power plant operations are expected to comply with U.S. Environmental Protection Agency (EPA) emissions standards, though the alternative of operating a fossil-fueled power plant in some areas may worsen existing attainment issues. Chemical and radiological emissions would not exceed the national emission standards for hazardous air pollutants.

During nuclear power plant operations, workers and members of the public would face unavoidable exposure to radiation and hazardous and toxic chemicals. Workers would be exposed to radiation and chemicals associated with routine plant operations and the handling of nuclear fuel and waste material. Workers would have higher levels of exposure than members of the public, but doses would be administratively controlled and would not exceed standards or administrative control limits. In comparison, the alternatives involving the construction and operation of a non-nuclear power generating facility would also result in unavoidable exposure to hazardous and toxic chemicals to workers and the public.

The generation of spent nuclear fuel and waste material, including low-level radioactive waste, hazardous waste, and nonhazardous waste would be unavoidable. Hazardous and nonhazardous wastes would be generated at non-nuclear power generating facilities. Wastes generated during plant operations would be collected, stored, and shipped for suitable treatment, recycling, or disposal in accordance with applicable Federal and state regulations. Due to the costs of handling these materials, power plant operators would be expected to carry out all activities and optimize all operations in a way that generates the smallest amount of waste possible.

9.3.2 Short-Term Versus Long-Term Productivity

The operation of power generating facilities would result in short-term uses of the environment, as described in Chapters 4, 5, 6, 7, and 8. "Short-term" is the period of time that continued power generating activities take place.

Power plant operations require short-term use of the environment and commitment of resources and commit certain resources (e.g., land and energy), indefinitely or permanently. Certain short-term resource commitments are substantially greater under most energy alternatives, including license renewal, than under the no-action alternative because of the continued generation of electrical power and the continued use of generating sites and associated infrastructure. During operations, all energy alternatives entail similar relationships between local short-term uses of the environment and the maintenance and enhancement of long-term productivity.

Air emissions from power plant operations introduce small amounts of radiological and nonradiological constituents to the region around the plant site. Over time, these emissions would result in increased concentrations and exposure, but they are not expected to impact air quality or radiation exposure to the extent that public health and long-term productivity of the environment would be impaired.

Continued employment, expenditures, and tax revenues generated during power plant operations directly benefit local, regional, and state economies over the short term. Local governments investing project-generated tax revenues into infrastructure and other required services could enhance economic productivity over the long term.

The management and disposal of spent nuclear fuel, low-level radioactive waste, hazardous waste, and nonhazardous waste requires an increase in energy and consumes space at treatment, storage, or disposal facilities. Regardless of the location, the use of land to meet waste disposal needs would reduce the long-term productivity of the land.

Power plant facilities are committed to electricity production over the short term. After decommissioning these facilities and restoring the area, the land could be available for other future productive uses.

9.3.3 Irreversible and Irretrievable Commitments of Resources

This section describes the irreversible and irretrievable commitment of resources that have been noted in this SEIS. Resources are irreversible when primary or secondary impacts limit the future options for a resource. An irretrievable commitment refers to the use or consumption of resources that are neither renewable nor recoverable for future use. Irreversible and irretrievable commitment of resources for electrical power generation include the commitment of land, water, energy, raw materials, and other natural and man-made resources required for power plant operations. In general, the commitment of capital, energy, labor, and material resources are also irreversible.

The implementation of any of the energy alternatives considered in this SEIS would entail the irreversible and irretrievable commitment of energy, water, chemicals, and—in some cases—fossil fuels. These resources would be committed during the license renewal term and over the entire life cycle of the power plant, and they would be unrecoverable.

Energy expended would be in the form of fuel for equipment, vehicles, and power plant operations and electricity for equipment and facility operations. Electricity and fuel would be purchased from offsite commercial sources. Water would be obtained from existing water supply systems. These resources are readily available, and the amounts required are not expected to deplete available supplies or exceed available system capacities.

9.4 Recommendations

The NRC's preliminary recommendation is that the adverse environmental impacts of license renewal for STP are not great enough to deny the option of license renewal for energy-planning decisionmakers. The NRC staff based this recommendation on the following:

- the analysis and findings in NUREG-1437, Volumes 1 and 2, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*,
- the Environmental Report (ER) submitted by STPNOC,
- consultation with Federal, state, and local agencies,
- the NRC's environmental review, and
- consideration of public comments received during the scoping process.

10.0 LIST OF PREPARERS

This supplemental environmental impact statement (SEIS) was prepared by members of the Office of Nuclear Reactor Regulation (NRR) with assistance from other U.S. Nuclear Regulatory Commission (NRC) organizations and contract support from Pacific Northwest National Laboratory (PNNL). Table 10–1 lists the NRC staff who contributed to the development of the SEIS. PNNL provides contract support for cultural resource, hydrology, and severe accident mitigation alternative (SAMA) reviews.

Table 10–1. List of Preparers

Name	Affiliation	Function or Expertise
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B. Pham	NRR	Management oversight
A. Imboden	NRR	Management oversight
T. Tran	NRR	Project management
A. BeBault	NRR	Socioeconomic, environmental justice, land use, and terrestrial
S. Klementowicz	NRR	Human health
K. Folk	NRR	Hydrology and alternatives
M. Moser	NRR	Aquatic and marine ecology and alternatives
B. Balsam	NRR	Aquatic and marine ecology and terrestrial
A. Travers	NRR	Cultural resource
J. Rikhoff	NRR	Socioeconomic, environmental justice, and land use
W. Rautzen	NRR	Air quality and meteorology (climatology)
J. Dozier	NRR	SAMA
National Laboratory Personnel [a]		
S. Short	PNNL	SAMA
R. Schmitt	PNNL	SAMA
C. Kincaid	PNNL	Hydrology
R. Prasad	PNNL	Hydrology
T. O'Neil	PNNL	Cultural resource

[a] PNNL is operated by Battelle for the U.S. Department of Energy.

11.0 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THIS SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT ARE SENT

Name	Affiliation
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O. Sylestine	Tribal Nation—Alabama–Coushatta Tribe
B. Horse	Tribal Nation—Kiowa Tribe of Oklahoma
R. Toahty	Tribal Nation—Comanche Nation
M. Orms	U.S. Fish & Wildlife Service
D. Bernhart	National Marine Fisheries Service
K. Boydston	Texas Parks & Wildlife Department
M. Wolfe	State Historic Preservation Officer
A. Street	Tribal Nation—Tonkawa Tribe of Oklahoma
M. Blount	Tribal Nation—Apalachicola Band of Creek Indians
B. Barcena Jr.	Tribal Nation—Lipan Apache Tribe of Texas
D. Romero Jr.	Tribal Nation—Lipan Apache Band of Texas
J. Mendoza	Tribal Nation—Pamaque Clan of Coahuila Y Tejas
R. Hernandez	Tribal Nation—Tap PilamCoahuiltecan Nation
J. Garza Jr.	Tribal Nation—Kickapoo Traditional Council
J. Loera	Tribal Nation—Ysleta del Sur Pueblo
N. Hudgins	Coastal Plains Groundwater Conservation District
L. Gaul	Texas Department of State Health Services
EIS Scoping Participant*	**Affiliation & Address**
N. McDonald	Matagorda County Judge 1700 7th Street, Room 301, Bay City, TX 77414
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List of Agencies, Organizations, and Persons to Whom Copies of This Supplemental Environmental Impact Statement Are Sent

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12.0 INDEX

APPENDIX A
COMMENTS RECEIVED ON THE STP ENVIRONMENTAL REVIEW

COMMENTS RECEIVED ON THE STP ENVIRONMENTAL REVIEW

A.1 Comments Received During the Scoping Period

The scoping process began on January 31, 2011, with the publication of the U.S. Nuclear Regulatory Commission's (NRC's) Notice of Intent to conduct scoping in the *Federal Register* (76 FR 5410). The scoping process included two public meetings held at the Bay City Civic Center in Bay City, Texas, on March 2, 2011. Approximately 60 members of the public attended the meetings. After the NRC's prepared statements pertaining to the license renewal process, the meetings were open for public comments. Attendees provided oral statements that were recorded and transcribed by a certified court reporter. Any written statements submitted at the public meeting are documented in the transcript of the meetings. Transcripts of the two meetings are an attachment to the Scoping Meeting Summary, dated May 19, 2011 (Agencywide Documents Access and Management System (ADAMS) No. ML110770661). In addition to the comments received during the public meetings, comments were also received electronically and through the mail.

Each commenter was given a unique identifier, so every comment could be traced back to its author. Table A–1 identifies the individuals who provided comments applicable to the environmental review and the Commenter ID associated with each person's set of comments. The individuals are listed in the order in which they spoke at the public meeting and in numerical order for the comments received by letters or e-mails.

Specific comments were categorized and consolidated by topic. Comments with similar specific objectives were combined to capture the common essential issues raised by participants. Comments fall into one of the following general groups:

- Specific comments that address environmental issues within the purview of the NRC environmental regulations related to license renewal. These comments address Category 1 (generic) or Category 2 (site-specific) issues identified in NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) or issues not addressed in the GEIS. The comments also address alternatives to license renewal and related Federal actions.

- General comments in support of or opposed to nuclear power or license renewal or comments regarding the renewal process, the NRC's regulations, and the regulatory process.

- Comments that address issues that do not fall within or are specifically excluded from the purview of NRC environmental regulations related to license renewal. These comments typically address issues such as the need for power, emergency preparedness, security, current operational safety issues, and safety issues related to operation during the renewal period.

Table A–1. Individuals Providing Comments During the Scoping Comment Period

Commenter	Commenter ID	Affiliation (if stated)	ADAMS No.
Randy Weber	STP 1	State Representative	ML110840441
Judge Nate McDonald	STP 2	Matagorda County judge and local emergency response official	ML110840441

Commenter	Commenter ID	Affiliation (if stated)	ADAMS No.
Mark Bricker	STP 3	Bay City Mayor	ML110840441
Ron Paul's office	STP 4	U.S. congressman	ML110840441
Ed Halpin	STP 5	STP CEO	ML110840441
Carolyn Thames	STP 6	Bay city council member	ML110840441
Don Booth	STP 7	Director local 211 Pipefitter union of 3,000	ML110840441
Cheryl Stewart	STP 8	Bay City Community Development Corporation board member and Bay City Historic Commission	ML110840441
David Dunham	STP 9	Matagorda County resident	ML110840441
Owen Bludau	STP 10	Director of Matagorda County Economic Development Corporation	ML110840441
Kesha Rogers	STP 11	Congressional candidate for 22nd Congressional District	ML110840441
James Lovett	STP 12		ML110840441
D. C. Dunham	STP 13	Bay City Community Development Corporation	ML110840441
Willie Rollins	STP 14	Matagorda County resident	ML110840441
Ian Overton	STP 15	LaRouche PAC organizer	ML110840441
John Corder	STP 16	Brazoria County resident	ML110840433
Judge Nate McDonald	STP 17	Matagorda County judge	ML110840433
Mitch Thames	STP 18	Chamber of Commerce, emergency response public information officer	ML110840433
Tim Powell	STP 19	STP Vice President	ML110840433
Ken Head	STP 20		ML110840433
Mike Bolin	STP 21		ML110840433
John Corder	STP 22	Brazoria County resident	ML110840433
Casey Kile	STP 23	Bay City Babe Ruth (local sport organization)	ML110840433
Robert Singleton	STP 24	Austin resident	ML110840433
Karen Hadden	STP 25	Executive director of SEED Coalition	ML110840433
Bobby Head	STP 26	Matagorda County resident	ML110840433
Tom Kovar	STP 27	Bay City resident	ML110840433
Vicki Adams	STP 28	Superintendent Palacios ISD	ML110730188
Eva Esparza	STP 29	Austin resident	ML110960078
Darby Riley	STP 30	San Antonio resident	ML110960079
Kamala Platt	STP 31		ML110960080
Marion Mlotok	STP 32	Austin resident	ML110960081
Karen Seal	STP 33	Lacoste resident	ML110960082

Commenter	Commenter ID	Affiliation (if stated)	ADAMS No.
Kassandra Levay	STP 34	San Antonio resident	ML110960083
Unknown	STP 35		ML110960084
T. Burns	STP 36	Midland resident	ML110960086
Jolly Clark	STP 37		ML110960087
Dale Bulla	STP 38		ML110960088
William Stout	STP 39		ML110960089
C. J. Keudell	STP 40	Austin resident	ML110960090
Tarek Tonsson	STP 41		ML110960091
Carol Geiger	STP 42		ML110960092
Veryan and Greg Thompson	STP 43		ML110960093
Robert Singleton	STP 44		ML110960094
Karen Hadden	STP 45	SEED Coalition	ML110960095
Alan Apurim	STP 46		ML110960096
Brandi Clark Burton	STP 47	Austin resident	ML110960097
Carol Geiger	STP 48	Austin resident	ML110960098
Eric Lane	STP 49	San Antonio resident	ML110960099
Jenna Findley	STP 50		ML111010476
Margaret Reed	STP 51	Austin resident	ML111010477
Scott and Cyndy Reynolds	STP 52		ML111010478
Jennifer Meador	STP 53	Austin resident	ML111010604
Joy Malacara	STP 54	Austin resident	ML111010479
Melanie and David Winters	STP 55		ML111010506
J. R. Rhode	STP 56		ML111010507
Christine Fry	STP 57		ML111010508
Leona Slodge	STP 58	Austin resident	ML111010509
Carolyn Campbell	STP 59	Austin resident	ML111010510
Bryan Dunlap and Todd Rinehart	STP 60		ML111010517
Peggy Cravens	STP 61	Austin resident	ML111010518
Shannon Jurak	STP 62	Austin resident	ML111010519
Thomas Nelms	STP 63		ML111010520
T. Nelms	STP 64		ML111010521
Peggy Pryor	STP 65	Andrews resident	ML110960077
Edmund Kelley	STP 66	Austin resident	ML11105A023
Maria Hogan	STP 67		ML11105A020

Commenter	Commenter ID	Affiliation (if stated)	ADAMS No.
Randy Weber	STP 1 (letter, also captured in public meeting transcript)	Texas State Representative	ML11108A059
Beth Larsen	STP 68	Austin resident	ML11119A007
Dzan Nguyen	STP 69	Austin resident	ML11119A008
John Trimble	STP 70	Austin resident	ML11119A010
Aguilar family	STP 71		ML11119A011
Juan Aguilar	STP 72		ML11119A012
Douglas McArthur	STP 73	Austin resident	ML11119A013
Shawn Tracy	STP 74		ML11119A014
Kelly Simon	STP 75	Austin resident	ML11119A015
N/A	STP 76		ML11119A016
Judy Moore	STP 77		ML11119A017
Cynthia Gebhardt	STP 78		ML11119A018
Rory Holcomb	STP 79	Austin resident	ML11119A019
N/A	STP 80		ML11119A020

Comments received during the scoping comment period applicable to this environmental review are presented in this section along with the NRC response. The comments that are general or outside the scope of the environmental review for South Texas Project (STP) license renewal are not included here but can be found in the Scoping Summary Report (ADAMS No. ML11153A082). To maintain consistency with the Scoping Summary Report, the unique identifier used in that report for each set of comments is retained in this Appendix A.

Applicable scoping comments are grouped in the following categories and presented in the following order:

- alternatives to license renewal of STP,
- socioeconomic impact of STP,
- water usage,
- human health,
- postulated accidents,
- terrestrial or aquatic ecology, and
- uranium fuel cycle and waste management.

A.1.1 Alternatives to License Renewal of STP, Units 1 and 2

The original sources for the comments in this category (alternatives to license renewal) can be found at the back of the Scoping Summary Report and are labeled with the following identifiers: 12-2, 15-1, 24-3, 25-5, 26-2, 27-2, 27-4, 29-2, 30-1, 31-2, 32-3, 35-2, 36-6, 38-2, 39-3, 40-2, 43-3, 45-3, 46-3, 47-4, 49-2, 51-2, 52-2, 53-2, 54-3, 55-2, 57-2, 59-2, 60-3, 61 2, 62-2, 69-2, 73-2, 74-1, 77-2, 79-2, and 80-2. These comments are extracted from the original sources.

Comment 12-2: Several nations have nuclear energy policies. These policies are all variations on one theme: one, oil is not a dependable source of energy, it can be interrupted at any time and it is not feasible to store more than a few months worth of reserve supply; two, nuclear energy is the only source of energy, other than wind and solar—which I hope come along in the future but at the present have to be considered in the development stage—nuclear energy is the only source of energy that can produce large quantities of energy without dumping large quantities of carbon dioxide into the atmosphere.

Yes, the natural gas plant is better than the coal plant, and I'm not particularly in favor of a coal plant in Matagorda County, but natural gas is contributing to global warming, and we cannot afford to build any more of it than we have to.

I'm a strong supporter of nuclear energy; I'm a strong supporter of renewing these. In due course, I will be a strong supporter of Units 3 and 4. Thank you.

Comment 15-1: And, I think that it's probably best, when talking about the environmental benefits of nuclear power, to compare it with the environmental problems that other forms of power offer. So for example, the amount of energy in one pellet of uranium, about the size of my fingernail here, is equivalent in energy to about 30 barrels of oil or 6.15 tons of coal, or 23 $^{1}/_{2}$ tons of dry wood.

When you start going into other examples of energy, such as wind or solar, the amount of return gets even worse because the amount of radiant heat coming down from the sun is only about 200 watts per square meter, and the amount of land area and the cost of building and maintaining solar panels or windmills is far, far greater than the actual benefit you get from them, not to mention that windmills kill birds by the dozen and solar panels, with their polarized lights, kill insects by the countless numbers.

Comment 24-3: Nuclear power was also always intended to be a bridge technology. We're always going to find something better, and what we could do right now instead of re-license these is make an investment in renewables which could have, in terms of jobs, just as much of an impact as extending the life of this plant or building new units.

The other thing about switching forms of energy is that you can create jobs locally that are going to be exclusively locally. Nuclear power, a lot of the jobs that are generated are going to be foreign manufacturing jobs. The components for these plants are built off site; they don't really generate that much for your local economy.

There are new and exciting technologies that we could be counting on. For example, there's an Australian company called EnviroMission that's just about to open a project in Arizona. What it is; it's a tower, just a tower, covered around the base with thick plastic. What it does is it captures the heat of the sun; the heated air rises up a chimney and turns a turbine. It's basically the only moving part, so the turbine and then the generators from it.

The cool thing about it is that it continues to generate electricity even at night because the hea[t] of the ground continues to make this temperature differential, and the air continues up the chimney, and the turbines continue to turn.

This is the kind of thing that can be built and provide localized power. In West Texas, for example, we could build these things and not have to ship the power across the State. We could actually use it to provide energy where it's built.

Comment 25-5: A big issue is need for power. Right now in the legal case involving Units 3 and 4, the Atomic Safety and Licensing Board has agreed to hear a contention that is one of omission. There was a failure to analyze what alternatives were there in terms of looking at energy efficiency. Building codes in particular are going to be saving; they've been adopted, going to be saving some 2,200 megawatts of power in Texas. We need to look at whether the power is needed and then we need to look at how else it could be generated.

And, certainly[,] jobs are crucially important in every community. We realize that that's important here. I think it's time to look at what are the options in terms of transition, what other kinds of ways to generate electricity could occur here; I think there are many and to start looking at training and what other options exist.

<u>Comment 26-2</u>: Randy Weber was here last week. He's our State representative. He got over in the next room and he said that Texas is growing by 113,000 people a month. Wow. We're outgrowing all the states combined. We're getting more people into Texas. He says if we keep growing the way we are, that by 2015 we're going to have to have five new nuclear plants, or 16 coal plants, or 28 gas plants, or 3,000 windmills if the windmills agree to turn 24-7-365. You know that's not going to happen.

Would I like to see all of our power generated totally clean[?] Yes, I would. It's not realistic, not with what we have as today's knowledge.

<u>Comment 27-2</u>: You have to have electricity and you have to have a lot of it. I wish I could afford Austin's 16 percent. But, you have to have a lot of electricity nowadays because of the way the population is, and if you look at the last 40-50 years of power generation, of gas-fired plants or coal-fired plants and how hazardous they are to the environment and people, then I think you [cannot] help but realize how safe nuclear power is. The Government has been using it to power their vehicles in the military for a long time.

<u>Comment 29-2</u>: There are safer alternative technologies that can replace the energy generated by these reactors.

<u>Comment 30-1</u>: Well before 2027, we should have outgrown the need for nuclear power with clean alternative energy and conservation [and] efficiency …

<u>Comment 31-2</u>: I urge the denial of the relicensing of the STP. As a San Antonio resident, I value my community and know that we are committed to renewables and conservation, much better paths to the future on a sustainable planet.

<u>Comment 32-3</u>: We should be investing in solar and wind and dismantling our aging reactors.

<u>Comment 35-2</u>: There are cheaper and renewable ways to get our power, and I would love to see Texas lead the way in these fields. Not continue to lead us down a dead end road with nuclear power.

<u>Comment 36-6</u>: STP does not displace [carbon dioxide] emissions. Other, truly renewable energy sources are much more highly developed now and can replace STP. By scheduled renewal, nuclear energy will be totally unnecessary.

<u>Comment 38-2</u>: We need to move toward heavy development of solar and wind regardless of the cost[—]they would be so much safer (and most likely cheaper in the long run, considering [(lacking of or merit of)] all the waste and other negatives of solar).

<u>Comment 39-3</u>: Safer, cleaner alternative ways to generate the same power (in essence[,] to boil water) exist today and should be used and funded, just like the Nuclear and Petroleum industries have been subsidized by the U.S. Government to the tune of BILLIONS of dollars annually.

<u>Comment 40-2</u>: At this point in time, I feel that the U.S. should move away from nuclear and oil as primary energy sources. Let's develop more renewable options.

Comment 43-3: Here in Texas, we have a wonderful abundance of sun as well as wind, neither depend[e]nt on other countries. We should be making use of these natural resources[,] which are safer, reduce use of scarce water, and [cannot] be used as political weapons.

Comment 45-3: Safer, cleaner alternative ways to generate the same power exist today and should be used. We should not be subjected to worrying about radioactive contamination—just to generate electricity. We should not have to worry about terrorists attacking a radioactive energy generation source, and we don't have these worries with solar, geothermal, natural gas, or wind power. These forms of energy generation, combined with energy efficiency and ever-improving methods of storage, could easily replace the electricity generated by Units 1 [and] 2. When these units have been down due to problems or fuel replacement, it did not cause problems with the grid or lead to blackouts. We can replace the generation of these units with safer, cleaner technologies.

Comment 46-3: For alternative energy sources, and a way to get the USA off foreign oil dependence that is costing us both in trade balance and military costs, see the downloadable document describing achievable ecological solutions for all these needs:

http://phoenixprojectfoundation.us/uploads/USA Article V SHE Document.pdf

Thank you for your hard work and consideration of these issues. Please be sure to keep me informed as this regulatory process proceeds.

Comment 47-4: We have safer and cleaner ways to generate the same power—THAT is where our money and attention need to be directed.

Comment 49-2: There are safer, cleaner alternatives to generate the same power that exists today, and we should commit the country to use them.

Comment 51-2: Safer, cleaner alternative ways to generate the same power exist today and should be used. Studies have found that energy efficiency and renewable energy sources, which are abundant in Texas, could replace the power generated by these two old nuclear reactors.

Comment 52-2: NOW is the time to make a commitment to safer and renewable energy sources.

Comment 53-2: Safer, cleaner alternative ways to generate the same power exist today and should be used. Studies have found that energy efficiency and renewable energy sources, which are abundant in Texas, could replace the power generated by these two old nuclear reactors.

Comment 54-3: There are safer, cleaner alternative ways to generate the same power available today, and these should be used instead of nuclear energy.

Comment 55-2: Safer, cleaner alternative ways to generate the same power exist today and should be used. Studies have found that energy efficiency and renewable energy sources, which are abundant in Texas, could replace the power generated by these two old nuclear reactors.

Comment 57-2: I believe there are alternative ways to generate power and support a more …[uncertain handwriting].

Comment 59-2: There are safer, cleaner alternative ways to generate power!

Comment 60-3: Texas is ready for a new way to power our lives; give Texa[s] a chance for a cleaner, safer power of energy …

Comment 61-2: There are safer, cleaner alternative ways to generate the same power that exist today and should be used.

Comment 62-2: Safer, cleaner alternative ways to generate the same power exist today and should be used.

Comment 69-2: Safer, cleaner alternative ways to generate the same power exist today and should be used.

Comment 73-2: Rather than pushing for more water-consuming nuclear power plants, Texas needs to focus more on the development of renewable energy sources such as wind and solar.

While many promises are made as to the safety of nuclear power, recent history demands we not place too much reliance on them. Some things do not readily lend themselves to engineering solutions. I believe nuclear power is one of those things, and thus I am opposed to the requested re-licensing.

Comment 74-1: To ensure the safety of my family and other Texas families, I believe the re-licensing of these two reactors for an additional [20] years should be halted for safety reasons. There are safer and cleaner alternatives than outdated reactors. These alternatives (solar, wind, etc.) should be strongly considered.

Comment 77-2: There are safer and cleaner ways to generate power today that we need to support and use. Renewable energy sources are everywhere in Texas and could replace more dangerous sources if funded and supported. Another factor to think about is the huge amount of water used in the reactors. The water from the Colorado River is needed to farming, cattle and families. Are we not just creating another problem by using energy sources that use so much water?

Comment 79-2: Safer, cleaner alternative ways to generate the same power exist today and should be used. Studies have found that energy efficiency and renewable energy sources, which are abundant in Texas, could replace the power generated by these two old nuclear reactors.

Comment 80-2: Safer, cleaner alternative ways to generate the same power exist today and should be used. Studies have found that energy efficiency and renewable sources, which are abundant in Texas, could replace the power generated by these two old nuclear reactors.

Response: *These comments provide input (or data) for the staff's environmental analysis of the alternatives to license renewal, including the alternative of not renewing the operating license—also known as the "no-action" alternative. In Chapter 8 of this supplemental environmental impact statement (SEIS), the staff evaluated the alternatives to license renewal. These include new nuclear generation, natural-gas-fired combined-cycle generation, supercritical coal-fired generation, combination alternative, and purchased power. In addition, in Chapter 8 of this SEIS, the staff considered many other options that were subsequently dismissed for reasons of technical, resource availability, or commercial limitations. These include offsite nuclear, gas and coal-fired capacity; energy conservation and energy efficiency; wind power; solar power; hydroelectric power; wave and ocean energy; geothermal power; municipal solid waste; biomass; biofuels; oil-fired power; fuel cells; and delayed retirement.*

A.1.2 Socioeconomic Impact of STP, Units 1 and 2

The original sources for the comments in this category (socioeconomic) can be found at the back of the Scoping Summary Report and are labeled with the following identifiers: 1-2, 3-1, 5-2, 6-2, 8-1, 9-1, 10-1, 13-1, 14-1, 20-2, 23-1, and 24-1. These comments are extracted from the original sources.

Comment 1-2: STP is the largest employer in Matagorda County with more than 1,200 employees and for 30 years has been a key part of the county and local communities. The company's employees are active in the local community, serving on school boards, chambers and in civic and service organizations.

For over 20 years, [the] existing [STP] units have supplied safe, clean and reliable energy to more than 2 million Texas homes while also providing permanent, well-paying jobs. The facility is a recognized industry leader in production, reliability and safety, as well as being focused and committed to the safety of its employees and the surrounding communities.

Comment 3-1: With that being stated, STP makes it obvious. STP is the largest employer to the county, their employees stay active in numerous organizations, and many serve as elected officials. They have a very high importance to safety as well as the environment. Their employees set the standard for their industry. Just last October, STP was named one of America's safest companies, the first nuclear facility to ever be honored with that award.

In 2008, STP started its educational incentive program as part of its workforce development efforts. It represents a $4.2 million investment that provides great opportunities for well-paying jobs in this community. For over 20 years, the facility has produced safe, reliable energy to the citizens of Texas, and for the past [7] consecutive years, STP has produced more electricity than any other two-unit nuclear plant in the country.

The license extension of STP will continue to provide jobs and economic benefits to our local community.

Comment 5-2: Our employees try to contribute and try to continue to do what they can to improve life within this community by serving, as the judge said, on various boards and providing leadership positions, and we're thankful that you give us that opportunity.

Comment 6-2: During the record low temperatures when there were problems in Texas with other sources of power, our local plant didn't have any problems keeping the power generating for Texans.

The culture of continuing improvement for all aspects of power generation overflows in the community. STP[NOC]'s contributions to our local charities, our chambers of commerce and civic groups provide the commitment to our future and our joint success. They give both time and money to make sure Matagorda County is the best in all of Texas.

Comment 8-1: My name is Cheryl Stewart, and I'm on the Bay City Community Development Corporation Board and also the Historic Commission, and I'm here today to inform you of the many ways that I have personally seen STP impact our community in a positive way.

STP contributed $100,000 to the Center for Energy Development and currently provides staffing to train our community's young adults. STP employees have been strong leaders in our strategic planning for the future of this community with our Bay City Matagorda United Plan. STP employees have also invested in the renovation of our historic downtown district and its beautification efforts. I have also served with STP employees on various community boards and have witnessed firsthand their dedication, their desire to be good neighbors, and their commitment to our community.

I am sure that our community would experience a huge loss without the involvement and support of STP.

Comment 9-1: The importance of STP to that future [cannot] be overemphasized. My employer is an educational partner with STP and their contribution to the future of our community through support of education is unprecedented in my 20 years of higher education experience.

<u>Comment 10-1</u>: STP personifies the best type of economic development project that a community could want. It's created a large number of jobs that have been filled with highly educated and highly skilled workers. It pays wages far above the county average. It's greatly enhanced the tax base of Matagorda County and to the taxing entities in whose location it is situation. It makes significant annual financial contributions to civic, educational, and promotional programs benefitting all of the county. It has created and funded a major grow-your-own technical education program, providing good career opportunities for all of our local youth. Its employee and their families are extensively involved in all aspects of our community and political life, and, by so doing, they make Matagorda County a much better place in which to live for all the rest of us.

<u>Comment 13-1</u>: And have you ever wondered what Bay City and Matagorda County would be like if we didn't have South Texas Nuclear Operating Company [STPNOC] here? There isn't a day that goes by that we don't run into or communicate with STP employees. They're involved throughout our community, and I really have a hard time imagining what it would be like here without them because they're such a huge asset to our community.

And, of course, we love to show off our assets, and I'm proud to say that every time I meet someone I always talk about we're the home of a nuclear power plant, because I'm just really proud of that. And, because of that, I've also invited all of our surrounding economic development associates to come and visit STP because I want them to see the high level of security and safety that they operate in every day. And, I've got them actually scheduled next month, so Mr. Halpin, hopefully you can stop by and say hello.

But, as an economic developer and resident of Matagorda County, I'm very thankful to have such a great asset in our community, and they will not only have a positive impact but an excellent impact on our taxes, community development, and our environmental justice.

<u>Comment 14-1</u>: I don't have a lot of knowledge on technical skills about nuclear energy, so I'm just going to limit my comments to the social environmental impact that STP has had on this community.

Matagorda County, like many rural communities, over the years has suffered from brain drain, where your best and your brightest tend to leave and seek their fortunes other places. Well, STP has helped to reverse that trend in Matagorda County. Not only does it provide great paying jobs for our youth that even go off to college and return to become productive citizens in this community, they have reduced the amount of exodus of kids leaving this community in the first place with the creation of the Center for Energy Development where we can now grow our own.

The social environmental impact of that, just in and of itself, has been tremendous. If we were to track the intellectual scale of Matagorda County within the last 20 years, you can begin to see that if you start off with the census of 2000, the number of high school graduated individuals in Matagorda County represented about one-third, another group of individuals that did not have a high school diploma represented another third. So effectively, basically, two-thirds of the population of Matagorda County had a high school diploma or less.

If you begin to look at the recent trend since the [STP] has been in this community, you can see that trend reversing and the numbers of educated citizens of this community going up.

When I returned to Matagorda County several years ago, I became actively involved in a lot of the nonprofit organizations. The premier nonprofit organization for this community was United Way, but at that time, unfortunately, United Way was under poor leadership and dysfunctional.

Thanks to the leadership of two employees from STP, one by the name of Gerald Wilson, another by the name of Chris Johnson, who took the leadership of the United Way and made it the organization that it is today that's supporting over 30 other non-profit organizations in this community, there are others that could talk more eloquently about the economic impact of STP, but the ancillary benefit of its employees serving on nonprofit boards, and not to mention our faith-based communities through their tithes, their offerings that support churches and other community-based organizations, that contribution is almost immeasurable.

Comment 20-2: What should you focus on? Obviously, our environmental concerns are a huge part of this. I'm [with] the Convention and Visitors Bureau, and one of our main focuses is bringing tourists down to Matagorda County to see what we have to offer.

Comment 23-1: And I'd just like to say that, on behalf of Babe Ruth, we're very grateful for everything STP does for us as an organization. They're a major sponsor in all of our events. Over the last [10] years, we've hosted [4] regional tournaments and [11] or [12] state tournaments, and without STP[NOC]'s support, we would never have been able to participate in those tournaments or even host those tournaments.

On the economic standpoint, Mr. Head said earlier last year we hosted a regional tournament. We had five states come to visit Bay City, over 400 visitors in town, over 100,000 new dollars just last year, and without STP supporting that, we wouldn't have been able to host that tournament. So, we'd like to thank them.

Not only do they help us monetarily with our tournaments, but their employees also volunteer with us, and we'd like to thank them for their employees and letting them volunteer.

Over the last [10] years, like I said, we've hosted about 15 tournaments and probably half a million new dollars in Matagorda County over the last [10] years.

Comment 24-1: You may ask why I'd want to come down from Austin to talk to you. Well, Austin is a 16 percent partner in [Units 1 and 2], and if you look back over the history of the project, we've got a lot less reason to celebrate this plant than may be some people who live here do. I'm not going to talk a lot about jobs, but I'm going to wrap up with that tonight.

But, Austin's experience with [Units] 1 and 2 was a nightmare. We had it thrust upon us by politicians who were determined to continue to take public votes until we bought a share of the plant. We tried to get out of the plant at one point, tried to sell our 16 percent share, and [cannot].

The problem was at its worst in the '90s when 42 cents out of every dollar that we paid on a utility bill was going for debt service at NRG. For our 16 percent share, we were paying almost half of our utility bill for debt service on the project.

Response: *These comments provided input (or data) for the staff's environmental analysis of the socioeconomic impacts of STP on local and regional communities. The comments include socioeconomic-related items such as taxes, employment, education, tourism, and public and civic services.*

The socioeconomic impacts of renewing the STP operating license and alternatives to license renewal are discussed in Sections 2.2.9, 4.9, 8.1.8, 8.2.8, 8.3.8, 8.4.8, 8.5.8, and 8.7.8 of this SEIS.

A.1.3 Water Usage

The original sources for the comments in this category (water usage) can be found at the back of the Scoping Summary Report and are labeled with the following identifiers: 25-4, 29-3, 32-2, 36-5, 37-3, 39-4, 40-3, 41-2, 45-4, 47-2, 51-3, 53-3, 54-2, 55-3, 59-3, 60-2, 62-4, 63-2, 64-3, 67-2, 71-2, 75-2, 77-2, and 80-4. These comments are extracted from the original sources.

Comment 25-4: There is a problem with the leaking main cooling reservoir [MCR], which was described and documented in the license application for Units 3 and 4. There needs to be tracking of where the water is going. Is it reaching the Gulf, where is it going, what is it doing? That should be part of the re-licensing study and analysis.

Water use is an increasing issue. Up until this point, the highest use that I know of through researchers looking at this is 49 percent of the Colorado River has been used for cooling purposes, and I know a couple of summers ago there was a lot of pumping going on to refill the reservoir when it got kind of low.

It’s a problem for those of us in Austin. The Colorado River water has to serve a lot of purposes. Rice farmers need it; we’re going to need it for many, many purposes, recreation, fishing on our end. And, Lake Travis levels were at an all-time low several years ago. Every single dam on the whole lake was closed; you couldn’t put a boat in.

And, we would like to see something shift to where this much water was no longer required. Certainly, you’re still going to have to still cool spent fuel rods and so on and so forth, but it is a question when you look at continuing the reactors’ life.

Comment 29-3: Vast water consumption requirements for these reactors add a hidden cost to taxpayers, farmers, ranchers and other industries. As water becomes more scarce in Texas, this becomes a very high risk should there be a meltdown like Japan.

Comment 32-2: We have been suffering for many years from drought conditions here in Texas. Given the huge amount of water needed for normal operation and to avert nuclear catastrophe, we would be better served to use the little water we have for agriculture and residential use.

Comment 36-5: STP requires a large amount of cooling water to operate, critical, as seen in Japan. Texas is facing more and more serious water shortages, as population rises and global warming effects take place. The need for water for other purposes than STP will grow. STP should relinquish its water use and shut down.

Comment 37-3: Vast consumption of water use, largely Colorado River water, which is increasingly needed for drinking water, livestock, and farming. The [MCR] is leaking out the bottom. How and when will this be repaired? Climate change—rising temperatures could affect whether there is enough cool water to cool the reactors.

Comment 39-4: Vast consumption of water use, largely Colorado River water, which is increasingly needed for drinking water, livestock, and farming in an era of more frequent and lengthy periods of drought. The [MCR] is leaking out of the bottom: How and when will this be repaired? Climate change considerations: The rising atmospheric temperatures could affect whether there is enough cool water to cool the reactors.

Comment 40-3: Also, as you know, nuclear power supplies require a lot of water for cooling purposes. Once again, the State of Texas is experienced drought in 98 [percent] of its counties. Let’s save the water for agricultural purposes.

Comment 41-2: The reactors consume vast quantities of water; use largely from the Colorado River; water that is needed for drinking water.

Comment 45-4: These reactors consume vast quantities of water use, largely Colorado River water, which is increasingly needed for drinking water, livestock, and farming. Drought is expected to increase in our region. We are concerned that there will not be adequate water to cool the reactors in an emergency or that the water will not be cool enough to effectively cool the reactors. Some U.S. reactors have had to shut down due to high water temperatures, and this could [result in a] scenario [that] could worsen with climate change impacts, leaving us with a dangerous situation and a shortage of power during intense heat waves.

The [MCR] is leaking out the bottom, as documented in the license application for STP 3 [and] 4. The reactors should not be relicensed when this serious condition remains unresolved. How and when will this be repaired? What studies have been done by the NRC on this serious problem? How can relicensing even be considered until this situation is corrected? Where is the water going, and how extensive is the radioactivity that may be leaking into the Gulf of Mexico [or the] Colorado River [or both]?

<u>Comment 47-2</u>: We have limited access to freshwater that can be used for this facility. The priority should be for drinking water, livestock, and farming. I understand that the [MCR] is leaking out the bottom. How and when will this be repaired?

<u>Comment 51-3</u>: These reactors consume vast quantities of water use, largely from the Colorado River, water that is needed for drinking water, livestock, and farming.

<u>Comment 53-3</u>: These reactors consume vast quantities of water use, largely from the Colorado River, water that is needed for drinking water, livestock, and farming.

<u>Comment 54-2</u>: The reactors would affect the Austin area by consuming vast quantities of our drinking water from the Colorado River …

<u>Comment 55-3</u>… these reactors consume vast quantities of water use, largely from the Colorado River, water that is needed for drinking water, livestock and farming;

<u>Comment 59-3</u>: Leave the Colorado River for other purposes—drinking, livestock, and farming.

<u>Comment 60-2</u>: Please help protect Americans, Texans, and all human beings that come into contact with the Texas Colorado River from having it depleted by renewing these reactors licenses[,] to continue consuming vast quantities. Protect the waterways from being poisoned in the event of emergencies at nuclear plants.

<u>Comment 62-4</u>: These reactors consume large quantities of water use, largely from the Colorado River, water that is needed for drinking water, livestock, and farming.

<u>Comment 63-2</u>: Too much water is used to cool the reactors! Too much water is used. It's dangerous.

<u>Comment 64-3</u>: Too much water is wasted! There goes the drinking water; all gone and toxic! Please do not relicense these two reactors.

<u>Comment 67-2</u>: The vast amount of water taken up by these reactors is very much needed for other purposes.

<u>Comment 71-2</u>: Nuclear reactors use large quantities of water, water that could be used for drinking, livestock, and farming.

<u>Comment 75-2</u>: These reactors consume vast quantities of water use, largely from the Colorado River[;] water that is needed for drinking water, livestock[,] and farming.

<u>Comment 77-2</u>: There are safer and cleaner ways to generate power today that we need to support and use. Renewable energy sources are everywhere in Texas and could replace more dangerous sources if funded and supported. Another factor to think about is the huge amount of water used in the reactors. The water from the Colorado River is needed [for] farming, cattle[,] and families. Are we not just creating another problem by using energy sources that use so much water?

<u>Comment 80-4</u>: These reactors consume vast quantities of water use, largely from the Colorado River[;] water that is needed for drinking water, livestock, and farming.

Response: *These comments provided input (or data) for the staff's environmental analysis of water resource impacts of STP on local and regional communities. These comments raise concerns about the water usage from the Colorado River and leakage from the MCR. The staff discusses water usage impacts in Sections 2.2.4, 2.2.5, 4.3, 4.4, 8.1.2, 8.1.3, 8.2.2, 8.2.3, 8.3.2, 8.3.3, 8.4.2, 8.4.3, 8.5.2, 8.7.2, and 8.7.3 of this SEIS.*

A.1.4 Human Health

The original sources for the comments in this category (human health or Radiation Impact) can be found at the back of the Scoping Summary Report and are labeled with the following identifiers: 25-1, 29-4, 36-3, and 45-6. These comments are extracted from the original sources.

<u>Comment 25-1</u>: I also have concerns about the re-licensing of reactors 1 and 2. I think there are a number of issues that need to be looked at carefully during this process and bearing worker safety in mind. One of them is tritium, and basically, there has been tritium showing up in wells on the site. This needs to be looked into thoroughly, as well as tritium in the Colorado River, and documented, measured, carefully analyzed to see if it's safe to continue down this path at this point in time.

<u>Comment 29-4</u>: There is currently a leak in the bottom. What are the health implications to wildlife and people of this leak? When will it be fixed? They have not repaired this, how can they be trusted for another 20 years?

<u>Comment 36-3</u>: I have heard the news reports that the leakage of plutonium and cesium is not a cause for concern. As a physician interested in this area, I know that this is ridiculous. I remember how much polonium [alpha emitter] was required to assassinate a Russian person in the UK.

<u>Comment 45-6</u>: We are concerned about increasing tritium levels in wells [on site] and in the Colorado River. Extensive testing should occur for all organisms in the region, and exposure of whooping cranes to tritium and other radionuclides should be examined since they are an endangered species and their winter grounds are only 35 miles from the STP site.

Response: *These comments provided input (or data) for the staff's environmental analysis of human health and environmental impacts related to possible radioactive leaks from STP.*

To ensure that STP is operated safely, the NRC licenses the plant to operate, licenses the plant operators, and establishes license conditions for the safe operation. The NRC provides continuous oversight of STP through its reactor oversight process (ROP) to verify that operations are in accordance with NRC regulations. The NRC has full authority to take necessary actions to protect public health and safety and the environment, and it may demand immediate STPNOC actions, up to and including a plant shutdown.

Radiation doses to members of the public from the current operations of STP are evaluated in the SEIS in Section 4.8.2. In that section, the staff reviewed the radioactive releases from STP (i.e., radioactive gaseous and liquid effluents, radiation from radioactive waste storage buildings, radiological impacts from refueling and maintenance activities, and tritium leaks) and the results of STPNOC's radiological environmental monitoring program (REMP) (i.e., analysis of air, water (surface, ground, and drinking), sediment, vegetation, and aquatic and terrestrial biota for radioactivity). Based on its review, the staff concluded that the radiological impacts to members of the public were within NRC's and U.S. Environmental Protection Agency's (EPA's) dose *standards, and there were no radiological effects to the environment and non-human species (i.e., local biota) from plant operation.*

The staff also evaluated the STP REMP. The REMP quantifies the environmental impacts associated with radioactive releases from the plant. The REMP monitors the environment over time, starting before the plant operates to establish background radiation levels and throughout its operating lifetime to monitor radioactivity in the local environment. The REMP provides a mechanism for determining the levels of radioactivity in the environment to ensure that any accumulation of radionuclides released into the environment will not become significant as a result of plant operations. Based on the review of several years of data, the staff concluded that there were no measurable impacts to the environment as a result of radioactive releases from STP.

In summary, the NRC provides continuous oversight of STP through its ROP to verify that they are being operated in accordance with NRC regulations. STP is required to maintain its radioactive effluent release program in compliance with NRC regulations and consistent with EPA standards. The NRC will continue to inspect STPNOC's compliance with radioactive effluent.

A.1.5 Postulated Accidents

The original sources for the comments in this category can be found at the back of the Scoping Summary Report and are labeled with the following identifiers: 25-3, 37-2, 39-2, 42-1, 45-2, and 48-1. These comments are extracted from the original sources.

<u>Comment 25-3</u>: [I]n 1982, there was a study done for the [NRC] called the [CRAC 2] Study. It found that if there were an accident—and they were looking at Units 1 and 2—that there would be 18,000 early deaths. They would also be followed by thousands of cancers. That study has not been updated. The population in some of this region has grown, and it needs to be looked at again to find out what is the reality of the situation today, and that needs to be compared to other ways of generating electricity.

<u>Comment 37-2</u>: Risks of an accident, fires, or explosions at one or more reactors at the site, risks that could increase with aging reactors NRC's 1982 CRAC 2 study found that there could be 18,000 early deaths if a serious accident occurred at the STP site.

<u>Comment 39-2</u>: Risks of an accident, fires, or explosions at one or more reactors at the site, risks that could increase with aging reactors. [NRC's] 1982 CRAC 2 study found that there could be 18,000 early deaths if a serious accident occurred at the STP site.

<u>Comment 42-1</u>: The [license renewal application (LRA)] is inadequate because it: (a) fails to adequately address the applicant's capacity to deal with fires and explosions that cause a loss of large areas of the plant—the mitigative strategies for addressing fires and explosions are inadequate to address the consequences of events such as the impacts of large commercial aircraft crashing into the reactors or related facilities, (b) fails to describe the means that would be used to determine radiation exposures to fire and explosion responders, and (c) fails to describe the means that would be used to protect fire and explosion responders from excessive radiation exposures.

<u>Comment 45-2</u>: We are all too aware of the fact that meltdowns can and do happen, and a recent Union of Concerned Scientists report notes that there were 14 near misses in the U.S. in 2010. NRC's 1982 CRAC 2 study found that there could be 18,000 early deaths if a serious accident occurred at the ST(N)P site, followed by thousands of cancers.

Comment 48-1: The [LRA] is inadequate because it: (a) fails to adequately address the applicant's capacity to deal with fires and explosions that cause a loss of large areas of the plant—the mitigative strategies for addressing fires and explosions are inadequate to address the consequences of events such as the impacts of large commercial aircraft crashing into the reactors or related facilities, (b) fails to describe the means that would be used to determine radiation exposures to fire and explosion responders, and (c) fails to describe the means that would be used to protect fire and explosion responders from excessive radiation exposures

Response: *These comments provided input (or data) on various aspects of severe accidents associated with fire and explosion hazards, ranging from the applicability of results from earlier NRC consequence studies (e.g., CRAC) to emergency management operation. The evaluations of STPNOC's severe accident analysis are discussed in Section 5.2 of this SEIS.*

The NRC and the global nuclear research and safety community have done extensive research over the past three decades evaluating reactor accidents and how they could affect the public. Earlier studies (e.g., NUREG/CR-2239, Technical Guidance for Siting Criteria Development*, commonly referred to as the 1982 Siting Study or CRAC 2 Study) had uncertainties and conservatisms and did not include information on current plant design, operation, accident management strategies, emergency preparedness procedures, or post-9/11 enhancements to mitigative measures. Earlier work was also limited by both computer hardware and software available at that time. Researchers attempted to overcome these limitations by simplifying some estimates or assumptions concerning possible damage to the reactor core, the possible radioactive contamination that could be released, and possible failures of the reactor vessel and containment buildings. These efforts led to overestimates in the results, particularly in the 1982 Siting Study (or CRAC 2 Study) report. This report was meant to assist the NRC staff in considering regulations for choosing nuclear power plant locations, but it has been regularly misinterpreted and misused as an estimate of accident consequences. Since those early studies, information from both NRC and cooperative foreign research has greatly increased our understanding of the timing and magnitude of possible radioactive releases from potential accidents at nuclear power plants.*

The NRC established a research project in 2006 to update its assessment of severe reactor accident scenarios and their potential consequences to human health. This research project, titled "State-of-the-Art Reactor Consequence Analyses (SOARCA)," was designed to develop best estimates of the public health effects that might result from a radiological release during a nuclear power plant accident. The SOARCA project used state-of-the-art computer codes to calculate accident progression and offsite consequences for important scenarios at two plants, Peach Bottom, a boiling-water reactor (BWR), and Surry, a pressurized-water reactor (PWR). These codes have been continuously updated to incorporate decades of experimental research. The SOARCA project had cooperation from the licensees of these plants to model them in great detail as they exist in their current state and include operator action timelines based on plant-specific procedures. The project also modeled the use of additional equipment and strategies required by the NRC following the terrorist attacks of September 11, 2001, to further improve each plant's capability to mitigate events involving a loss of large areas of the plant caused by fire and explosions.

SOARCA results show that when operators are successful in using available onsite equipment during the accidents analyzed in SOARCA, they can either (a) prevent the reactor from melting or (b) delay or reduce releases of radioactive material to the environment. Even if operators are unsuccessful in stopping the accident, SOARCA shows that the accidents progress more slowly and release much smaller amounts of radioactive material than calculated in the 1982 Siting Study or CRAC 2 Study. Therefore, public health consequences from severe nuclear reactor accident scenarios are smaller than previously calculated. The delayed releases calculated *provide more time for emergency response actions, such as evacuating or sheltering. All modeled scenarios in SOARCA showed essentially zero early fatalities. In contrast, the 1982 Siting Study calculated 92 mean early fatalities for Peach Bottom, 45 for Surry, and 6.5*[1] *(not 18,000)*[2] *for STP conditional on the occurrence of a hypothetical large source term being released. In addition, in SOARCA, the calculated individual long-term risks of dying from cancer from exposure to radiation from these accidents are very small—millions of times lower than the general risk of dying from cancer in the U.S. from all causes.*

Because STP and the Surry plant studied in SOARCA are both Westinghouse-designed PWRs with large dry containments, the insights gained from the SOARCA project regarding accident progression and offsite health consequences can generally be applied to the STP site.

More information regarding the SOARCA project is available on NRC's Web site at http://www.nrc.gov/about-nrc/regulatory/research/soar.html.

A.1.6 Terrestrial or Aquatic Ecology

The original sources for the comments in this category can be found at the back of the Scoping Summary Report and are labeled with the following identifiers: 18-1, 20-3, 44-2, and 45-7. These comments are extracted from the original sources.

<u>Comment 18-1</u>: I want to touch on two aspects of the review. One is going to be the environmental aspect. It's very important when you talk about Matagorda County—and I'll do just a little bit of a commercial—we have a very, very sensitive area in that we have the freshwater from our Colorado River, two bays, estuaries, as well as the Gulf of Mexico. We are the North American Christmas bird count winner about [11] out of the last [12] years. It was foggy one morning, and we missed some of those birds. But, as you see that as we've got such a great ecological area here the whole time Units 1 and 2 have been operating. So, we're very, very proud of the fact that the [STPNOC], with Units 1 and 2, continues to operate in a strong fashion while our environment is protected.

<u>Comment 20-3</u>: What should you focus on? Obviously, our environmental concerns are a huge part of this. I'm [with] the Convention and Visitors Bureau, and one of our main focuses is bringing tourists down to Matagorda County to see what we have to offer. Good thing one of our sights to see is STP, as well as all around STP we have tons of fishing, birding, we have farm lands and everything else, and from what I've seen, there have been no concerns with those at all, as I grew up fishing right below STP on the Colorado River. And, I would like to thank STP for providing that to me, providing the safe waters and the safe grounds for me to do that on.

<u>Comment 44-2</u>: In addition, the existing South Texas units need to be evaluated to see if they will need to be modified to meet the newly proposed cooling water requirements that the [EPA] announced this week.

<u>Comment 45-7</u>: We are concerned about increasing tritium levels in wells [on site] and in the Colorado River. Extensive testing should occur for all organisms in the region, and exposure of whooping cranes to tritium and other radionuclides should be examined since they are an endangered species and their winter grounds are only 35 miles from the STP site.

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[1] The 1982 Siting Study calculated 5.2 mean early fatalities for STP for the SST1 source term. This value is based upon a standard 1,120 MWe PWR. When corrected for the actual electrical output (1410 MWe), the result is 6.5 mean early fatalities.
[2] The 1982 Siting Study calculated 18,000 early fatalities as the 99th percentile value conditional upon the SST1 source term release, assuming New York City meteorology and Indian Point population and wind rose as well as no evacuation. This was included as a sensitivity to show the effect of evacuation distance on early fatalities and was not meant to be a realistic estimate of the offsite health consequences of a severe nuclear reactor accident.

Response:

These comments provided input (or data) for the staff's environmental analysis of the ecology impacts of STP. The staff discusses these impacts in Sections 2.2.6, 2.2.7, 4.5, 4.6, 4.8, 8.1.4, 8.1.5, 8.2.4, 8.2.5, 8.3.4, 8.3.5, 8.4.4, 8.4.5, 8.5.3, 8.7.4, and 8.7.5 of this SEIS.

A.1.7 Uranium Fuel Cycle and Waste Management

The original sources for the comments in this category can be found at the back of the Scoping Summary Report and are labeled with the following identifiers: 29-5, 32-4, 33-2, 34-1, 36-2, 37-4, 39-5, 43-2, 45-5, 46-2, 47-3, 49-3, 51-4, 53-4, 54-4, 55-4, 59-4, 61-4, 62-5, 63-3, 64-2, 69-4, 71-3, 75-3, 77-3, 79-3, 80-5. These comments are extracted from the original sources. In summary, these comments express concerns about transportation of radioactive materials, long-term stewardship of nuclear waste, and uranium mining.

Comment 29-5: Whose backyard is the waste being transported through? [In] whose backyard is the waste being dumped?

Comment 32-4: Lastly, there is no way this can be justified as a result of the lack of safe storage for thousands and thousands of years of the nuclear waste. Please reject the renewal applications. The danger to our citizens is too great.

Comment 33-2: Uranium mining is a health issue. Nuclear waste remains a serious threat to future generations as well as the current population.

Comment 34-1: Please do not approve the licensing. Nuclear waste is too dangerous.

Comment 36-2: I also know, from following WCS in Andrews, Texas, that there is no safe disposal for LLRW [low-level radioactive waste], and still no safe disposal for the high-level waste fuel rods such as are melting in Japan today.

Comment 37-4: There is no adequate solution for radioactive waste, so it makes sense to stop generating more.

Comment 39-5: There is no adequate solution for radioactive waste, so it makes sense to stop generating more.

Comment 43-2: As we have seen in the last few weeks, nuclear energy is not as safe as made out to be, and there are too many problems with disposal that have not been solved.

Comment 45-5: It is time to stop generating more radioactive waste since there is no safe storage and disposal solution, even after attempts have been made for some [60] years. Relicensing would the creation of waste. There may not be enough room for even the so-called [LLRW] at the planned West Texas radioactive waste dump, since there is an attempt to allow Out of Compact waste[,] and the volume and curies limits may be reached long before all STP waste could be shipped. There is still no "high-level" repository for spent fuel rods.

Comment 46-2: I'm opposed to their continuation for all the usual reasons that any kind of accident and even a Category 4 or 5 hurricane-induced storm surge could remove external supports such as cooling ponds or water access (and who knows what hammering debris-laden waves on top of the storm surge could do), plus disposal of nuclear waste—no human technology is foolproof and totally isolated for thousands of years!

Comment 47-3: At the most fundamental level[,] we cannot justify generating more radioactive waste when there is no adequate solution for dealing with it.

Comment 49-3: Every nuclear power plant is a potential disaster waiting to happen[,] and every nuclear power plant is a long-term disaster by the toxic waste they generate.

Comment 51-4: There is no adequate solution for radioactive waste, so it makes no sense to continue generating more.

Comment 53-4: There is no adequate solution for radioactive waste[,] so it makes no sense to continue generating more.

Comment 54-4: There is no adequate solution for radioactive waste, so it makes no sense to continue generating more.

Comment 55-4: [T]here is no adequate solution for radioactive waste, so it makes no sense to continue generating more.

Comment 59-4: Until there is an adequate solution for radioactive waste, we should not continue to generate more.

Comment 61-4: There is no adequate solution for radioactive waste, so it makes no sense to continue generating more.

Comment 62-5: There is no adequate solution for radioactive waste, so it makes no sense to continue generating more.

Comment 63-3: What about waste? Radioactive waste is terrible to contend with.

Comment 64-2: Too much water is wasted! Way too much [water] daily to cool it!

These […] dangerous radioactive waste! Is not safe. What are you going to do with the radioactive waste?

Comment 69-4: There is no adequate solution for radioactive waste, so it makes no sense to continue generating more.

Comment 71-3: There is no solution for the disposal of radioactive waste, so it makes no sense to continue generating more.

Comment 75-3: There is no adequate solution for radioactive waste, so it makes no sense to continue generating more.

Comment 77-3: Radioactive waste is and will continue to be a big problem[,] so why would we go in that direction. Leadership and creating thinking is needed at this moment in history. Please be part of solving problems and not adding new problems.

Comment 79-3: There is no adequate solution for radioactive waste, so it makes no sense to continue generating more.

Comment 80-5: There is no adequate solution for radioactive waste, so it makes no sense to continue generating more.

Response: *These comments raise concerns about the uranium fuel cycle and waste management. The staff addresses the environmental impacts of the uranium fuel cycle and waste management in Chapter 6 of this SEIS.*

APPENDIX B
NATIONAL ENVIRONMENTAL POLICY ACT ISSUES FOR LICENSE RENEWAL OF NUCLEAR POWER PLANTS

NATIONAL ENVIRONMENTAL POLICY ACT ISSUES FOR LICENSE RENEWAL OF NUCLEAR POWER PLANTS

The table in this appendix summarizes the National Environmental Policy Act (NEPA) issues for license renewal of nuclear power plants identified in Table B–1 in Appendix B, Subpart A, to Title 10 Part 51 of the *Code of Federal Regulations* (10 CFR Part 51). Data supporting this table are contained in NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. Throughout this supplemental environmental impact statement (SEIS), "generic" issues are also referred to as Category 1 issues, and "site-specific" issues are also referred to as Category 2 issues.

Table B–1. Summary of Issues and Findings

Issue	Type of Issue	Finding
Surface Water Quality, Hydrology, and Use		
Impacts of refurbishment on surface water quality	Generic	SMALL. Impacts are expected to be negligible during refurbishment because best management practices are expected to be employed to control soil erosion and spills.
Impacts of refurbishment on surface water use	Generic	SMALL. Water use during refurbishment will not increase appreciably or will be reduced during plant outage.
Altered current patterns at intake and discharge structures	Generic	SMALL. Altered current patterns have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.
Altered salinity gradients	Generic	SMALL. Salinity gradients have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.
Altered thermal stratification of lakes	Generic	SMALL. Generally, lake stratification has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
Temperature effects on sediment transport capacity	Generic	SMALL. These effects have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.
Scouring caused by discharged cooling water	Generic	SMALL. Scouring has not been found to be a problem at most operating nuclear power plants and has caused only localized effects at a few plants. It is not expected to be a problem during the license renewal term.
Eutrophication	Generic	SMALL. Eutrophication has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
Discharge of chlorine or other biocides	Generic	SMALL. Effects are not a concern among regulatory and resource agencies, and are not expected to be a problem during the license renewal term.

Issue	Type of Issue	Finding
Discharge of sanitary wastes and minor chemical spills	Generic	SMALL. Effects are readily controlled through National Pollutant Discharge Elimination System (NPDES) permit and periodic modifications, if needed, and are not expected to be a problem during the license renewal term.
Discharge of other metals in wastewater	Generic	SMALL. These discharges have not been found to be a problem at operating nuclear power plants with cooling-tower-based heat-dissipation systems and have been satisfactorily mitigated at other plants. They are not expected to be a problem during the license renewal term.
Water use conflicts (plants with once-through cooling systems)	Generic	SMALL. These conflicts have not been found to be a problem at operating nuclear power plants with once-through heat-dissipation systems.
Water use conflicts (plants with cooling ponds or cooling towers using makeup water from a small river with low flow)	Site-specific	SMALL OR MODERATE. The issue has been a concern at nuclear power plants with cooling ponds and at plants with cooling towers. Impacts on instream and riparian communities near these plants could be of moderate significance in some situations. See §51.53(c)(3)(ii)(A).
Aquatic Ecology		
Refurbishment	Generic	SMALL. During plant shutdown and refurbishment, there will be negligible effects on aquatic biota because of a reduction of entrainment and impingement of organisms or a reduced release of chemicals.
Accumulation of contaminants in sediments or biota	Generic	SMALL. Accumulation of contaminants has been a concern at a few nuclear power plants but has been satisfactorily mitigated by replacing copper alloy condenser tubes with those of another metal. It is not expected to be a problem during the license renewal term.
Entrainment of phytoplankton and zooplankton	Generic	SMALL. Entrainment of phytoplankton and zooplankton has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
Cold shock	Generic	SMALL. Cold shock has been satisfactorily mitigated at operating nuclear plants with once-through cooling systems, has not endangered fish populations, or been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds, and is not expected to be a problem during the license renewal term.
Thermal plume barrier to migrating fish	Generic	SMALL. Thermal plumes have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.
Distribution of aquatic organisms	Generic	SMALL. Thermal discharge may have localized effects but is not expected to affect the larger geographical distribution of aquatic organisms.
Premature emergence of aquatic insects	Generic	SMALL. Premature emergence has been found to be a localized effect at some operating nuclear power plants but has not been a problem and is not expected to be a problem during the license renewal term.

Issue	Type of Issue	Finding
Gas supersaturation (gas bubble disease)	Generic	SMALL. Gas supersaturation was a concern at a small number of operating nuclear power plants with once-through cooling systems but has been satisfactorily mitigated. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.
Low dissolved oxygen in the discharge	Generic	SMALL. Low dissolved oxygen has been a concern at one nuclear power plant with a once-through cooling system but has been effectively mitigated. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.
Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	Generic	SMALL. These types of losses have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.
Stimulation of nuisance organisms (e.g.,shipworms)	Generic	SMALL. Stimulation of nuisance organisms has been satisfactorily mitigated at the single nuclear power plant with a once-through cooling system where previously it was a problem. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.
Aquatic Ecology (for Plants with Once-Through and Cooling-Pond Heat-Dissipation Systems)		
Entrainment of fish and shellfish in early life stages	Site-specific	SMALL, MODERATE, OR LARGE. The impacts of entrainment are small at many plants but may be moderate or even large at a few plants with once-through and cooling-pond cooling systems. Further, ongoing efforts in the vicinity of these plants to restore fish populations may increase the numbers of fish susceptible to intake effects during the license renewal period, such that entrainment studies conducted in support of the original license may no longer be valid. See §51.53(c)(3)(ii)(B).
Impingement of fish and shellfish	Site-specific	SMALL, MODERATE, OR LARGE. The impacts of impingement are small at many plants but may be moderate or even large at a few plants with once-through and cooling-pond cooling systems. See §51.53(c)(3)(ii)(B).
Heat shock	Site-specific	SMALL, MODERATE, OR LARGE. Because of continuing concerns about heat shock and the possible need to modify thermal discharges in response to changing environmental conditions, the impacts may be of moderate or large significance at some plants. See §51.53(c)(3)(ii)(B).
Aquatic Ecology (for Plants with Cooling-Tower-Based Heat-Dissipation Systems)		
Entrainment of fish and shellfish in early life stages	Generic	SMALL. Entrainment of fish has not been found to be a problem at operating nuclear power plants with this type of cooling system and is not expected to be a problem during the license renewal term.
Impingement of fish and shellfish	Generic	SMALL. The impingement has not been found to be a problem at operating nuclear power plants with this type of cooling system and is

Issue	Type of Issue	Finding
		not expected to be a problem during the license renewal term.
Heat shock	Generic	SMALL. Heat shock has not been found to be a problem at operating nuclear power plants with this type of cooling system and is not expected to be a problem during the license renewal term.
Groundwater Use and Quality		
Impacts of refurbishment on groundwater use and quality	Generic	SMALL. Extensive dewatering during the original construction on some sites will not be repeated during refurbishment on any sites. Any plant wastes produced during refurbishment will be handled in the same manner as in current operating practices and are not expected to be a problem during the license renewal term.
Groundwater use conflicts (potable and service water; plants that use <100 gallons per minute (gpm)	Generic	SMALL. Plants using less than 100 gpm are not expected to cause any groundwater use conflicts.
Groundwater use conflicts (potable and service water, and dewatering plants that use >100 gpm	Site-specific	SMALL, MODERATE, OR LARGE. Plants that use more than 100 gpm may cause groundwater use conflicts with nearby groundwater users. See §51.53(c)(3)(ii)(C).
Groundwater use conflicts (plants using cooling towers withdrawing makeup water from a small river)	Site-specific	SMALL, MODERATE, OR LARGE. Water use conflicts may result from surface water withdrawals from small water bodies during low flow conditions which may affect aquifer recharge, especially if other groundwater or upstream surface water users come online before the time of license renewal. See §51.53(c)(3)(ii)(A).
Groundwater use conflicts (Ranney wells)	Site-specific	SMALL, MODERATE, OR LARGE. Ranney wells can result in potential groundwater depression beyond the site boundary. Impacts of large groundwater withdrawal for cooling tower makeup at nuclear power plants using Ranney wells must be evaluated at the time of application for license renewal. See §51.53(c)(3)(ii)(C).
Groundwater quality degradation (Ranney wells)	Generic	SMALL. Groundwater quality at river sites may be degraded by induced infiltration of poor-quality river water into an aquifer that supplies large quantities of reactor cooling water. However, the lower quality infiltrating water would not preclude the current uses of groundwater and is not expected to be a problem during the license renewal term.
Groundwater quality degradation (saltwater intrusion)	Generic	SMALL. Nuclear power plants do not contribute significantly to saltwater intrusion.
Groundwater quality degradation (cooling ponds in salt marshes)	Generic	SMALL. Sites with closed-cycle cooling ponds may degrade groundwater quality. Because water in salt marshes is brackish, this is not a concern for plants located in salt marshes.

Issue	Type of Issue	Finding
Groundwater quality degradation (cooling ponds at inland sites)	Site-specific	SMALL, MODERATE, OR LARGE. Sites with closed-cycle cooling ponds may degrade groundwater quality. For plants located inland, the quality of the groundwater in the vicinity of the ponds must be shown to be adequate to allow continuation of current uses. See §51.53(c)(3)(ii)(D).
Terrestrial Ecology		
Refurbishment impacts	Site-specific	SMALL, MODERATE, OR LARGE. Refurbishment impacts are insignificant if no loss of important plant and animal habitat occurs. However, it cannot be known whether important plant and animal communities may be affected until the specific proposal is presented with the license renewal application. See §51.53(c)(3)(ii)(E).
Cooling tower impacts on crops and ornamental vegetation	Generic	SMALL. Impacts from salt drift, icing, fogging, or increased humidity associated with cooling tower operation have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.
Cooling tower impacts on native plants	Generic	SMALL. Impacts from salt drift, icing, fogging, or increased humidity associated with cooling tower operation have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.
Bird collisions with cooling towers	Generic	SMALL. These collisions have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.
Cooling pond impacts on terrestrial resources	Generic	SMALL. Impacts of cooling ponds on terrestrial ecological resources are considered to be of small significance at all sites.
Powerline right-of-way (ROW) management (cutting and herbicide application)	Generic	SMALL. The impacts of ROW maintenance on wildlife are expected to be of small significance at all sites.
Bird collisions with powerlines	Generic	SMALL. Impacts are expected to be of small significance at all sites.
Impacts of electromagnetic fields on flora and fauna	Generic	SMALL. No significant impacts of electromagnetic fields on terrestrial flora and fauna have been identified. Such effects are not expected to be a problem during the license renewal term.
Floodplains and wetland on powerline ROW	Generic	SMALL. Periodic vegetation control is necessary in forested wetlands underneath powerlines and can be achieved with minimal damage to the wetland. No significant impact is expected at any nuclear power plant during the license renewal term.
Threatened and Endangered Species		
Threatened or endangered species	Site-specific	SMALL, MODERATE, OR LARGE. Generally, plant refurbishment and continued operation are not expected to adversely affect threatened or endangered species. However, consultation with appropriate agencies would be needed at the time of license renewal

Issue	Type of Issue	Finding
		to determine whether or not threatened or endangered species are present and whether or not they would be adversely affected. See §51.53(c)(3)(ii)(E).
Air quality		
Air quality during refurbishment (non-attainment and maintenance areas)	Site-specific	SMALL, MODERATE, OR LARGE. Air quality impacts from plant refurbishment associated with license renewal are expected to be small. However, vehicle exhaust emissions could be cause for concern at locations in or near non-attainment or maintenance areas. The significance of the potential impact cannot be determined without considering the compliance status of each site and the number of workers expected to be employed during the outage. See §51.53(c)(3)(ii)(F).
Air quality effects of transmission lines	Generic	SMALL. Production of ozone and oxides of nitrogen is insignificant and does not contribute measurably to ambient levels of these gases.
Land Use		
Onsite land use	Generic	SMALL. Projected onsite land use changes required during refurbishment and the renewal period would be a small fraction of any nuclear power plant site and would involve land that is controlled by the applicant.
Powerline ROW	Generic	SMALL. Ongoing use of powerline ROWs would continue with no change in restrictions. The effects of these restrictions are of small significance.
Human Health		
Radiation exposures to the public during refurbishment	Generic	SMALL. During refurbishment, the gaseous effluents would result in doses that are similar to those from current operation. Applicable regulatory dose limits to the public are not expected to be exceeded.
Occupational radiation exposures during refurbishment	Generic	SMALL. Occupational doses from refurbishment are expected to be within the range of annual average collective doses experienced for pressurized-water reactors and boiling-water reactors. Occupational mortality risk from all causes including radiation is in the mid-range for industrial settings.
Microbiological organisms (occupational health)	Generic	SMALL. Occupational health impacts are expected to be controlled by continued application of accepted industrial hygiene practices to minimize exposure to workers.
Microbiological organisms (public health) (plants using lakes or canals, or cooling towers or cooling ponds that discharge to a small river)	Site-specific	SMALL, MODERATE, OR LARGE. These organisms are not expected to be a problem at most operating plants except possibly at plants using cooling ponds, lakes, or canals that discharge to small rivers. Without site-specific data, it is not possible to predict the effects generically. See §51.53(c)(3)(ii)(G).

Issue	Type of Issue	Finding
Noise	Generic	SMALL. Noise has not been found to be a problem at operating plants and is not expected to be a problem at any plant during the license renewal term.
Electromagnetic fields—acute effects (electric shock)	Site-specific	SMALL, MODERATE, OR LARGE. Electrical shock resulting from direct access to energized conductors or from induced charges in metallic structures have not been found to be a problem at most operating plants and generally are not expected to be a problem during the license renewal term. However, site-specific review is required to determine the significance of the electric shock potential at the site. See §51.53(c)(3)(ii)(H).
Electromagnetic fields—chronic effects	Uncategorized	UNCERTAIN. Biological and physical studies of 60-hertz electromagnetic fields have not found consistent evidence linking harmful effects with field exposures. However, research is continuing in this area and a consensus scientific view has not been reached.
Radiation exposures to public (license renewal term)	Generic	SMALL. Radiation doses to the public will continue at current levels associated with normal operations.
Occupational radiation exposures (license renewal term)	Generic	SMALL. Projected maximum occupational doses during the license renewal term are within the range of doses experienced during normal operations and normal maintenance outages, and would be well below regulatory limits.
Socioeconomic Impacts		
Housing impacts	Site-specific	SMALL, MODERATE, OR LARGE. Housing impacts are expected to be of small significance at plants located in a medium or high population area and not in an area where growth control measures that limit housing development are in effect. Moderate or large housing impacts of the workforce associated with refurbishment may be associated with plants located in sparsely populated areas or in areas with growth control measures that limit housing development. See §51.53(c)(3)(ii)(I).
Public services: public safety, social services, and tourism and recreation	Generic	SMALL. Impacts to public safety, social services, and tourism and recreation are expected to be of small significance at all sites.
Public services: public utilities	Site-specific	SMALL OR MODERATE. An increased problem with water shortages at some sites may lead to impacts of moderate significance on public water supply availability. See §51.53(c)(3)(ii)(I).
Public services: education (refurbishment)	Site-specific	SMALL, MODERATE, OR LARGE. Most sites would experience impacts of small significance but larger impacts are possible depending on site- and project-specific factors. See §51.53(c)(3)(ii)(I).
Public services: education (license renewal term)	Generic	SMALL. Only impacts of small significance are expected.
Offsite land use (refurbishment)	Site-specific	SMALL OR MODERATE. Impacts may be of moderate significance at plants in low population areas. See §51.53(c)(3)(ii)(I).

Issue	Type of Issue	Finding
Offsite land use (license renewal term)	Site-specific	SMALL, MODERATE, OR LARGE. Significant changes in land use may be associated with population and tax revenue changes resulting from license renewal. See §51.53(c)(3)(ii)(I).
Public services: transportation	Site-specific	SMALL, MODERATE, OR LARGE. Transportation impacts (level of service) of highway traffic generated during plant refurbishment and during the term of the renewed license are generally expected to be of small significance. However, the increase in traffic associated with the additional workers and the local road and traffic control conditions may lead to impacts of moderate or large significance at some sites. See §51.53(c)(3)(ii)(J).
Historic and archaeological resources	Site-specific	SMALL, MODERATE, OR LARGE. Generally, plant refurbishment and continued operation are expected to have no more than small adverse impacts on historic and archaeological resources. However, the National Historic Preservation Act requires the Federal agency to consult with the State Historic Preservation Officer to determine whether or not there are properties present that require protection. See §51.53(c)(3)(ii)(K).
Aesthetic impacts (refurbishment)	Generic	SMALL. No significant impacts are expected during refurbishment.
Aesthetic impacts (license renewal term)	Generic	SMALL. No significant impacts are expected during the license renewal term.
Aesthetic impacts of transmission lines (license renewal term)	Generic	SMALL. No significant impacts are expected during the license renewal term.
Postulated Accidents		
Design basis accidents	Generic	SMALL. The staff has concluded that the environmental impacts of design-basis accidents are of small significance for all plants.
Severe accidents	Site-specific	SMALL. The probability weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives. See §51.53(c)(3)(ii)(L).
Uranium Fuel Cycle and Waste Management		
Offsite radiological impacts (individual effects from other than the disposal of spent fuel and high-level waste)	Generic	SMALL. Offsite impacts of the uranium fuel cycle have been considered by the Commission in Table S-3 of this part. Based on information in the GEIS, impacts on individuals from radioactive gaseous and liquid releases including radon-222 and technetium-99 are small.
Offsite radiological impacts (collective effects)	Generic	The 100-year environmental dose commitment to the U.S. population from the fuel cycle, high-level waste, and spent fuel disposal excepted, is calculated to be about 14,800 person rem, or 12 cancer fatalities, for each additional 20-year power reactor operating term. Much of this, especially the contribution of radon releases from mines and tailing piles, consists of tiny doses summed over large

Issue	Type of Issue	Finding
		populations. This same dose calculation can theoretically be extended to include many tiny doses over additional thousands of years as well as doses outside the United States. The result of such a calculation would be thousands of cancer fatalities from the fuel cycle, but this result assumes that even tiny doses have some statistical adverse health effect which will not ever be mitigated (for example no cancer cure in the next thousand years), and that these doses projected over thousands of years are meaningful; however, these assumptions are questionable. In particular, science cannot rule out the possibility that there will be no cancer fatalities from these tiny doses. For perspective, the doses are very small fractions of regulatory limits, and even smaller fractions of natural background exposure to the same populations. Nevertheless, despite all the uncertainty, some judgment as to the regulatory NEPA implications of these matters should be made and it makes no sense to repeat the same judgment in every case. Even taking the uncertainties into account, the Commission concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the collective effects of the fuel cycle, this issue is considered Category 1 (Generic).
Offsite radiological impacts (spent fuel and high-level waste disposal)	Generic	Chapter 6 of this SEIS provides further discussion of these impacts.
Nonradiological impacts of the uranium fuel cycle	Generic	SMALL. The nonradiological impacts of the uranium fuel cycle resulting from the renewal of an operating license for any plant are found to be small.
Low-level waste storage and disposal	Generic	SMALL. The comprehensive regulatory controls that are in place and the low public doses being achieved at reactors ensure that the radiological impacts to the environment will remain small during the term of a renewed license. The maximum additional onsite land that may be required for low-level waste storage during the term of a renewed license and associated impacts will be small. Nonradiological impacts on air and water will be negligible. The radiological and nonradiological environmental impacts of long-term disposal of low-level waste from any individual plant at licensed sites are small. In addition, the Commission concludes that there is reasonable assurance that sufficient low-level waste disposal capacity will be made available when needed for facilities to be decommissioned consistent with NRC decommissioning requirements.
Mixed waste storage and disposal	Generic	SMALL. The comprehensive regulatory controls and the facilities and procedures that are in place ensure proper handling and storage, as well as negligible doses and exposure to toxic materials for the public and the environment at all plants. License renewal will not increase the small, continuing risk to human health and the environment posed by mixed waste at all plants. The radiological and nonradiological environmental impacts of long-term disposal of mixed waste from any individual plant at licensed sites are small. In addition, the

Issue	Type of Issue	Finding
		Commission concludes that there is reasonable assurance that sufficient mixed waste disposal capacity will be made available when needed for facilities to be decommissioned consistent with NRC decommissioning requirements.
Onsite spent fuel	Generic	SMALL. The expected increase in the volume of spent fuel from an additional 20 years of operation can be safely accommodated on site with small environmental effects through dry or pool storage at all plants if a permanent repository or monitored retrievable storage is not available.
Nonradiological waste	Generic	SMALL. No changes to generating systems are anticipated for license renewal. Facilities and procedures are in place to ensure continued proper handling and disposal at all plants.
Transportation	Generic	SMALL. The impacts of transporting spent fuel enriched up to 5 percent uranium-235 with average burnup for the peak rod to current levels approved by NRC up to 62,000 megawatt days per metric-ton uranium and the cumulative impacts of transporting high-level waste to a single repository, such as Yucca Mountain, Nevada are found to be consistent with the impact values contained in 10 CFR 51.52(c), Summary Table S–4, "Environmental Impact of Transportation of Fuel and Waste to and from One Light-Water-Cooled Nuclear Power Reactor." If fuel enrichment or burnup conditions are not met, the applicant must submit an assessment of the implications for the environmental impact values reported in §51.52.
Decommissioning		
Radiation doses	Generic	SMALL. Doses to the public will be well below applicable regulatory standards regardless of which decommissioning method is used. Occupational doses would increase no more than 1 man-rem caused by buildup of long-lived radionuclides during the license renewal term.
Waste management	Generic	SMALL. Decommissioning at the end of a 20-year license renewal period would generate no more solid wastes than at the end of the current license term. No increase in the quantities of Class C or greater than Class C wastes would be expected.
Air quality	Generic	SMALL. Air quality impacts of decommissioning are expected to be negligible either at the end of the current operating term or at the end of the license renewal term.
Water quality	Generic	SMALL. The potential for significant water quality impacts from erosion or spills is no greater whether decommissioning occurs after a 20-year license renewal period or after the original 40-year operation period, and measures are readily available to avoid such impacts.
Ecological resources	Generic	SMALL. Decommissioning after either the initial operating period or after a 20-year license renewal period is not expected to have any direct ecological impacts.
Socioeconomic impacts	Generic	SMALL. Decommissioning would have some short-term socioeconomic impacts. The impacts would not be increased by delaying decommissioning until the end of a 20-year relicense period, but they might be decreased by population and economic growth.

Issue	Type of Issue	Finding
Environmental Justice		
Environmental justice	Uncategorized	NONE. The need for and the content of an analysis of environmental justice will be addressed in plant-specific reviews.

Table source: Table B–1 in Appendix B, Subpart A, to 10 CFR Part 51

APPENDIX C
APPLICABLE REGULATIONS, LAWS, AND AGREEMENTS

APPLICABLE REGULATIONS, LAWS, AND AGREEMENTS

The Atomic Energy Act (AEA) authorizes the U.S. Nuclear Regulatory Commission (NRC) to enter into agreement with any state to assume regulatory authority for certain activities. For example, in accordance with Section 274 of the AEA, as amended, beginning on March 1, 1963, the State of Texas assumed regulatory responsibility over the following nuclear material usages:

- byproduct materials as defined in Section 11e.(1) of the Act,
- byproduct materials as defined in Section 11e.(2) of the Act,
- source materials, and
- special nuclear materials in quantities not sufficient to form a critical mass.

The Texas Department of State Health Services–Radiation Program administers the Texas Agreement State Program.

In addition to implementing some Federal programs, state legislatures develop state laws, which are subject to applicable Federal statutes and regulations. State laws supplement, as well as implement, Federal laws for protection of air, water quality, and groundwater. State legislation may address solid waste management programs, locally rare or endangered species, and historic and cultural resources.

The Clean Water Act (CWA) allows for primary enforcement and administration through state agencies, provided the state program is at least as stringent as the Federal program. The state program must conform to the CWA and to the delegation of authority for the Federal National Pollutant Discharge Elimination System (NPDES) Program from the U.S. Environmental Protection Agency (EPA) to the state. In accordance with the CWA, for surface water, the primary mechanism to control water pollution is the requirement that directs dischargers (e.g., point source dischargers) to obtain an NPDES permit or, in the case of states where the authority has been delegated from EPA, a State Pollutant Discharge Elimination System (SPDES) permit.

C.1 Federal and State Environmental Requirements

Certain environmental requirements may have been delegated to state authorities for implementation, enforcement, or oversight by the applicable Federal agencies in exercising the agencies' regulations. Table C–1 provides a list of STP licenses and permits needed for compliance with the major requirements of the Texas environmental laws that affect the license renewal of South Texas Project (STP). These licenses and permits are addressed in this supplemental environmental impact statement (SEIS), pursuant to the NRC ESRP, Section 1.3, "Compliance and Consultations."

Table C–1. Licenses and Permits.

Permit	Number	Dates	Responsible Agency
License to operate STP, Unit 1	NPF-76	Issued: 3/22/1988 Expires: 8/20/2027	NRC
License to operate STP, Unit 2	NPF-80	Issued: 12/16/1988 Expires: 12/15/2028	NRC

Permit	Number	Dates	Responsible Agency
Hazardous materials shipments registration	0622110 550 067S	Issued: 6/29/2011 Expired: 6/30/2012	U.S. Department of Transportation
Permits for maintenance, dredging (barge slip)	10570	Issued: 11/4/2004 Expires: 12/31/2014	U.S. Army Corps of Engineers (USACE)
Permits for maintenance, dredging (intake)	SWG-1992-02707	Issued: 7/21/2009 Expires: 12/31/2019	USACE
Texas Pollutant Discharge Elimination System Permit	WQ0001908000	Issued: 4/5/2012 Expires: 12/1/2014	TCEQ
Air Permit (auxiliary boilers)	7410	Issued: 12/23/2004 Expires: 12/23/2014	TCEQ
Air Permit (emission sources)	0801	Issued: 1/18/2011 Expires: 1/18/2016	TCEQ
Registration of Industrial and Hazardous Waste	30651, EPA ID No. TXD020810503	Issued: 8/16/1976 Expires: Not applicable	TCEQ
Potable Water System	Texas Commission on Environmental Quality (TCEQ) ID No. 1610103/1610051	Issued: Not applicable Expires: Not applicable	TCEQ

Source: STP License Renewal Application (STPNOC 2010).

C.2 References

Several operating permit applications may be prepared and submitted. Regulatory approval or permits or both would be received prior to license renewal approval by the NRC. As a convenient source of references of environmental requirements, Table C–2 lists representative Federal, state, and local approvals by the responsible agencies applicable to license renewal.

Table C–2. Federal, State, and Local Laws and Other Requirements.
STP is subject to other requirements regarding various aspects of their environmental program. Representatives of those requirements are briefly described below.

License, Permit, or Other Required Approval (or Submittal)	Responsible Agency	Authority	Relevance
Air Quality Protection			
Required for sources that are not exempt and are major sources, affected sources subject to the Acid Rain Program, sources subject to new source performance standards, or sources subject to National Emission Standards for Hazardous Air Pollutants	U.S. EPA or TCEQ	Texas Air Pollution Control Regulation—TX Administrative Code, Title 30	Nuclear Power plants are subject to 40 CFR Part 61, Subpart H, “National Emissions Standards for Emissions of Radionuclides,” which is included in the terms and conditions of the Title V Operating Permit.

License, Permit, or Other Required Approval (or Submittal)	Responsible Agency	Authority	Relevance
Water Resources Protection			
NPDES Permit—Construction Site Stormwater—required before making point source discharges of storm water from a construction project that disturbs more than 2 ha (5 ac) of land	U.S. EPA or TCEQ	CWA (33 USC 1251 et seq.); 40 CFR Part 122	Any plant refurbishment involving construction of more than 2 ha (5 ac) of land would require a Stormwater Pollution Prevention Plan and Construction Site Storm Water Discharge Permit.
NPDES Permit—Industrial Facility Stormwater—required before making point source discharges of storm water from an industrial site	U.S. EPA or TCEQ	CWA (33 USC 1251 et seq.); 40 CFR Part 122	Stormwater would be discharged from the nuclear power plants during operations. Stormwater would discharge through existing outfalls covered by a permit.
NPDES Permit—Process Water Discharge—required before making point source discharges of industrial process wastewater	U.S. EPA or TCEQ	CWA (33 USC 1251 et seq.); 40 CFR Part 122	Processed industrial wastewater would be discharged through existing outfalls covered by the permit.
Spill Prevention Control and Countermeasures Plan—required for any facility that could discharge diesel fuel in harmful quantities into navigable waters or onto adjoining shorelines	U.S. EPA or TCEQ	CWA (33 USC 1251 et seq.); 40 CFR Part 112	A Spill Prevention Control and Countermeasures Plan is required at nuclear power plants storing large volumes of diesel fuel or other petroleum products or both.
CWA, Section 401, Water Quality Certification—required to be submitted to the agency responsible for issuing any Federal license or permit to conduct an activity that may result in a discharge of pollutants into waters of a state	U.S. EPA or TCEQ	CWA, Section 401 (33 USC 1341);	Certification for operation of a nuclear power plant may require a Federal license or permit (e.g., a CWA, Section 404, Permit or a CWA, Section 401, Water Quality Certification).
New Underground Storage Tanks System Registration—required within 30 days of bringing a new underground storage tank system into service	U.S. EPA or TCEQ	Resources Conservation and Recovery Act (RCRA), as amended, Subtitle I (42 USC 6991a-6991i); 40 CFR §280.22	This registration is required if new underground storage tank systems would be installed during refurbishment at a nuclear power plant.
Above Ground Storage Tank Permit—required to install, remove, repair, or alter any stationary tank for the storage of flammable or combustible liquids	Applicable State Fire Marshal		This permit is required if new above-ground diesel fuel storage tanks would be installed during refurbishment at a nuclear power plant. In accordance with STP ER, there is no refurbishment.
Waste Management & Pollution Prevention			
Registration and Hazardous Waste	U.S. EPA or	RCRA, as	Generators of hazardous waste

License, Permit, or Other Required Approval (or Submittal)	Responsible Agency	Authority	Relevance
Generator Identification Number—required before a person who generates over 100 kg (220 lb) per calendar month of hazardous waste ships the hazardous waste off site	TCEQ	amended (42 USC 6901 et seq.), Subtitle C	must notify EPA that the wastes exist and require management in compliance with RCRA.
Hazardous Waste Facility Permit—required if hazardous waste will undergo nonexempt treatment by the generator; be stored on site for longer than 90 days by the generator of 1,000 kg (2,205 lb) or more of hazardous waste per month; be stored on site for longer than 180 days by the generator of between 100 and 1,000 kg (220 and 2,205 lb) of hazardous waste per month; be disposed of on site; or be received from off site for treatment or disposal	U.S. EPA or TCEQ	RCRA, as amended (42 USC 6901 et seq.), Subtitle C	Hazardous wastes are usually not disposed of on site at nuclear power plants. Hazardous wastes generated on site are not generally stored for more than 90 days. However, should a nuclear power plant store wastes on site for greater than 90 days for characterization, profiling, or scheduling for treatment or disposal, a Hazardous Waste Facility Permit would be required.
Emergency Planning & Response			
List of Material Safety Data Sheets—submission required for hazardous chemicals (as defined in 29 CFR Part 1910) that are stored on site in excess of their threshold quantities	State and local emergency planning agencies (State Emergency Response Commission or SERC)	Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA), Section 311 (42 USC 11021); 40 CFR §370.20	Nuclear power plant operators are required to submit List of Material Safety Data Sheets to state and local emergency planning agencies.
Annual Hazardous Chemical Inventory Report—submission required when hazardous chemicals have been stored at a facility during the preceding year in amounts that exceed threshold quantities	State and local emergency response agencies (SERC); local fire department	EPCRA, Section 312 (42 USC 11022); 40 CFR §370.25	If hazardous chemicals have been stored at a nuclear power plant during the preceding year in amounts that exceed threshold quantities, plant operators would be required to submit an Annual Hazardous Chemical Inventory Report.
Notification of On-Site Storage of an Extremely Hazardous Substance—submission required within 60 days after onsite storage begins of an extremely hazardous substance in a quantity greater than the threshold planning quantity	State and local emergency response agencies (SERC)	EPCRA, Section 304 (42 USC 11004); 40 CFR §355.30	If an extremely hazardous substance stored at a nuclear power plant in a quantity greater than the threshold planning quantity, plant operators would prepare and submit the Notification of On-Site Storage of an Extremely Hazardous Substance.
Annual Toxics Release Inventory Report—required for facilities that have 10 or more full-time	U.S. EPA or TCEQ	EPCRA, Section 313 (42 USC 11023);	If required, nuclear power plant operators would prepare and submit a Toxics Release

License, Permit, or Other Required Approval (or Submittal)	Responsible Agency	Authority	Relevance
employees and are assigned certain standards		40 CFR Part 372	Inventory Report to EPA.
Industrial Classification codes.			
Transportation of Radioactive Wastes and Conversion Products Packaging, Labeling, and Routing Requirements for Radioactive Materials—required for packages containing radioactive materials that will be shipped by truck or rail	U.S. Department of Transportation	Hazardous Material Transportation Act (HMTA) (49 USC 1501 et seq.); AEA, as amended (42 USC 2011 et seq.); 49 CFR Parts 172, 173, 174, 177, and 397	When shipments of radioactive materials are made, nuclear power plant operators would comply with U.S. Department of Transportation packaging, labeling, and routing requirements.
Biotic Resource Protection			
Threatened and Endangered Species Consultation—required between the responsible Federal agencies and affected states to ensure that the project is unlikely to jeopardize the continued existence of any species listed at the Federal or state level as endangered or threatened or result in destruction of critical habitat of such species	U.S. Fish and Wildlife Service (FWS) and other applicable state agencies (listed in Appendix D of this SEIS)	Endangered Species Act of 1973, as amended (16 USC 1531 et seq.)	The NRC would consult with the FWS and state agencies regarding the impact of license renewal on threatened or endangered species or their critical habitat.
CWA, Section 404, (Dredge and Fill) Permit—required to place dredged or fill material into waters of the U.S., including areas designated as wetlands, unless such placement is exempt or authorized by a Nationwide permit or a regional permit (A notice must be filed if a Nationwide or regional permit applies.)	USACE	CWA (33 USC 1251 et seq.); 33 CFR Parts 323 and 330	Any dredging or placement of fill material into wetlands within the jurisdiction of the USACE at a nuclear power plant would require a Section 404 permit.
Cultural Resources Protection			
Archaeological and Historical Resources Consultation—required before a Federal agency approves a project in an area where archaeological or historic resources might be located	State Historic Preservation Officer or Tribal Historic Preservation Officer or both (listed in Appendix D of this SEIS)	National Historic Preservation Act of 1966, as amended (16 USC 470 et seq.); Archaeological and Historical Preservation Act of 1974 (16 USC 469-469c-2); Antiquities Act of	The NRC would consult with the State or Tribal Historic Preservation Officers or both and applicable Indian tribes (e.g., tribes that have historical ties to the land) regarding the impacts of license renewal and the results of archaeological and architectural surveys of nuclear power plant site.

License, Permit, or Other Required Approval (or Submittal)	Responsible Agency	Authority	Relevance
		1906 (16 USC 431 et seq.); Archaeological Resources Protection Act of 1979, as amended (16 USC 470aa-mm)	

APPENDIX D
CONSULTATION CORRESPONDENCE

CONSULTATION CORRESPONDENCE

D.1 Background

The Endangered Species Act of 1973, as amended; the Magnuson–Stevens Fisheries Management Act of 1996, as amended; and the National Historic Preservation Act of 1966 (NHPA) require that Federal agencies consult with applicable state and Federal agencies and groups before taking action that may affect threatened or endangered species, essential fish habitat, or historic and archaeological resources, respectively. Table D–1 contains a list of correspondence between the NRC and other agencies in compliance with these Federal acts.

Table D–1. Consultation Correspondence

Author	Recipient	Date of Letter/Email
NRC (B. Pham)	Advisory Council on Historic Preservation (D. Klima)	January 27, 2011 (ML110190591)
NRC (B. Pham)	Tribal Nation—Ysleta del Sur Pueblo (J. Loera)	February 9, 2011 (ML110190385)
NRC (B. Pham)	Tribal Nation—Alabama–Coushatta Tribe (O. Sylestine)	February 9, 2011 (ML110190418)
NRC (B. Pham)	Tribal Nation—Kiowa Tribe of Oklahoma (B. Horse)	February 9, 2011 (ML110390244)
NRC (B. Pham)	Tribal Nation—Comanche Nation (R. Toahty)	February 9, 2011 (ML110390265)
NRC (B. Pham)	U.S. Fish & Wildlife Service (M. Orms)	February 16, 2011 (ML110190429)
NRC (B. Pham)	National Marine Fisheries Service (D. Bernhart)	February 16, 2011 (ML110190434)
NRC (B. Pham)	Texas Parks & Wildlife Department (K. Boydston)	February 16, 2011 (ML110190571)
NRC (B. Pham)	State Historic Preservation Officer (M. Wolfe)	February 17, 2011 (ML110190549)
NRC (B. Pham)	Tribal Nation—Tonkawa Tribe of Oklahoma (A. Street)	February 17, 2011 (ML110390321)
NRC (B. Pham)	Tribal Nation—Apalachicola Band of Creek Indians (M. Blount)	February 17, 2011 (ML110390321)
NRC (B. Pham)	Tribal Nation—Lipan Apache Tribe of Texas (B. Barcena Jr.)	February 17, 2011 (ML110390321)
NRC (B. Pham)	Tribal Nation—Lipan Apache Band of Texas (D. Romero Jr.)	February 17, 2011 (ML110390321)
NRC (B. Pham)	Tribal Nation—Pamaque Clan of Coahuila Y Tejas (J. Mendoza)	February 17, 2011 (ML110390321)
NRC (B. Pham)	Tribal Nation—Tap Pilam-Coahuiltecan Nation (R. Hernandez)	February 17, 2011 (ML110390321)

Author	Recipient	Date of Letter/Email
NRC (B. Pham)	Tribal Nation—Kickapoo Traditional Council (J. Garza Jr.)	February 23, 2011 (ML110240161)
Tribal Nation—Tonkawa Tribe of Oklahoma (M. Allen)	NRC (Chief, Rules, Announcements, & Directives Branch)	February 15, 2011 (ML110490057)
National Marine Fisheries Service (T. Mincey)	NRC (T. Tran)	March 3, 2011 (ML110690848)
Tribal Nation—Apalachicola Band of Creek Indians (M. Blount)	NRC (Chief, Rules, Announcements, & Directives Branch)	March 7, 2011 (ML110750424)
Tribal Nation—Kickapoo Traditional Council (J. Garza Jr.)	NRC (Chief, Rules, Announcements, & Directives Branch)	April 1, 2011 (ML110980503)
Tribal Nation—Tap Pilam–Coahuiltecan Nation (R. Hernandez)	NRC (Chief, Rules, Announcements, & Directives Branch)	April 1, 2011 (ML11111A134)
Texas Parks & Wildlife Department (A. Turner)	NRC (B. Pham)	April 20, 2011 (ML11119A009)
U.S. Fish & Wildlife Service (M. Orms)	NRC (T. Tran)	June 2, 2011 (ML11173A235)
State Historic Preservation Officer (Bill Martin)	NRC (T. Tran)	September 13, 2011 (ML11259A029)
NRC (D. Wrona)	Tribal Nation—Kickapoo Traditional Council (J. Garza Jr.)	November 17, 2011 (ML11269A011)
NRC (D. Wrona)	Tribal Nation— Tonkawa Tribe of Oklahoma (M. Allen)	November 17, 2011 (ML11269A015)
NRC (D. Wrona)	Tribal Nation—Tap Pilam–Coahuiltecan Nation (R. Hernandez)	November 29, 2011 (ML11269A112)
NRC (D. Wrona)	Tribal Nation—Apalachicola Band of Creek Indians (M. Blount)	January 19, 2012 (ML11269A063)

D.2 Consultation Correspondence

The following pages contain copies of the letters listed in Table D–1.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

January 27, 2011

Mr. Don L. Klima, Director
Advisory Council on Historic Preservation
Office of Federal Agency Programs
1100 Pennsylvania Ave, NW, Suite 803
Washington, DC 20004

SUBJECT: SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION REVIEW

Dear Mr. Klima:

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing an application to renew the operating license for South Texas Project (STP), Units 1 and 2, which are located in Matagorda County, Texas. STP is operated by STP Nuclear Operating Company (STPNOC). The application dated October 25, 2010, for renewal was submitted by STPNOC, pursuant to NRC requirements of Title 10 of the *Code of Federal Regulations* Part 54 (10 CFR Part 54). The NRC has established that, as part of the staff review of any nuclear power plant license renewal action, a site-specific Supplemental Environmental Impact Statement (SEIS) to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437, will be prepared under the provisions of 10 CFR Part 51, the NRC regulation that implements the National Environmental Policy Act of 1969 (NEPA). In accordance with 36 CFR 800.8, the SEIS will include analyses of potential impacts to historic and cultural resources. A draft SEIS is scheduled for publication in 2011, and will be provided to you for review and comment.

If you have any questions or require additional information, please contact the Project Manager, Mr. Tam Tran, at 301-415-3617 or Tam.Tran@nrc.gov.

Sincerely,

Bo Pham, Branch Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

cc: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 9, 2011

Javier Loera
Tribal Historic and Preservation Officer (THPO)
Ysleta del Sur Pueblo
119 S. Old Pueblo Rd.
P.O. Box 17579
El Paso, Texas 79917

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION REVIEW

Dear Javier Loera:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from South Texas Project Nuclear Operating Company (STPNOC) for the renewal of the operating license for the South Texas Project (STP), Units 1 and 2, located in Matagorda, Texas. STP is in close proximity to lands that may be of interest to the Ysleta del Sur Pueblo. As described below, the NRC process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Section 51.28(b) of Title 10 of the *Code of Federal Regulations* (10 CFR), the NRC invites the Ysleta del Sur Pueblo to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8, the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating license for STP, Units 1 and 2, will expire on August 20, 2027, and December 15, 2028, respectively. STPNOC submitted its application for renewal of the STP, Units 1 and 2, operating licenses by letter dated October 25, 2010.

The NRC is gathering information for a STP, Units 1 and 2, site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the STP, Units 1 and 2, site that are related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others) and will contain a recommendation regarding the environmental acceptability of the license renewal action. Provided for your information is the STP, Units 1 and 2, Site Layout (Enclosure 1) and Transmission Line Map (Enclosure 2).

The NRC will hold two public scoping meetings for the South Texas Project license renewal site-specific supplement to the GEIS on March 2, 2011, at the Bay City Civic Center, Main Hall, Room 100, 201 Seventh Street, Bay City, TX 77414. There will be two sessions to accommodate interested parties. The first session will convene at 1:30 p.m. and will continue until 3:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 9:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session. To be considered, comments must be provided either at the transcribed public meetings or in writing. No formal comments on the proposed scope of the supplement to the GEIS will be accepted during informal discussions.

The license renewal application is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://www.nrc.gov/reading-rm/adams/web-based.html. The accession number for the license renewal application is ML103010256. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's Public Document Room reference staff by telephone at 1-800-397-4209, or 301-415-4737, or by e-mail at pdr.resource@nrc.gov.

The STP, Units 1 and 2, license renewal application is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/south-texas-project.html. In addition, the Bay City Public Library, located at 1100 7th Street, Bay City, TX 77414, has agreed to make the application available for public inspection.

The GEIS, which assesses the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Ysleta del Sur Pueblo may have to offer on the scope of the environmental review by April 1, 2011. Written comments should be submitted by mail to the Chief, Rules, Announcements, and Directives Branch, Division of Administrative Services, Mail Stop TWB-05-B01M, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC at http://www.regulations.gov referencing documents filed under Docket ID NRC-2010-0375. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and provide you a copy.

The NRC will issue the draft supplemental environmental impact statement (SEIS) for public comment (anticipated publication in 2012), and will hold another set of public meetings in the site vicinity to solicit comments on the draft. A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS.

The issuance of the final SEIS for STP, Units 1 and 2, is planned for 2012. If you need additional information regarding the environmental review process, please contact Tam Tran, Environmental Project Manager, at 301-415-3617 or by e-mail at Tam.Tran@nrc.gov.

Sincerely,

Bo M. Pham, Branch Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosures:
As stated

cc w/encls.: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 9, 2011

Chief Oscola Clayton Sylestine
Alabama-Coushatta Tribe
Route 3, Box 659
Livingston, TX 77351

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION REVIEW

Dear Chief Sylestine:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from South Texas Project Nuclear Operating Company (STPNOC) for the renewal of the operating license for the South Texas Project (STP), Units 1 and 2, located in Matagorda, Texas. STP is in close proximity to lands that may be of interest to the Alabama-Coushatta Tribe as described below; the NRC process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Section 51.28(b) of Title 10 of the *Code of Federal Regulations* (10 CFR), the NRC invites the Alabama-Coushatta Tribe to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8, the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating license for STP, Units 1 and 2, will expire on August 20, 2027, and December 15, 2028, respectively. STPNOC submitted its application for renewal of the STP, Units 1 and 2, operating licenses by letter dated October 25, 2010.

The NRC is gathering information for a STP, Units 1 and 2, site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the STP, Units 1 and 2, site that are related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others) and will contain a recommendation regarding the environmental acceptability of the license renewal action. Provided for your information is the STP, Units 1 and 2, Site Layout (Enclosure 1) and Transmission Line Map (Enclosure 2).

O. Sylestine - 2 -

The NRC will hold two public scoping meetings for the South Texas Project license renewal site-specific supplement to the GEIS on March 2, 2011, at the Bay City Civic Center, Main Hall, Room 100, 201 Seventh Street, Bay City, TX 77414. There will be two sessions to accommodate interested parties. The first session will convene at 1:30 p.m. and will continue until 3:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 9:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session. To be considered, comments must be provided either at the transcribed public meetings or in writing. No formal comments on the proposed scope of the supplement to the GEIS will be accepted during informal discussions.

The license renewal application is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://www.nrc.gov/reading-rm/adams/web-based.html. The accession number for the license renewal application is ML103010256. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's Public Document Room reference staff by telephone at 1-800-397-4209, or 301-415-4737, or by e-mail at pdr.resource@nrc.gov.

The STP, Units 1 and 2, license renewal application is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/south-texas-project.html. In addition, the Bay City Public Library, located at 1100 7th Street, Bay City, TX 77414, has agreed to make the application available for public inspection.

The GEIS, which assesses the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Alabama-Coushatta Tribe may have to offer on the scope of the environmental review by April 1, 2001. Written comments should be submitted by mail to the Chief, Rules, Announcements, and Directives Branch, Division of Administrative Services, Mail Stop TWB-05-B01M, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC at http://www.regulations.gov referencing documents filed under Docket ID NRC-2010-0375. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and provide you a copy.

The NRC will issue the draft supplemental environmental impact statement (SEIS) for public comment (anticipated publication date in 2012), and will hold another set of public meetings in the site vicinity to solicit comments on the draft. A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS.

O. Sylestine - 3 -

The issuance of the final SEIS for STP, Units 1 and 2, is planned for 2012. If you need additional information regarding the environmental review process, please contact Tam Tran, Environmental Project Manager, at 301-415-3617 or by e-mail at Tam.Tran@nrc.gov.

Sincerely,

Bo M. Pham, Branch Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosures:
As stated

cc w/encls.: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 9, 2011

Mr. Billy Evans Horse
Chairman of the Kiowa Tribe
Kiowa Tribe of Oklahoma
P.O. Box 369
Carnegie, OK 73015

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION REVIEW

Dear Mr. Horse:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from South Texas Project Nuclear Operating Company (STPNOC) for the renewal of the operating license for the South Texas Project (STP), Units 1 and 2, located in Matagorda, Texas. STP is in close proximity to lands that may be of interest to the Kiowa Tribe of Oklahoma. As described below, the NRC process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Section 51.28(b) of Title 10 of the *Code of Federal Regulations* (10 CFR), the NRC invites the Kiowa Tribe of Oklahoma to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8, the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating license for STP, Units 1 and 2, will expire on August 20, 2027, and December 15, 2028, respectively. STPNOC submitted its application for renewal of the STP, Units 1 and 2, operating licenses by letter dated October 25, 2010.

The NRC is gathering information for a STP, Units 1 and 2, site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the STP, Units 1 and 2, site that are related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others) and will contain a recommendation regarding the environmental acceptability of the license renewal action. Provided for your information is the STP, Units 1 and 2, Site Layout (Enclosure 1) and Transmission Line Map (Enclosure 2).

The NRC will hold two public scoping meetings for the South Texas Project license renewal site-specific supplement to the GEIS on March 2, 2011, at the Bay City Civic Center, Main Hall, Room 100, 201 Seventh Street, Bay City, TX 77414. There will be two sessions to accommodate interested parties. The first session will convene at 1:30 p.m. and will continue until 3:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 9:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session. To be considered, comments must be provided either at the transcribed public meetings or in writing. No formal comments on the proposed scope of the supplement to the GEIS will be accepted during informal discussions.

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The GEIS, which assesses the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Kiowa Tribe of Oklahoma may have to offer on the scope of the environmental review by April 1, 2011. Written comments should be submitted by mail to the Chief, Rules, Announcements, and Directives Branch, Division of Administrative Services, Mail Stop TWB-05-B01M, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC at http://www.regulations.gov referencing documents filed under Docket ID NRC-2010-0375. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and provide you a copy.

The NRC will issue the draft supplemental environmental impact statement (SEIS) for public comment (anticipated publication in 2012), and will hold another set of public meetings in the site vicinity to solicit comments on the draft. A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS.

B. Horse - 3 -

The issuance of the final SEIS for STP, Units 1 and 2, is planned for 2012. If you need additional information regarding the environmental review process, please contact Tam Tran, Environmental Project Manager, at 301-415-3617 or by e-mail at Tam.Tran@nrc.gov.

Sincerely,

Bo M. Pham, Branch Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosures:
As stated

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 9, 2011

Ms. Ruth Toahty
NAGPRA Coordinator
Comanche Nation
NAGPRA and Historic Preservation Program
Comanche National Museum
701 NW Ferris
Lawton, OK 73507

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION REVIEW

Dear Ms. Toahty:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from South Texas Project Nuclear Operating Company (STPNOC) for the renewal of the operating license for the South Texas Project (STP), Units 1 and 2, located in Matagorda, Texas. STP is in close proximity to lands that may be of interest to the Comanche Nation. As described below, the NRC process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Section 51.28(b) of Title 10 of the *Code of Federal Regulations* (10 CFR), the NRC invites the Comanche Nation to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8, the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

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Please submit any comments that the Comanche Nation may have to offer on the scope of the environmental review by April 1, 2011. Written comments should be submitted by mail to the Chief, Rules, Announcements, and Directives Branch, Division of Administrative Services, Mail Stop TWB-05-B01M, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC at http://www.regulations.gov referencing documents filed under Docket ID NRC-2010-0375. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and provide you a copy.

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The issuance of the final SEIS for STP, Units 1 and 2, is planned for 2012. If you need additional information regarding the environmental review process, please contact Tam Tran, Environmental Project Manager, at 301-415-3617 or by e-mail at Tam.Tran@nrc.gov.

Sincerely,

Bo M. Pham, Branch Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosures:
As stated

cc w/encls.: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 16, 2011

Ms. Mary Orms
U.S. Fish and Wildlife Service (USFWS)
c/o TAMU – Corpus Christi
6300 Ocean Drive
Corpus Christi, TX 78412

SUBJECT: REQUEST FOR LIST OF FEDERALLY PROTECTED SPECIES AND IMPORTANT HABITATS WITHIN THE AREA UNDER EVALUATION FOR THE SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION REVIEW

Dear Ms. Orms:

The U.S. Nuclear Regulatory Commission (NRC or the staff) is reviewing an application submitted by South Texas Project Nuclear Operating Company (STPNOC) for the renewal of the operating license for the South Texas Project (STP), Units 1 and 2. STP is located in Matagorda County in Texas, approximately 70 miles South-Southwest of Houston. The application for renewal was submitted by STPNOC in a letter dated October 25, 2010, pursuant to Title 10 of the *Code of Federal* Regulations Part 54 (10 CFR Part 54). The NRC has established that, as part of the staff's review of any nuclear power plant license renewal application, a site-specific Supplemental Environmental Impact Statement (SEIS) to its *Generic Environmental Impact Statement for License Renewal of Nuclear Plants,* NUREG-1437, must be prepared under 10 CFR Part 51, the NRC's regulation that implements the National Environmental Policy Act (NEPA) of 1969, as amended. In the SEIS for STP, the NRC staff will consider the proposed action of whether or not to renew STP's operating license for an additional 20 years beyond the initial 40-year licensing period. The SEIS will include an analysis of pertinent environmental issues, impacts to endangered or threatened species, impacts to marine resources and habitats and impacts to other fish and wildlife. This letter is being submitted under the provisions of the Endangered Species Act of 1973, as amended, and the Fish and Wildlife Coordination Act of 1934, as amended.

The STP site is approximately 12,220 acres in size and consists of approximately 46 acres of site buildings, support facilities, transmission rights-of-way, and other developed land. The remaining land includes an Essential Cooling Pond (46 acres); a Main Cooling Reservoir (7,000 acres); natural lowland habitat (1,700 acres); and other undeveloped land (3,474 acres), some of which is leased for cattle grazing. The STP site is bounded on the north, east, and south by estuarine marshland. In their license renewal application, STPNOC stated that, if renewed, STP would continue to use existing plant facilities and structures and existing power transmission facilities. No major construction or component replacement (referred to collectively in the GEIS as "refurbishment") would occur as a result of the proposed license renewal.

STP uses a cooling pond-based heat dissipation system to cool its reactor units. Heated discharge water flows from the main condensers and into the Main Cooling Reservoir, where waste heat is removed. The Colorado River supplies makeup water for the Main Cooling Reservoir. Four makeup pumps carry with a total capacity of 269,000 gallons per minute transport water from the Colorado River to a Reservoir Makeup Pumping Facility, which then releases water to the Main Cooling Reservoir. The makeup pumps are operated intermittently as needed. The Main Cooling Reservoir also has a blowdown structure, which releases reservoir water to the Colorado River 1.1 miles downstream of STP along the west bank.

The transmission lines associated with STP include 9 345-kV lines and are depicted in the Transmission Line Map (enclosed). The associated transmission line rights-of-way extend a total distance of 336 miles and encompass approximately 4,775 acres of land. The transmission lines pass through primarily agricultural and rangeland as well as developed areas with low population densities and some forested areas. In its review, the NRC staff will consider Federally listed species and terrestrial and aquatic habitats that occur in or near the transmission line rights-of-way. Note that though the STP site is contained within Matagorda County, the transmission lines traverse an additional 14 counties, which are listed at the bottom of the Federally Listed Species Table (enclosed).

To support the SEIS preparation process and to ensure compliance with Section 7 of the Endangered Species Act, the NRC requests concurrence on the enclosed Federally Listed Species Table, which includes threatened, endangered, proposed, and candidate species that may be on or in the vicinity of the STP or its associated transmission line rights-of-way. The NRC also requests any additional information on protected species and critical habitat that may be in the vicinity of the STP if such information is available. In addition, please provide any information you consider appropriate under the provisions of the Fish and Wildlife Coordination Act.

The NRC staff plans to hold two public scoping meetings on March 2, 2011. The first session will be held in the afternoon and an identical session will be held later that evening. The first meeting will convene at 1:30 PM and will continue until 3:30 PM, as necessary. The second meeting will convene at 7:00 PM and will continue until 9:00 PM as necessary. Both sessions will be held at the Bay City Civic Center, Main Hall, Room 100, 201 Seventh Street, Bay City, TX 77414. In addition, during the week of July 11, 2011, the NRC plans to conduct a site audit. You and your staff are invited to attend both the public meetings and the site audit. Your office will receive a copy of the draft SEIS along with a request for comments. The anticipated publication date for the draft SEIS is in 2012.

M. Orms - 3 -

If you have any questions concerning the NRC staff's review of this license renewal application, please contact Tam Tran, License Renewal Project Manager, at 301-415-3617 or by e-mail at Tam.Tran@nrc.gov.

Sincerely,

Bo M. Pham, Branch Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosures:
1. Area Map, 50-mile radius
2. Area Map, 6-mile radius
3. Site Area Map
4. Transmission Line Map
5. Federal T&E Species Table

cc w/encls: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 16, 2011

Mr. David Bernhart
Asst. Regional Administrator for Protected Resources
NOAA Fisheries Services (NMFS)
Southeast Region Office
263 13th Avenue South
St. Petersburg, FL 33701

SUBJECT: REQUEST FOR LIST OF FEDERALLY PROTECTED SPECIES AND IMPORTANT HABITATS WITHIN THE AREA UNDER EVALUATION FOR THE SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION REVIEW

Dear Mr. Bernhart:

The U.S. Nuclear Regulatory Commission (NRC or the staff) is reviewing an application submitted by South Texas Project Nuclear Operating Company (STPNOC) for the renewal of the operating license for the South Texas Project (STP), Units 1 and 2. STP is located in Matagorda County in Texas, approximately 70 miles South-Southwest of Houston. The application for renewal was submitted by STPNOC in a letter dated October 25, 2010, pursuant to Title 10 of the *Code of Federal* Regulations Part 54 (10 CFR Part 54). The NRC has established that, as part of the staff's review of any nuclear power plant license renewal application, a site-specific Supplemental Environmental Impact Statement (SEIS) to its *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*, NUREG-1437, must be prepared under 10 CFR Part 51, the NRC's regulation that implements the National Environmental Policy Act (NEPA) of 1969, as amended. In the SEIS for STP, the NRC staff will consider the proposed action of whether or not to renew STP's operating license for an additional 20 years beyond the initial 40-year licensing period. The SEIS will include an analysis of pertinent environmental issues, impacts to endangered or threatened species, impacts to marine resources and habitats and impacts to other fish and wildlife. This letter is being submitted under the provisions of the Endangered Species Act of 1973, as amended, and the Fish and Wildlife Coordination Act of 1934, as amended.

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To support the SEIS preparation process and to ensure compliance with Section 7 of the Endangered Species Act, the NRC requests concurrence on the enclosed Federally Listed Species Table, which includes threatened, endangered, proposed, and candidate species that may be on or in the vicinity of the STP or its associated transmission line rights-of-way. The NRC also requests any additional information on protected species and critical habitat that may be in the vicinity of the STP if such information is available. In addition, please provide any information you consider appropriate under the provisions of the Fish and Wildlife Coordination Act.

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Sincerely,

Bo M. Pham, Branch Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

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2. Area Map, 6-mile radius
3. Site Area Map
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5. Federal T&E Species Table

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 16, 2011

Ms. Kathy Boydston
Habitat Assessment Program Manager
Texas Parks and Wildlife Department
4200 Smith School Road
Austin, TX 78744

SUBJECT: REQUEST FOR LIST OF STATE-PROTECTED SPECIES AND IMPORTANT HABITATS WITHIN THE AREA UNDER EVALUATION FOR THE SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION REVIEW

Dear Ms. Boydston:

The U.S. Nuclear Regulatory Commission (NRC or the staff) is reviewing an application submitted by South Texas Project Nuclear Operating Company (STPNOC) for the renewal of the operating license for the South Texas Project (STP), Units 1 and 2. STP is located in Matagorda County, approximately 70 miles south-southwest of Houston. The application for renewal was submitted by STPNOC in a letter dated October 25, 2010, pursuant to Title 10 of the *Code of Federal* Regulations Part 54 (10 CFR Part 54). The NRC has established that, as part of the staff's review of any nuclear power plant license renewal application, a site-specific Supplemental Environmental Impact Statement (SEIS) to its *Generic Environmental Impact Statement for License Renewal of Nuclear Plants,* NUREG-1437, will be prepared under 10 CFR Part 51, the NRC's regulation that implements the National Environmental Policy Act (NEPA) of 1969, as amended. The SEIS includes an analysis of pertinent environmental issues, impacts to endangered or threatened species, impacts to marine resources and habitats, and impacts to other fish and wildlife. This letter is being submitted under the provisions of the Endangered Species Act of 1973, as amended, and the Fish and Wildlife Coordination Act of 1934, as amended.

For the purpose of license renewal, STPNOC stated that STP, Units 1 and 2, operating under renewed licenses, would use existing plant facilities and transmission (also, the license renewal application preparation did not identify the need to undertake any major refurbishment or replacement actions to maintain the functionality of the STP systems, structures, and components during the period of extended operation). STP, Units 1 and 2, site is bounded on the north, east, and south by estuarine marshland, veined with man-made ditches and tidal creeks. Approximately 7,000 acres of the site real estate consists of the Main Cooling Reservoir (MCR) and it is a main geographical feature of the site.

STP, Units 1 and 2, are pressurized-water reactors. STP uses the 7,000-acre MCR, with makeup water from the Colorado River, as the ultimate heat sink for its cooling system. Make up water from the Colorado River is pumped and piped into the MCR from the Reservoir Makeup Pumping Facility (RMPF) by means of four makeup pumps with a total capacity of 269,000 gallons per minute. The makeup pumps are operated intermittently as needed and dictated by local hydrology and meteorological condition. The MCR also has a blowdown structure to relieve reservoir water to the Colorado River.

As a part of the SEIS preparation, the application transmission line rights-of-way will be reviewed. The applicant's transmission lines (in-scope) consist of mainly 345-kV lines (note: there is a 138-kV line to bring emergency power to STP) that tie STP electrical system to the grid. These lines of interest are captured in the "Transmission Line Map" (enclosed). Please note that though the STP project site is contained within Matagorda County, the transmission lines associated with the site traverse an additional 14 counties that are listed at the bottom of Table 1, enclosure 5. For these counties, the NRC will only be considering protected species whose ranges may overlap with the transmission line rights-of-way. Typically, the rights-of-way are 100 to 400 feet wide.

To support the SEIS preparation process, the NRC requests a list of State-protected species and important habitats that may be in the vicinity of STP, Units 1 and 2, site and its associated transmission line rights-of-way. The applicant, STP Nuclear Operating Company (STPNOC), corresponded with your office on March 17, 2009. The correspondence includes "Table 1, Protected Species in Texas Counties Containing STP, Units 1 and 2, Project Facilities and Transmission Lines." In the correspondence, STPNOC requested a response from your office by April 16, 2009. To avoid any duplication of effort, you may provide us with your response to STPNOC on this item previously, if available, rather than compiling a new list. If any information is not current, please provide any applicable updates. The March 17, 2009, letter from STPNOC is enclosed for your reference. In addition, please provide any information you consider appropriate under the provisions of the Fish and Wildlife Coordination Act.

The NRC staff plans to hold two public NEPA scoping meetings on March 2, 2011. The first session will be held in the afternoon and an identical session will be held later that evening. The first meeting will convene at 1:30 PM and will continue until 3:30 PM, as necessary. The second meeting will convene at 7:00 PM and will continue until 9:00 PM, as necessary. Both sessions will be held at the Bay City Civic Center, Main Hall, Room 100, 201 Seventh Street, Bay City, TX 77414. In addition, during the week of July 11, 2011, the NRC plans to conduct a site audit. You and your staff are invited to attend both the public meetings and the site audit. Your office will receive a copy of the draft SEIS along with a request for comments. The anticipated publication date for the draft SEIS is in 2012.

K. Boydston - 3 -

For questions concerning the review of this license renewal application, please contact Tam Tran, License Renewal Project Manager, at 301-415-3617 or via email, Tam.Tran@nrc.gov.

Sincerely,

Bo M. Pham, Branch Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosures:
1. Area Map, 50-mile radius
2. Area Map, 6-mile radius
3. Site Area Map
4. Transmission Line Map
5. Letter from Applicant to State Agency

cc w/encls: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 17, 2011

Mark Wolfe, State Historic Preservation Officer (SHPO)
Texas Historical Commission
P.O. Box 12276
Austin, TX 78711-2276

SUBJECT: SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION REVIEW (TRACK NUMBER 201002271)

Dear Mr. Wolfe:

The U.S. Nuclear Regulatory Commission (NRC or the staff) is reviewing an application submitted by South Texas Project Nuclear Operating Company (STPNOC) for the renewal of the operating license for South Texas Project (STP), Units 1 and 2. STP is located in Matagorda County Texas. The application for renewal was submitted by STPNOC in a letter dated October 25, 2010, pursuant to Title 10 of the *Code of Federal Regulations* Part 54 (10 CFR Part 54). The NRC has established that, as part of the staff's review of any nuclear power plant license renewal application, a site-specific Supplemental Environmental Impact Statement (SEIS) to its *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*, NUREG-1437, will be prepared under 10 CFR Part 51, the NRC's regulation that implements the National Environment Policy Act of 1969, as amended (NEPA). The NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA) with NEPA in accordance with 36 CFR 800.8(c).

In the context of the NHPA, the staff has determined that the area of potential effect (APE) for a license renewal action is the area at the power plant site and its immediate environs that may be impacted by post-license renewal land-disturbing operations or projected refurbishment activities associated with the proposed action. The APE may extend beyond the immediate environs in those instances where post-license renewal land-disturbing operations or projected refurbishment activities specifically related to license renewal may potentially have an effect on known or proposed historic sites. This determination is made irrespective of ownership or control of the lands of interest. The SEIS will include an analysis of pertinent environmental issues and analyses of potential impacts to historic and cultural resources.

For the purpose of license renewal, STPNOC stated that STP, Units 1 and 2, operating under renewed licenses, would use existing plant facilities and transmission. Please see the enclosed maps and pictures, which show the area under review.

The staff plans to hold two public environmental scoping meetings on March 2, 2011, at the Bay City Civic Center, Main Hall, Room 100, 201 Seventh Street, Bay City, TX 77414. The first meeting will convene at 1:30 PM and will continue until 3:30 PM, as necessary. The second meeting will convene at 7:00 PM with a repeat of the overview portions of the first meeting and will continue until 9:00 PM, as necessary. In addition, during the week of July 11, 2011, the staff plans to conduct a site audit at South Texas Project. You and your staff are invited to attend both the site audit and the public meetings. Your office will receive a copy of the draft SEIS along with a request for comments. The publication date for the draft SEIS is scheduled for 2012.

M. Wolfe - 2 -

The STP, Units 1 and 2, license renewal application is available at:
http://www.nrc.gov/reactors/operating/licensing/renewal/applications/south-texas-project.html

If you have any questions concerning the staff's review of this license renewal application, please contact Tam Tran, Project Manager, at 301-415-3617 or by e-mail at Tam.Tran@nrc.gov.

Sincerely,

Bo M. Pham, Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosures:
1. Area Map, 50-mile radius
2. Area Map, 6-mile radius
3. Site Area Map
4. Transmission Line Map

cc w/encls: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 17, 2011

Mr. Anthony E. Street
Tribal President
Tonkawa Tribe of Oklahoma
1 Rush Buffalo Road
Tonkawa, OK 74653

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION REVIEW

Dear Mr. Street:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from South Texas Project Nuclear Operating Company (STPNOC) for the renewal of the operating license for the South Texas Project (STP), Units 1 and 2, located in Matagorda, Texas. STP is in close proximity to lands that may be of interest to the Tonkawa Tribe of Oklahoma. As described below, the NRC process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Section 51.28(b) of Title 10 of the *Code of Federal Regulations* (10 CFR), the NRC invites the Tonkawa Tribe of Oklahoma to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8, the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating license for STP, Units 1 and 2, will expire on August 20, 2027, and December 15, 2028, respectively. STPNOC submitted its application for renewal of the STP, Units 1 and 2, operating licenses by letter dated October 25, 2010.

The NRC is gathering information for a STP, Units 1 and 2, site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the STP, Units 1 and 2, site that are related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others) and will contain a recommendation regarding the environmental acceptability of the license renewal action. Provided for your information is the STP, Units 1 and 2, Site Layout (Enclosure 1) and Transmission Line Map (Enclosure 2).

The NRC will hold two public scoping meetings for the South Texas Project license renewal site-specific supplement to the GEIS on March 2, 2011, at the Bay City Civic Center, Main Hall, Room 100, 201 Seventh Street, Bay City, TX 77414. There will be two sessions to accommodate interested parties. The first session will convene at 1:30 p.m. and will continue until 3:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 9:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session. To be considered, comments must be provided either at the transcribed public meetings or in writing. No formal comments on the proposed scope of the supplement to the GEIS will be accepted during informal discussions.

The license renewal application is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://www.nrc.gov/reading-rm/adams/web-based.html. The accession number for the license renewal application is ML103010256. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's Public Document Room reference staff by telephone at 1-800-397-4209, or 301-415-4737, or by e-mail at pdr.resource@nrc.gov.

The STP, Units 1 and 2, license renewal application is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/south-texas-project.html. In addition, the Bay City Public Library, located at 1100 7th Street, Bay City, TX 77414, has agreed to make the application available for public inspection.

The GEIS, which assesses the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Tonkawa Tribe of Oklahoma may have to offer on the scope of the environmental review by April 1, 2011. Written comments should be submitted by mail to the Chief, Rules, Announcements, and Directives Branch, Division of Administrative Services, Mail Stop TWB-05-B01M, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC at http://www.regulations.gov referencing documents filed under Docket ID NRC-2010-0375. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and provide you a copy.

The NRC will issue the draft supplemental environmental impact statement (SEIS) for public comment (anticipated publication in 2012), and will hold another set of public meetings in the site vicinity to solicit comments on the draft. A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS.

The issuance of the final SEIS for STP, Units 1 and 2, is planned for 2012. If you need additional information regarding the environmental review process, please contact Tam Tran, Environmental Project Manager, at 301-415-3617 or by e-mail at Tam.Tran@nrc.gov.

Sincerely,

Bo M. Pham, Branch Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosures:
As stated

cc w/encls.: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 17, 2011

Apalachicola Band of Creek Indians
113 N. First Street
Mabank, TX 75147

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION REVIEW

Dear Principal Chief Mary Sixwomen Blount:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from South Texas Project Nuclear Operating Company (STPNOC) for the renewal of the operating license for the South Texas Project (STP), Units 1 and 2, located in Matagorda, Texas. STP is in close proximity to lands that may be of interest to the Apalachicola Band of Creek Indians. As described below, the NRC process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Section 51.28(b) of Title 10 of the *Code of Federal Regulations* (10 CFR), the NRC invites the Apalachicola Band of Creek Indians to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8, the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating license for STP, Units 1 and 2, will expire on August 20, 2027. and December 15, 2028, respectively. STPNOC submitted its application for renewal of the STP, Units 1 and 2, operating licenses by letter dated October 25, 2010.

The NRC is gathering information for a STP, Units 1 and 2, site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the STP, Units 1 and 2, site that are related to terrestrial ecology, aquatic ecology. hydrology, cultural resources, and socioeconomic issues (among others) and will contain a recommendation regarding the environmental acceptability of the license renewal action. Provided for your information is the STP, Units 1 and 2, Site Layout (Enclosure 1) and Transmission Line Map (Enclosure 2).

Apalachicola Band of Creek Indians - 2 -

The NRC will hold two public scoping meetings for the South Texas Project license renewal site-specific supplement to the GEIS on March 2, 2011, at the Bay City Civic Center, Main Hall, Room 100, 201 Seventh Street, Bay City, TX 77414. There will be two sessions to accommodate interested parties. The first session will convene at 1:30 p.m. and will continue until 3:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 9:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session. To be considered, comments must be provided either at the transcribed public meetings or in writing. No formal comments on the proposed scope of the supplement to the GEIS will be accepted during informal discussions.

The license renewal application is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://www.nrc.gov/reading-rm/adams/web-based.html. The accession number for the license renewal application is ML103010256. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's Public Document Room reference staff by telephone at 1-800-397-4209, or 301-415-4737, or by e-mail at pdr.resource@nrc.gov.

The STP, Units 1 and 2, license renewal application is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/south-texas-project.html. In addition, the Bay City Public Library, located at 1100 7th Street, Bay City, TX 77414, has agreed to make the application available for public inspection.

The GEIS, which assesses the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Apalachicola Band of Creek Indians may have to offer on the scope of the environmental review by April 1, 2011. Written comments should be submitted by mail to the Chief, Rules, Announcements, and Directives Branch, Division of Administrative Services, Mail Stop TWB-05-B01M, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC at http://www.regulations.gov referencing documents filed under Docket ID NRC-2010-0375. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and provide you a copy.

The NRC will issue the draft supplemental environmental impact statement (SEIS) for public comment (anticipated publication in 2012), and will hold another set of public meetings in the site vicinity to solicit comments on the draft. A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS.

The issuance of the final SEIS for STP, Units 1 and 2, is planned for 2012. If you need additional information regarding the environmental review process, please contact Tam Tran, Environmental Project Manager, at 301-415-3617 or by e-mail at Tam.Tran@nrc.gov.

Sincerely,

Bo M. Pham, Branch Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosures:
As stated

cc w/encls.: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 17, 2011

Bernard F. Barcena Jr., Chairman
Lipan Apache Tribe of Texas
PO Box 8888
Corpus Christi, TX 78426

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION REVIEW

Dear Chairman Bernard F. Barcena Jr.:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from South Texas Project Nuclear Operating Company (STPNOC) for the renewal of the operating license for the South Texas Project (STP), Units 1 and 2, located in Matagorda, Texas. STP is in close proximity to lands that may be of interest to the Lipan Apache Tribe of Texas. As described below, the NRC process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Section 51.28(b) of Title 10 of the *Code of Federal Regulations* (10 CFR), the NRC invites the Lipan Apache Tribe of Texas to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8, the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating license for STP, Units 1 and 2, will expire on August 20, 2027, and December 15, 2028, respectively. STPNOC submitted its application for renewal of the STP, Units 1 and 2, operating licenses by letter dated October 25, 2010.

The NRC is gathering information for a STP, Units 1 and 2, site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the STP, Units 1 and 2, site that are related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others) and will contain a recommendation regarding the environmental acceptability of the license renewal action. Provided for your information is the STP, Units 1 and 2, Site Layout (Enclosure 1) and Transmission Line Map (Enclosure 2).

The NRC will hold two public scoping meetings for the South Texas Project license renewal site-specific supplement to the GEIS on March 2, 2011, at the Bay City Civic Center, Main Hall, Room 100, 201 Seventh Street, Bay City, TX 77414. There will be two sessions to accommodate interested parties. The first session will convene at 1:30 p.m. and will continue until 3:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 9:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session. To be considered, comments must be provided either at the transcribed public meetings or in writing. No formal comments on the proposed scope of the supplement to the GEIS will be accepted during informal discussions.

The license renewal application is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://www.nrc.gov/reading-rm/adams/web-based.html. The accession number for the license renewal application is ML103010256. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's Public Document Room reference staff by telephone at 1-800-397-4209, or 301-415-4737, or by e-mail at pdr.resource@nrc.gov.

The STP, Units 1 and 2, license renewal application is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/south-texas-project.html. In addition, the Bay City Public Library, located at 1100 7th Street, Bay City, TX 77414, has agreed to make the application available for public inspection.

The GEIS, which assesses the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Lipan Apache Tribe of Texas may have to offer on the scope of the environmental review by April 1, 2011. Written comments should be submitted by mail to the Chief, Rules, Announcements, and Directives Branch, Division of Administrative Services, Mail Stop TWB-05-B01M, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC at http://www.regulations.gov referencing documents filed under Docket ID NRC-2010-0375. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and provide you a copy.

The NRC will issue the draft supplemental environmental impact statement (SEIS) for public comment (anticipated publication in 2012), and will hold another set of public meetings in the site vicinity to solicit comments on the draft. A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS.

The issuance of the final SEIS for STP, Units 1 and 2, is planned for 2012. If you need additional information regarding the environmental review process, please contact Tam Tran, Environmental Project Manager, at 301-415-3617 or by e-mail at Tam.Tran@nrc.gov.

Sincerely,

Bo M. Pham, Branch Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosures:
As stated

cc w/encls.: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 17, 2011

Daniel Romero Jr
General Council Chairman
Lipan Apache Band of Texas
1306 S. 9th Avenue
Edinburgh, TX 78539

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION REVIEW

Dear Mr. Daniel Romero Jr.:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from South Texas Project Nuclear Operating Company (STPNOC) for the renewal of the operating license for the South Texas Project (STP), Units 1 and 2, located in Matagorda, Texas. STP is in close proximity to lands that may be of interest to the Lipan Apache Band of Texas. As described below, the NRC process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Section 51.28(b) of Title 10 of the *Code of Federal Regulations* (10 CFR), the NRC invites the Lipan Apache Band of Texas to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8, the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

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Please submit any comments that the Lipan Apache Band of Texas may have to offer on the scope of the environmental review by April 1, 2011. Written comments should be submitted by mail to the Chief, Rules, Announcements, and Directives Branch, Division of Administrative Services, Mail Stop TWB-05-B01M, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC at http://www.regulations.gov referencing documents filed under Docket ID NRC-2010-0375. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and provide you a copy.

The NRC will issue the draft supplemental environmental impact statement (SEIS) for public comment (anticipated publication in 2012), and will hold another set of public meetings in the site vicinity to solicit comments on the draft. A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS.

D. Romero Jr. - 3 -

The issuance of the final SEIS for STP, Units 1 and 2, is planned for 2012. If you need additional information regarding the environmental review process, please contact Tam Tran, Environmental Project Manager, at 301-415-3617 or by e-mail at Tam.Tran@nrc.gov.

Sincerely,

Bo M. Pham, Branch Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosures:
As stated

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 17, 2011

J.R. Mendoza, Chief Speaker
Pamaque Clan of Coahuila Y Tejas
Spanish Colonial Indian Missions Inc.
3631 Callaghan Road #614
San Antonio, TX 78228

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION REVIEW

Dear J.R. Mendoza:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from South Texas Project Nuclear Operating Company (STPNOC) for the renewal of the operating license for the South Texas Project (STP), Units 1 and 2, located in Matagorda, Texas. STP is in close proximity to lands that may be of interest to the Pamaque Clan of Coahuila Y Tejas. As described below, the NRC process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Section 51.28(b) of Title 10 of the *Code of Federal Regulations* (10 CFR), the NRC invites the Pamaque Clan of Coahuila Y Tejas to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8, the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating license for STP, Units 1 and 2, will expire on August 20, 2027, and December 15, 2028, respectively. STPNOC submitted its application for renewal of the STP, Units 1 and 2, operating licenses by letter dated October 25, 2010.

The NRC is gathering information for a STP, Units 1 and 2, site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the STP, Units 1 and 2, site that are related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others) and will contain a recommendation regarding the environmental acceptability of the license renewal action. Provided for your information is the STP, Units 1 and 2, Site Layout (Enclosure 1) and Transmission Line Map (Enclosure 2).

The NRC will hold two public scoping meetings for the South Texas Project license renewal site-specific supplement to the GEIS on March 2, 2011, at the Bay City Civic Center, Main Hall, Room 100, 201 Seventh Street, Bay City, TX 77414. There will be two sessions to accommodate interested parties. The first session will convene at 1:30 p.m. and will continue until 3:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 9:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session. To be considered, comments must be provided either at the transcribed public meetings or in writing. No formal comments on the proposed scope of the supplement to the GEIS will be accepted during informal discussions.

The license renewal application is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://www.nrc.gov/reading-rm/adams/web-based.html. The accession number for the license renewal application is ML103010256. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's Public Document Room reference staff by telephone at 1-800-397-4209, or 301-415-4737, or by e-mail at pdr.resource@nrc.gov.

The STP, Units 1 and 2, license renewal application is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/south-texas-project.html. In addition, the Bay City Public Library, located at 1100 7th Street, Bay City, TX 77414, has agreed to make the application available for public inspection.

The GEIS, which assesses the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that Pamaque Clan of Coahuila Y Tejas may have to offer on the scope of the environmental review by April 1, 2011. Written comments should be submitted by mail to the Chief, Rules, Announcements, and Directives Branch, Division of Administrative Services, Mail Stop TWB-05-B01M, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC at http://www.regulations.gov referencing documents filed under Docket ID NRC-2010-0375. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and provide you a copy.

The NRC will issue the draft supplemental environmental impact statement (SEIS) for public comment (anticipated publication in 2012), and will hold another set of public meetings in the site vicinity to solicit comments on the draft. A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS.

J. Mendoza - 3 -

The issuance of the final SEIS for STP, Units 1 and 2, is planned for 2012. If you need additional information regarding the environmental review process, please contact Tam Tran, Environmental Project Manager, at 301-415-3617 or by e-mail at Tam.Tran@nrc.gov.

Sincerely,

Bo M. Pham, Branch Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosures:
As stated

cc w/encls.: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 17, 2011

Raymond Hernandez
Cultural Preservation Officer
Tap Pilam-Coahuiltecan Nation
American Indians in Texas
1313 Guadalupe Street, Suite 104
San Antonio, Texas 78207

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION REVIEW

Dear Cultural Preservation Officer Raymond Hernandez:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from South Texas Project Nuclear Operating Company (STPNOC) for the renewal of the operating license for the South Texas Project (STP), Units 1 and 2, located in Matagorda, Texas. STP is in close proximity to lands that may be of interest to the Tap Pilam-Coahuiltecan Nation. As described below, the NRC process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Section 51.28(b) of Title 10 of the *Code of Federal Regulations* (10 CFR), the NRC invites the Tap Pilam-Coahuiltecan Nation to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8, the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating license for STP, Units 1 and 2, will expire on August 20, 2027, and December 15, 2028, respectively. STPNOC submitted its application for renewal of the STP, Units 1 and 2, operating licenses by letter dated October 25, 2010.

The NRC is gathering information for a STP, Units 1 and 2, site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the STP, Units 1 and 2, site that are related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others) and will contain a recommendation regarding the environmental acceptability of the license renewal action. Provided for your information is the STP, Units 1 and 2, Site Layout (Enclosure 1) and Transmission Line Map (Enclosure 2).

R. Hernandez - 2 -

The NRC will hold two public scoping meetings for the South Texas Project license renewal site-specific supplement to the GEIS on March 2, 2011, at the Bay City Civic Center, Main Hall, Room 100, 201 Seventh Street, Bay City, TX 77414. There will be two sessions to accommodate interested parties. The first session will convene at 1:30 p.m. and will continue until 3:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 9:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session. To be considered, comments must be provided either at the transcribed public meetings or in writing. No formal comments on the proposed scope of the supplement to the GEIS will be accepted during informal discussions.

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The STP, Units 1 and 2, license renewal application is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/south-texas-project.html. In addition, the Bay City Public Library, located at 1100 7th Street, Bay City, TX 77414, has agreed to make the application available for public inspection.

The GEIS, which assesses the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Tap Pilam-Coahuiltecan Nation may have to offer on the scope of the environmental review by April 1, 2011. Written comments should be submitted by mail to the Chief, Rules, Announcements, and Directives Branch, Division of Administrative Services, Mail Stop TWB-05-B01M, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC at http://www.regulations.gov referencing documents filed under Docket ID NRC-2010-0375. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and provide you a copy.

The NRC will issue the draft supplemental environmental impact statement (SEIS) for public comment (anticipated publication in 2012), and will hold another set of public meetings in the site vicinity to solicit comments on the draft. A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS.

R. Hernandez - 3 -

The issuance of the final SEIS for STP, Units 1 and 2, is planned for 2012. If you need additional information regarding the environmental review process, please contact Tam Tran, Environmental Project Manager, at 301-415-3617 or by e-mail at Tam.Tran@nrc.gov.

Sincerely,

Bo M. Pham, Branch Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosures:
As stated

cc w/encls.: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 23, 2011

Juan Garza Jr., Chairman
Kickapoo Traditional Council
HCR1 Box 9700
Eagle Pass, TX 78852

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION REVIEW

Dear Mr. Garza:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from South Texas Project Nuclear Operating Company (STPNOC) for the renewal of the operating license for the South Texas Project (STP), Units 1 and 2, located in Matagorda, Texas. STP is in close proximity to lands that may be of interest to the Kickapoo Traditional Council. As described below, the NRC process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Section 51.28(b) of Title 10 of the *Code of Federal Regulations* (10 CFR), the NRC invites the Kickapoo Traditional Council to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8, the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

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J. Garza - 2 -

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Please submit any comments that the Kickapoo Traditional Council may have to offer on the scope of the environmental review by April 1, 2011. Written comments should be submitted by mail to the Chief, Rules, Announcements, and Directives Branch, Division of Administrative Services, Mail Stop TWB-05-B01M, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC at http://www.regulations.gov referencing documents filed under Docket ID NRC-2010-0375. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and provide you a copy.

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J. Garza - 3 -

The issuance of the final SEIS for STP, Units 1 and 2, is planned for 2012. If you need additional information regarding the environmental review process, please contact Tam Tran, Environmental Project Manager, at 301-415-3617 or by e-mail at Tam.Tran@nrc.gov.

Sincerely,

Bo M. Pham, Branch Chief
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosures:
As stated

cc w/encls.: Distribution via Listserv

16FR3410

PUBLIC SUBMISSION

As of: February 16, 2011
Received: February 15, 2011
Status: Pending_Post
Tracking No. 80befbe9
Comments Due: April 01, 2011
Submission Type: Web

Docket: NRC-2010-0375
Notice of Receipt and Availability of Application for Renewal of Facility Operating License

Comment On: NRC-2010-0375-0003
STP Nuclear Operating Company; Notice of Intent to Prepare an Environmental Impact Statement and Conduct the Scoping Process for South Texas Project, Units 1 and 2

Document: NRC-2010-0375-DRAFT-0001
Comment on FR Doc # 2011-01904

Submitter Information

RECEIVED

2011 FEB 16 AM 10: 3

RULES AND DIRECTIVES BRANCH

Name: Miranda Allen
Address:
1 Rush Buffalo Road
Tonkawa, OK, 74653
Organization: Tonkawa Tribe of Oklahoma
Government Agency Type: Tribal
Government Agency: Tonkawa Tribe of Oklahoma

General Comment

Date: February 15, 2011

Regarding the request for comments concerning the South Texas Project, Units 1 and 2, license renewal application review.

The Tonkawa Tribe has no specifically designated historical or cultural sites identified in the above listed project area. However if any human remains, funerary objects, or other evidence of historical or cultural significance is inadvertently discovered then the Tonkawa Tribe would certainly be interested in proper disposition thereof. We appreciate notification by your office of the many projects on-going, and as always the Tonkawa Tribe is willing to work with your representatives in any manner to uphold the provisions of NAGPRA to the extent of our capability.

Respectfully,

SUNSI Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = T. Tran (TXT1)

NRR-PMDAPEm Resource

From: Teletha Mincey [Teletha.Mincey@noaa.gov]
Sent: Thursday, March 03, 2011 1:29 PM
To: Tran, Tam
Subject: South Texas Project <a e>
Attachments: Texas.pdf

Hello:

In response to NRC's letter dated February 16, 2011, attached is a listing of species under the National Marine Fisheries Service's jurisdiction. Also, please checkout the website below for further information. Thank you.

http://sero.nmfs.noaa.gov/pr/pr.htm

--
Teletha Mincey
Program Analyst
NOAA Fisheries
Southeast Region
263 13th Ave S
St. Petersburg, FL 33701-5505
(727) 551-5772 - Direct Line
(727) 824-5309 - Fax

01/31/2011
76FR 5410
③

RULES AND DIRECTIVES BRANCH

2011 MAR 15 AM 7: 45

APALACHICOLA CREEK INDIANS

113 N FIRST STREET, MABANK, TX 75147

903-880-0240 Email Sixwomen@apalachicolacreek.com

RECEIVED

Chief, Rules, Announcements, and Directives Branch
Division of Administrative Services
Mail Stop TWB-05-B01M
US Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Monday, March 7, 2011

Subject: Apalachicola Council Comments On South Texas Project, Units 1 and 2, License Renewal Application

Dear Branch Chief,

Thank you this opportunity to review and comment letter dated February 17, 2011. The Apalachicola Elder Council find this an important task as we have suffered historic and cultural losses despite existing promises under Environmental Policy Law. Therefore, we preface our comments with the following preamble:

Whereas the Apalachicola Town known as Red Ground Town, Econchatte Micco the Chief, was destroyed by the U.S. Army Corps of Engineers to build the Jim Woodruff Dam in 1957 located at the confluence of the Flint, Chattahoochee and Apalachicola Rivers in Alabama, Georgia and Florida, and

Whereas, the Apalachicola Indian Cemetery, previously located on Indian Hill near the City of Livingston in Polk County, Texas, was excavated by approval of the Trinity River Authority in 1969 sending the remains of our Apalachicola ancestors and Hereditary Chief John Blount to the bottom of the Trinity River thence to the Gulf of Mexico and without protection and guarantees of the Environmental Protection Act, and

Whereas the Apalachicola Creek Indians have been in Texas since 1834 and have suffered cultural and historic losses in modern times despite legislative protections, we admit our comments today are sincere but tempered by painful experience. None the less, we cling to the hope that the Nuclear Regulation Agency will do no further harm to any Texas Residents, to the general environment we call home or to the historical and cultural sites not previously or thoroughly examined by non Native Anthropologists and literary scholars.

SE Review Complete

E-RIDS=ADM-03

TRADITIONAL COUNCIL

CHAIRMAN
Juan Garza, Jr., Kisisika

SECRETARY
Jesus Anico, Chakodata

TREASURER
Rogelio Elizondo, Apichicuea

MEMBERS
David J. Gonzalez, Kikekideah
Nanate Hernandez, Nanatea

KICKAPOO
TRADITIONAL TRIBE OF TEXAS

HCR 1 Box 9700
Eagle Pass, Texas 78852

Traditional Council

1/31/2011
76 FR 5410
(27)

RECEIVED
2011 APR -7 AM 11:22

April 1, 2011

Chief, Rules, Announcements, and Directives Branch,
Division of Administrative Services,
Mail Stop TWB-05-B01M,
US Nuclear Regulatory Commission,
Washington, DC 20555-0001

Re: REQUEST FOR COMMENTS CONCERNING THE SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION REVIEW

Dear Sir(s):

Thank you for your letter dated on February 23, 2011, regarding your request for comments concerning the South Texas Project, Units 1 and 2, License Application Review.

Thank you for advising us about the proposed action. The Kickapoo Nation values its traditions and customs so we appreciate your taking the time to ask for our input in this matter. By keeping the lines of communication open we can peacefully co-exist yet attend to our respective businesses.

We do not have any comments or questions regarding said project, as we are unaware of any tribal sites in this area, therefore it does not affect our interests in any way. Furthermore, the Kickapoo Traditional Tribe of Texas wishes you success in your endeavor.

Should you have any further questions please do not hesitate to contact us.

Juan Garza, Jr., Chairman

E-RIDS = ADM-03

Tap Pilam
Coahuiltecan Nation
1313 Guadalupe Street
San Antonio, Texas 78207

April 1, 2011

Chief, Rules, Announcements, and Directive Branch
Division of Administrative Services
Mail Stop TWB-05-B01M
United States Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Re: Docket ID NRC-2010-0305

To whom it may concern:

The Tap Pilam Coahuiltecan Nation is grateful for the opportunity to provide comments concerning the South Texas Project (STP), Units 1 and 2, license renewal application review.

We are concerned with the renewal of this license because of the project's location and proximity to historical French and Spanish colonial settlements. Our ancestral relatives were brought into these settlements, and we their descendants continue to have deep cultural roots and ties to the land.

More specifically, we are concerned that archeological data of a third site, as mentioned in Attachment D of the Applicant's Environmental Report (September 2010) is missing from the records. Before any consideration is given to the renewal of this license, we recommend that a new archeological investigation to this third site be conducted.

In a global context, a nuclear disaster similar to the one occurring in Japan would make our deep cultural roots and ties to the land inaccessible for an undetermined length of time. We want to be assured that adequate safeguards are in place in order to prevent a repeat of the tragedy in Japan. For example, in Japan there were no alternate sources of power to run the water pumps that would cool off the reactors which caused radiation to leak and contaminate the surrounding areas for miles. This would be disastrous not only to our cultural heritage, but to all the people of South Texas.

It is our intention to continue researching how our Nation's families and culture will be impacted by the renewal of the license. In conjunction with upcoming public meetings and publication, we intend to continue providing input and comments.

Tap Pilam Coahuiltecan
Tribal Council

Tribes

Pa-nam-a Payaya
Raymond Hernandez
coahtexo@hctc.net

Pompopa
Mickey Killian
pakawan@satx.rr.com

Venados
Teodoso Herrera
VENADO5@aol.com

Auteca Paguame
Ramon Vasquez y Sanchez
xagukai@txdirect.net

Pampopa
Casanova

Once again we are grateful for your thoughtfulness of our cultural roots and ties to the land, including the abovementioned comments, before approving a license renewal to the STP Units 1 and 2.

Respectfully submitted,
Raymond Hernandez
Cultural Preservation Officer
Tap Pilam-Coahuiltecan Nation
American Indians in Texas
1313 Guadalupe Street, Suite 104
San Antonio, Texas 78207

1/31/2011
76FR5410
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RECEIVED
2011 APR 27 AM 11: 15

TEXAS PARKS & WILDLIFE

Life's better outside.®

April 20, 2011

Bo M. Pham
Branch Chief
Projects Branch 1
Division of License Renewal
US Nuclear Regulatory Commission
Washington, D.C. 20555-0001

RE: Proposed license renewal of the South Texas Project Units 1 & 2, Matagorda County, Texas.

Dear Mr. Pham:

The Texas Parks and Wildlife Department (TPWD) has received your request for information regarding potential impacts to threatened and endangered species and for information on other issues of concern relating to the project referenced above. Under section 12.0011 of the Texas Parks and Wildlife Code, TPWD is charged with "providing recommendations that will protect fish and wildlife resources to local, state, and federal agencies that approve, permit, license, or construct developmental projects" and "providing information on fish and wildlife resources to any local, state, and federal agencies or private organizations that make decisions affecting those resources."

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application submitted by the South Texas Project Nuclear Operating Company (STPNOC) for the renewal of the operating license for the South Texas Project (STP), Units 1 and 2. STP is located in Matagorda County, approximately 70 miles south-southwest of Houston.

For the purpose of license renewal, STPNOC stated that STP, Units 1 and 2, operating under renewed licenses, would use existing plant facilities and transmission lines and that no new construction or changes in operation are proposed. In addition, the license renewal application preparation did not identify the need to undertake any major refurbishment or replacement actions to maintain the functionality of the STP systems, structures, and components during the period of extended operation.

Based upon the project description, TPWD does not anticipate significant adverse impacts to rare, threatened or endangered species, or other fish and wildlife resources. However, if the project scope changes and new construction becomes proposed as part of the license renewal process, TPWD requests the opportunity to provide additional comments.

TPWD County Lists

To aid in the preparation of the Supplemental Environmental Impact Statement for the proposed relicensing project, TPWD recommends the use of the county list for rare species in Matagorda County. The TPWD county lists for rare species may be obtained from the following link: http://gis.tpwd.state.tx.us/TpwEndangeredSpecies/DesktopDefault.aspx. These lists provide information regarding rare species that have potential to occur within each county.

4200 SMITH SCHOOL ROAD
AUSTIN, TEXAS 78744-3291
512.389.4800
www.tpwd.state.tx.us

To manage and conserve the natural and cultural resources of Texas and to provide hunting, fishing and outdoor recreation opportunities for the use and enjoyment of present and future generations.

SUNSI Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add - T. Tran (TXT1)

TPWD appreciates the opportunity to work with the Nuclear Regulatory Commission to ensure these projects are developed in the most environmentally sensitive manner as is possible. If you have any questions regarding our comments, please contact Amy Turner at (361) 576-0022.

Sincerely,

Amy Turner

Amy Turner
Wildlife Habitat Assessment Program
Wildlife Division

/ajt:15906

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
c/o TAMU-CC, Campus Box 338
6300 Ocean Drive
Corpus Christi, Texas 78412

June 2, 2011

Mr. Tam Tran
License Renewal Project Manager
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Consultation No. 21430-2007-I-0082

Dear Mr. Tran:

Thank you for your June 1, 2011, telephone call regarding the South Texas Project Nuclear Operating Company's (STPNOC) operating license renewal application for Units 1 and 2 in Matagorda County, Texas. The nuclear plant, Units 1 and 2, and 9 associated 345-kV transmission lines that cross an additional 14 counties current exist are in operation. The facility applied for a renewal in October 2010, and has requested an additional 20 years beyond the initial 40-year licensing period. No new discharge or construction is proposed and the Nuclear Regulatory Commission is in the process of preparing a supplemental Environmental Impact Statement and submitted a species list for the U.S. Fish and Wildlife Service's (Service) review and concurrence.

The Service has reviewed and corrected the list (see enclosed list) and provides the following additional comments. The STPNOC is located in Matagorda County; however, the transmission lines traverse a total of 15 counties. The 15 counties are within three Service Field Offices' areas of responsibility. The Clear Lake Field Office will be the lead office because the plant is located in Matagorda County; however, for any future potential expansions, construction of new transmission lines and/or maintenance and improvements to existing lines please contact the following offices for counties within their area of responsibility.

Clear Lake Ecological Services Field Office - Matagorda, Brazoria, Wharton, Fayette, Colorado
Corpus Christi Ecological Field Office - Victoria, Jackson, DeWitt, Karnes, Wilson, Gonzales, Lavaca
Austin Ecological Services Field Office - Guadalupe, Bexar, Comal
Phone numbers for the respective offices are as follows: 281-286-8282, 361-994-9005, 512-490-0057.

Additional recommendations are also provided for various species.

Whooping crane
All 15 counties are within the whooping crane migratory corridor and some are in the critical wintering grounds of the endangered whooping crane (*Grus americana*) (see Figure 1). Whooping cranes use a variety of habitats including marsh, tidal flats, uplands, and barrier islands and roost in waters less than 10 inches. Whooping cranes usually arrive on the Texas coast between late-October and mid-November and spend almost six months on the wintering grounds. As spring approaches, they leave for the breeding grounds in Canada normally between March 25 and April 15 with the last birds usually gone by May 1st (occasional stragglers may stay into mid-May).

Usually, whooping crane migration flights are generally at altitudes of between 1,000 and 6,000 feet, but they fly at lower altitudes when seeking stopover habitats. They will often make low flights up to two miles from a stopover site to forage late in the day or in early morning. They may also interrupt migration flights to drink and/or forage in agricultural fields or wetlands for brief periods and may be at low altitudes during mid-day. Whooping cranes are largely opportunistic in their use of stopover sites along the Central Flyway, and will use sites with available habitat when weather or diurnal conditions require a break in migration. The Service recommends that: 1) project construction should be complete prior to the spring and autumn migration of late March to early May and mid-September to mid-November, respectively and 2) if equipment above 15 feet is proposed for use during construction or maintenance, please mark and/or lie cranes/equipment down during night time hours and periods of low visibility and 3) for all existing and future transmission lines we recommend the lines be marked with bird diverters to minimize impacts to whooping cranes from collisions during flight.

Ocelot and Gulf coast jaguarundi
Clearing/removal of the surrounding vegetation may particularly affect listed species in the area, including the ocelot and the Gulf coast jaguarundi. Both these endangered cats require dense brush cover; however information from Mexico indicates that the jaguarundi may be more tolerant of open areas. In Texas, the ocelots occur in dense shrubland. Although the ocelot's prime habitat needs are 70 to 90% canopy coverage, it will utilize a lesser degree of cover for hunting areas, and as protected corridors for travel. Roads, narrow water bodies, and rights-of-way, brushy fencelines, watercourses and other brush strips connecting areas of habitat are important for the ocelot. Any cat sightings and road mortalities should be reported immediately to the Service. Both the ocelot and Gulf coast jaguarundi are crepuscular and are active/travel during the dawn to dusk hours; noise and bright lighting used for night construction could dissuade these cats in their movements and should not be used. When assessing impacts to cats the project should be evaluated for loss of habitat, loss of connectivity, construction noise and lights during construction and/or operation.

Bald eagle
The bald eagle has been removed from the Federal Endangered and Threatened list (rule effective August 8, 2007). However, protections provided to the bald eagle under the Bald and Golden Eagle Protection (BGEPA) and the Migratory Bird Treaty Act (MBTA) will continue to remain in place after the species is delisted. Both Federal laws prohibit "take," and the BGEPA prohibits disturbance as a form of "take" as well. To help provide more clarity on the management of the bald eagle after delisting, the Service published a regulatory definition of "disturb" (72 FR 31132), and the Final National Bald Eagle Management Guidelines (72 FR 31156). The management guidelines and further information on the bald eagle may be viewed at http://www.fws.gov. The bald eagle may occur in Colorado, Brazoria, Matagorda, Wharton, Fayette, Victoria, Jackson, DeWitt, Gonzales, Guadalupe, Lavaca, and Comal counties.

Migratory Birds
The Migratory Bird Treaty Act implements various treaties and conventions for the protection of migratory birds. Under the Act, taking, killing or possessing migratory birds is unlawful. Many may nest in trees, brush areas or other suitable habitat. The Service recommends activities requiring vegetation removal or disturbance avoid the peak nesting period of March through August to avoid destruction of individuals, nests or eggs. If project activities must be conducted during this time, we recommend surveying for nests prior to commencing work. If a nest is found, and if possible, the Service recommends a buffer of vegetation (= 50m for songbirds, > 100m for wading birds, and > 180m for terns, skimmers and birds of prey) remain around the nest until young have fledged or the nest is

abandoned. A list of migratory birds may be viewed at http://migratorybirds.fws.gov/intrnltr/mbta/proposedbirdlist.pdf or http://federalregister.gov/a/2010-3294.

Under the Migratory Bird Treaty Act (MBTA) it is unlawful to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, at any time, or in any manner, any migratory bird (*e.g.* waterfowl, shorebirds, birds of prey, song birds, etc.) included in the terms of this Convention…for the protection of migratory birds…or any part, nest, or egg of any such bird." Section 1.1307(a)(3) of the Commission's Rules requires a licensee to file an environmental assessment (EA) for the Commission's review and approval if a licensee's proposed facilities are to be located in an area that: (i) may affect listed threatened or endangered species or designated critical habitats; or (ii) are likely to jeopardize the continued existence of any proposed endangered or threatened species or likely to result in the destruction or adverse modification of proposed critical habitats, as determined by the Secretary of the Interior pursuant to the Endangered Species Act of 1973. *See* 47 C.F.R. 1.1307(a)(3).

Brown Pelican
The brown pelican has been removed from the threatened and endangered list (rule effective December 17, 2009), however, is being monitored for 5 years. It is protected under the Migratory Bird Treaty Act and may occur in Brazoria and Matagorda counties.

Mountain Plover and Black Bear
The mountain plover is not longer being proposed as threatened and the black bear is not found within any of the counties under review.

State Listed Species
The State of Texas protects certain species. Please contact the Texas Parks and Wildlife Department (Endangered Resources Branch), 4200 Smith School Road, Austin, Texas 78744 (telephone 512/389-8021) for information concerning fish, wildlife, and plants of State concern or visit their website at http://www.tpwd.state.tx.us/nature/endang/animals/mammals/.

Wetlands and Wildlife Habitat
Wetlands and riparian zones provide valuable fish and wildlife habitat as well as contribute to flood control, water quality enhancement, and groundwater recharge. Wetland and riparian vegetation provides food and cover for wildlife, stabilizes banks and decreases soil erosion. These areas are inherently dynamic and very sensitive to changes caused by such activities as overgrazing, logging, major construction, or earth disturbance. Executive Order 11990 asserts that each agency shall provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial value of wetlands in carrying out the agency's responsibilities. Construction activities near riparian zones should be carefully designed to minimize impacts. If vegetation clearing is needed in these riparian areas, as is true with this project, they should be re-vegetated with native wetland and riparian vegetation to prevent erosion or loss of habitat. We recommend minimizing the area of soil scarification and initiating incremental re-establishment of herbaceous vegetation at the proposed work sites. Denuded and/or disturbed areas should be re-vegetated with a mixture of native legumes and grasses. Species commonly used for soil stabilization are listed in the Texas Department of Agriculture's (TDA) Native Tree and Plant Directory, available from TDA at P.O. Box 12847, Austin, Texas 78711. To prevent and/or minimize soil erosion and compaction associated with construction activities, avoid any unnecessary clearing of vegetation, and follow established rights-of-way whenever possible. All machinery and petroleum products should be

stored outside the floodplain and/or wetland area during construction to prevent possible contamination of water and soils. No permanent structures should be placed in the 100-year floodplain.

If your project will involve filling of a wetland or riparian area it may require a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers. For permitting requirements please contact the U.S. Corps of Engineers, District Engineer, P.O. Box 1229, Galveston, Texas 77553-1229, (409) 766-3002.

Beneficial Landscaping
In accordance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping, where possible, any landscaping associated with project plans should be limited to seeding and replanting with native species. A mixture of grasses and forbs appropriate to address potential erosion problems and long-term cover should be planted when seed is reasonably available. Although Bermuda grass is listed in seed mixtures, this species and other introduced species should be avoided as much as possible. The Service also recommends the use of native trees, shrubs, and herbaceous species that are adaptable, drought tolerant and conserve water.

Service Response
Please note that the Service strives to respond to requests for project review within 30 days of receipt, however, this time period is not mandated by regulation. Responses may be delayed due to workload and lack of staff. Failure to meet the 30-day timeframe does not constitute a concurrence from the Service that the proposed project will not have impacts to threatened and endangered species.

We thank you for your concern for endangered and threatened species, migratory birds, and other wildlife resources, and we appreciate the opportunity to comment and review the proposed action and species list. If we can be of further assistance or if you have any questions about these comments; please contact Mary Orms at 361/994-9005, extension 246 or at Mary_Orms@fws.gov. Please refer to the Service Consultation number listed above in any future correspondence regarding this project.

Sincerely,

E. Dawn Whitehead

for Allan M. Strand
Field Supervisor

cc: Moni Belton, Clear Lake Ecological Services Field Office, Houston, TX
Bill Seawell, Austin Ecological Services Field Office, Austin, TX

Attachments

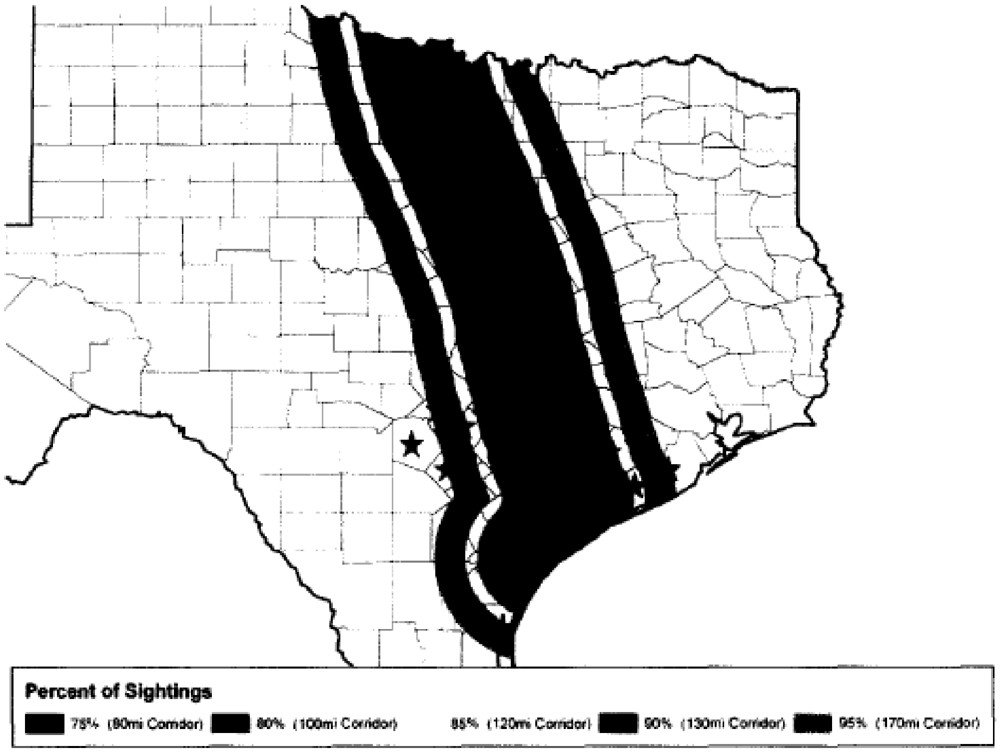

Figure 1. Whooping Crane Migratory Corridor

Federally Listed Species Potentially Occurring On and In The Vicinity of the South Texas Project Site and Its Associated Transmission Line Rights-of-Way

Scientific Name	Common Name	Federal Status	County(Counties) of Occurrence
Amphibians			
Bufo houstonensis	Houston Toad	E	Colorado, Lavaca
Eurycea nana	San Marcos salamander	T	Bexar, Comal
Typhlomolge rathbuni	Texas blind salamander	E	Bexar, Comal
Arachnids			
Cicurina baronia	Robber baron cave meshweaver	E	Bexar
Cicurina madla	Madla's cave meshweaver	E	Bexar
Cicurina venii	Braken bat cave meshweaver	E	Bexar
Cicurina vespera	Government Canyon bat cave meshweaver	E	Bexar
Neoleptoneta microps	Government Canyon bat cave spider	E	Bexar
Texella cokendolpheri	Cokendolpher cave harvestman	E	Bexar
Birds			
Charadrius melodus	piping plover	T	Brazoria, Matagorda
Dendroica chrysoparia	golden-cheeked warbler	E	Bexar, Comal
Falco *femoralis septentrionalis*	northern aplomado falcon	E	Matagorda
Tympanuchus cupido attwateri	Attwater's greater prairie-chicken	E	Colorado, Victoria
Vireo atricapilla	black-capped vireo	E	Bexar, Comal
Grus americana	whooping crane	E	Bexar, Comal, Colorado, Brazoria, Matagorda, Wharton, Fayette, Victoria, Jackson, DeWitt, Karnes, Wilson, Gonzales, Guadalupe, Lavaca
Crustaceans			
Stygobromus pecki	Peck's cave amphipod	E	Bexar, Comal
Fish			
Etheostoma *fonticola*	fountain darter	E	Bexar, Comal
Gambusia georgei	San Marcos gambusia	E	Bexar, Comal
Flowering Plants			
Zizania texana	Texas wild rice	E	Bexar, Comal
Spiranthes parksii	Navasota ladies' tresses	E	Fayette
Insects			
Heterelmis comalensis	Comal Springs riffle beetle	E	Bexar, Comal
Rhadine exilis	*unnamed* ground beetle	E	Bexar
Rhadine infernalis	*unnamed* ground beetle	E	Bexar
Stygoparnus comalensis	Comal Springs dryopid beetle	E	Bexar, Comal
Batrisodes venyivi	Helotes mold beetle	E	Bexar
Mammals			
Herpailurus yagouaroundi cacomitli	Gulf Coast jaguarondi	E	Karnes
Leopardus pardalis	ocelot	E	Karnes

Trichechus manatus	West Indian manatee	E	Jackson
Reptiles			
Caretta car*etta*	loggerhead sea turtle	T	Brazoria, Matagorda
Chelonia mydas	green sea turtle	T	Brazoria, Matagorda
Dermochelys coriacea	*leatherback* sea turtle	E	Brazoria, Matagorda
Eretmochelys imbricate	*hawksbill* sea turtle	E	Brazoria, Matagorda
Lepidochelys kempii	Kemp's ridley sea turtle	E	Brazoria, Matagorda

From: Bill Martin [mailto:Bill.Martin@thc.state.tx.us]
Sent: Monday, May 02, 2011 12:24 PM
To: O'Neil, Tara
Cc: Tran, Tam; Travers, Allison; Leigh, Kimberly D
Subject: RE: STP License Renewal - SHPO Meeting

OK, Tara. Thanks!

From: O'Neil, Tara [mailto:tara.oneil@pnl.gov]
Sent: Monday, May 02, 2011 2:11 PM
To: Bill Martin
Cc: Tran, Tam; Travers, Allison; Leigh, Kimberly D
Subject: STP License Renewal - SHPO Meeting

Bill,

This is a follow-up email to document our phone conversation just a few minutes ago. We determined at this point in time that there is no need for the NRC to meet with the Texas Historical Commission (THC) regarding cultural resources at the STP site for the license renewal project action (track number 201002271).

The NRC will conduct the cultural resources environmental audit the week of May 23, 2011 for South Texas Project Units 1 & 2. We will contact you after the audit, if we have questions or concerns.

We will check the THC website in a few weeks for tribal consultation guidance.

Thank you,

Tara O'Neil
Archaeologist

Tara K. O'Neil

From: Tran, Tam [mailto:Tam.Tran@nrc.gov]
Sent: Thursday, April 28, 2011 10:10 AM
To: Bill Martin
Cc: Leigh, Kimberly D; O'Neil, Tara; Travers, Allison
Subject: RE: track number

Hello,

I appreciate the opportunity to talk with you this week about the South Texas Project (STP), units 1 and 2, license renewal. As stated in the attached letter of consultation to SHPO of February 17, 2011, the staff planned to conduct an audit at the STP site and would like to invite your office to attend this review. The cultural audit portion of this review is now scheduled for the week of May 23-26. If meeting at the STP site is not feasible, the staff would like to visit your office during the May 23-26 week, for consultation as follow:

- Discuss NRC's licensing action, schedule, opportunities to participate in the NEPA process, and process for completing Section 106 and any questions or issues the SHPO may have concerning cultural resources (follow-up of the February 17, 2011 letter introducing the project and NRC plan to coordinate compliance with Section 106 of the National Historic Preservation Act with NEPA, in accordance with 36 CFR 800.8c)
- Discuss specific information inquiry concerning known cultural resource surveys and sites that may be of concern in the affected area for STP license renewal
- Discuss information inquiry about which affected Tribes and interested parties who have historical ties to the area, as it relates to STP license renewal
- Discuss SHPO concurrence in the STP letter dated March 17, 2009 requesting concurrence that there would be no effect to historic properties, from the license renewal and associated operation and maintenance activities (SHPO responded with "stamping" concurring that no historic properties affected and license renewal may proceed, dated 10/26/2009)
- Discuss the staff's confirmatory review by checking the SHPO Texas Historic Sites Atlas that can be accessed remotely

If the consultation will be at your office in Austin, the staff will drive from the STP site to Austin for this purpose during the May 23-26 week; hence, please let us know which date would be feasible for this meeting. Alternatively, please let us know if you have other suggestions.

Thanks/Tam

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 17, 2011

Juan Garza Jr., Chairman
Kickapoo Traditional Council
HCR1 Box 9700
Eagle Pass, TX 78852

SUBJECT: SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL ENVIRONMENTAL REVIEW

Dear Chairman Juan Garza Jr.:

The U.S. Nuclear Regulatory Commission (NRC) would like to thank you for your letter dated April 1, 2011, in response to the NRC's request for comments regarding the proposed license renewal of South Texas Project (STP) and the associated environmental review. The NRC values the importance of establishing and maintaining open lines of communication with the Kickapoo Tribal Council. For your information, the draft Supplemental Environmental Impact Statement for license renewal of STP is scheduled to be published in 2012 and will be provided to you for comment.

If at any time you have questions or concerns regarding the STP environmental review process, please contact Tam M. Tran, Project Manager, at 301-415-3617 or by e-mail at Tam.Tran@nrc.gov.

Sincerely,

David J. Wrona, Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

cc: Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 17, 2011

Mr. Don L. Patterson, Tribal President
Attention: Miranda Allen
Tonkawa Tribe of Oklahoma
1 Rush Buffalo Road
Tonkawa, OK 74653

SUBJECT: SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL ENVIRONMENTAL REVIEW

Dear Mr. Don L. Patterson,

The U.S. Nuclear Regulatory Commission (NRC) would like to thank you for your letter dated February 15, 2011, in response to this agency's request for comments concerning the proposed license renewal of South Texas Project (STP) and the associated environmental review. The NRC values the importance of establishing and maintaining open lines of communication with the Tonkawa Tribe of Oklahoma.

In response to your comment, the NRC will notify the Tonkawa Tribe if any information about human remains, funerary objects, or other evidence of historical or cultural significance are discovered during the STP license renewal environmental review. For your information, the draft Supplemental Environmental Impact Statement for license renewal of STP is scheduled to be published 2012 and will be provided to you for comment.

If at any time you have questions or concerns regarding the STP environmental review process, please contact Tam M. Tran, Project Manager, at 301-415-3617, or by e-mail at Tam.Tran@nrc.gov.

Sincerely,

David J. Wrona. Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

cc: Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 29, 2011

Raymond Hernandez
Cultural Preservation Officer
Tap Pilam-Coahuiltecan Nation
American Indians in Texas
1313 Guadalupe Street, Suite 104
San Antonio, TX 78207

SUBJECT: SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL ENVIRONMENTAL REVIEW

Dear Mr. Hernandez:

The U.S. Nuclear Regulatory Commission (NRC) would like to thank you for your letter dated April 1, 2011, sent in response to the NRC's request for comments concerning the proposed license renewal of South Texas Project (STP) and the associated environmental review. The NRC values the importance of establishing and maintaining open lines of communication with the Tap Pilam-Coahuitecan Nation. Accordingly, the NRC would like to address the concerns identified in your comment letter.

In your letter, you raised a concern about missing archaeological data in the applicant's environmental report (ER). In response, the NRC issued a request for additional information (RAI), and the STP Nuclear Operating Company has provided the NRC (documented in the enclosed letter dated July 5, 2011) with additional data and documentation on the three cultural sites mentioned in Attachment D of the ER. The NRC finds the new data to be sufficient for both the National Environmental Policy Act (NEPA) review and National Historic Preservation Act (NHPA) Section 106 review. In addition, the environmental review will consider the potential effects on historical French and Spanish colonial settlements from activities associated with STP operation during the period of extended operation. The staff will document its review in Sections 2, 4, and 8 of the draft Supplemental Environmental Impact Statement (DSEIS).

In response to your concern about "a nuclear disaster similar to the one occurring in Japan" and the prospect of inaccessibility "to the cultural roots and ties to the land," the NRC is responsible for licensing and regulating the operation of nuclear power plants to ensure the protection of public health and safety and the environment. The safe operation of nuclear power plants is not limited to license renewal. The NRC ensures safe operation of nuclear power plants on an ongoing basis at every nuclear power plant. The NRC performs safety inspections throughout the operating life of the plant, whether during the current or renewed operating license period.

For your information, the NRC near-term task force review of insights from the Fukushima Dai-Ichi accident is documented in a report entitled "Recommendations for Enhancing Reactor Safety in the 21st Century." This report can be found on the internet at: http://pbadupws.nrc.gov/docs/ML1118/ML111861807.pdf.

On July 12, 2011, the task force issued this report (ML111861807) and then the NRC staff presented its recommendations to the Commission on July 19, 2011. As part of the short-term review, the task force concluded that, while improvements [safety enhancements] are expected to be made as a result of the lessons learned from the events in Japan, the continued operation of nuclear power plants and licensing activities for new plants do not pose an imminent risk to public health and safety. In the meantime, the NRC will continue to oversee and monitor nuclear power plants to ensure that U.S. reactors remain safe. Additional information about what the NRC is doing to ensure the continued protection of health and safety at U.S. nuclear power plants following the events in Japan can be found at http://www.nrc.gov/japan/japan-info.html.

Again, thank you for your comments. These and other comments received during the public scoping period will be addressed in the DSEIS for license renewal of STP. The DSEIS is scheduled to be published in 2012 and will be provided to you for comment. If you need additional information regarding the STP environmental review process or this letter, please contact Tam Tran, Project Manager, at 301-415-3617 or by e-mail at Tam.Tran@nrc.gov.

Sincerely,

David J. Wrona, Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosure:
As stated

cc w/encl.: Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

January 19, 2012

Mary Sixwomen Blount
Principle Chief
Apalachicola Creek Indians
113 N First Street
Mabank, TX 75147

SUBJECT: SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL ENVIRONMENTAL REVIEW

Dear Ms. Blount:

The U.S. Nuclear Regulatory Commission (NRC) thanks you for your letter dated March 7, 2011, in response to the NRC's request for comments in the letter dated February 17, 2011, concerning the environmental review of the South Texas Project (STP) license renewal. The NRC values the importance of establishing and maintaining open lines of communication with the Apalachicola Creek Indians. Accordingly, the NRC would like to address some of your concerns regarding compliance with National Environmental Policy Act (NEPA).

You informed the NRC about your interviews of tribal members living in the general area of the STP and provided comments. The NRC responds to your comments as follows:

- In response to your comment concerning hiring a Native American Anthropologist familiar with the migratory habits of Texas/Louisiana tribes, the NRC notes that a qualified expert on Native American (Archeologist) is a part of the NRC team who is conducting the environmental review in accordance with NEPA requirements to comply with the National Historic Preservation Act (NHPA) Section 106. Chapter 2 of the draft Supplemental Environmental Impact Statement (DSEIS) will describe the known cultural resources at the STP site. When published, Chapter 4 of the DSEIS will describe impacts to known cultural resources at the STP site as a result of license renewal.

- In response to your comment concerning the impacts to the residents in the area who are poor and non-white, impacts to all low-income and minority individuals living within a 50-mile radius will be considered as a part of the staff's review in accordance with NEPA requirements. Chapter 4.9 of the DSEIS will document the staff's review.

M. Sixwomen Blount - 2 -

Again, thank you for your comments. These and other comments received during the public scoping period will be addressed in the DSEIS for license renewal of STP. The DSEIS is scheduled for 2012 and will be provided to you for comment. If you need additional information regarding the STP environmental review process or this letter, please contact Tam Tran, Project Manager, at 301-415-3617, or by e-mail at Tam.Tran@nrc.gov.

Sincerely,

David J. Wrona, Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

cc: Listserv

APPENDIX E
CHRONOLOGY OF ENVIRONMENTAL REVIEW CORRESPONDENCE

CHRONOLOGY OF ENVIRONMENTAL REVIEW CORRESPONDENCE

This appendix contains a chronological listing of correspondence between the U.S. Nuclear Regulatory Commission (NRC) and external parties as part of its environmental review for the South Texas Project (STP). All documents, with the exception of those containing proprietary information, are available electronically from the NRC's Public Electronic Reading Room, which is found on the Internet at the following web address: http://www.nrc.gov/reading-rm.html. From this site, the public can gain access to the NRC's Agencywide Documents Access and Management System (ADAMS), which provides text and image files of NRC's public documents. The ADAMS accession number for each document is included below.

E.1 Environmental Review Correspondence

Table E–1 lists the environmental review correspondence in date order beginning with the request by South Texas Project Nuclear Operating Company (STPNOC) to renew the operating licenses for STP.

Table E–1. Environmental Review Correspondence

Date	Correspondence Description	ADAMS No.
10/25/10	STP, Units 1 and 2, Transmittal of LRA	ML103010257
11/4/10	Press Release-10-202, "NRC Announces Availability of License Renewal Application for South Texas Project Nuclear Power Plant"	ML103081029
11/23/10	Maintenance of Reference Materials at the Bay City Public Library for the Review of STP License Renewal Application	ML103090389
11/23/10	Receipt and availability of the LRA For STP, Units 1 and 2 (LTR)	ML103020399
12/9/10	Project Manager Change for the License Renewal of STP, Units 1 and 2 (TAC No. ME4936)	ML103410524
1/6/11	Acceptance of LRA for STP, Units 1 and 2	ML103440610
1/7/11	Determination of acceptability and sufficiency for docketing, proposed review schedule, and opportunity for a hearing regarding the application from STPNOC for renewal of the operating licenses for STP electric gene	ML103420531
1/7/11	Notice of acceptance for docketing of the application and notice of opportunity for hearing regarding renewal of facility operating license numbers NPF-76 and NPF-80 for an additional 20-year period STPNOC, STP	ML103420650
1/13/11	Press Release-11-009: "NRC Announces Opportunity for Hearing on Application to Renew Operating Licenses for South Texas Project Nuclear Power Plant"	ML110130500
1/21/11	Notice of intent to prepare an environmental impact statement (EIS) and conduct scoping process for license renewal for STP, Units 1 and 2	ML103490511
1/25/11	3/2/11—forthcoming meeting to discuss the license renewal process and environmental scoping for STP, Units 1 and 2, LRA review	ML103510697
1/27/11	STP, Units 1 and 2, LRA review (ACHP)	ML110190591
1/31/11	Comment (44) of Edmund E. Kelley, opposing STP, Units 1 and 2, LRA review	ML11105A023
1/31/11	Comment (51) of Juan Aguilar, on behalf of self, opposed to relicensing of STP, Units 1 and 2	ML11119A011

Date	Correspondence Description	ADAMS No.
1/31/11	Comment (52) of Juan Aguilar, on behalf of self, opposing STP, Units 1 and 2, relicensing application	ML11119A012
1/31/11	Comment (54) of Shawn Tracy, on behalf of self, opposing STP, Units 1 and 2, relicensing application	ML11119A014
2/7/11	Press Release-11-017: "NRC to Meet with Public March 2 for Input on South Texas Project Nuclear Plant Environmental Review for License Renewal"	ML110380405
2/9/11	Comanche Nation—request for comments concerning the STP, Units 1 and 2, LRA review	ML110390265
2/9/11	Kiowa Tribe of Oklahoma—Request for comments concerning the STP, Units 1 and 2, LRA review	ML110390244
2/9/11	Ysleta del Sur Pueblo—Request for comments concerning the STP, Units 1 and 2, LRA review	ML110190385
2/9/11	Alabama-Coushatta Tribe—Request for comments concerning the STP, Units 1 and 2, LRA review	ML110190418
2/15/11	Comment (1) of Miranda Allen, on behalf of the Tonkawa Tribe of Oklahoma on request for comments concerning the STP, Units 1 and 2, LRA review	ML110490057
2/16/11	Request for list of Federally protected species and important habitats within the area under evaluation for the STP, Units 1 and 2, license renewal (FWS)	ML110190429
2/16/11	Request for list of Federally protected species and important habitats within the area under evaluation for the STP, Units 1 and 2, LRA review (NMFS)	ML110190434
2/16/11	Request for list of state-protected species and important habitats within the area under evaluation for the STP, Units 1 and 2, LRA review (Texas Parks and Wildlife Department)	ML110190571
2/17/11	Request for comments concerning the STP, Units 1 and 2, LRA review (Tribes)	ML110390321
2/17/11	STP, Units 1 and 2, LRA online reference portal	ML110610201
2/17/11	STP, Units 1 and 2, LRA review (SHPO)	ML110190549
2/23/11	Kickapoo Traditional Council—Request for comments concerning the STP, Units 1 and 2, LRA review	ML110240161
2/28/11	Comment (46) of Randy K. Weber, on behalf of Texas House of Representatives, supporting license renewal for STP, Units 1 and 2	ML11108A059
2/28/11	Schedule for the conduct of review of the STP, Units 1 and 2, LRA	ML110340478
3/3/11	3/3/11—NRR e-mail capture—STP (NMFS)	ML110690848
3/7/11	Comment (3) of Mary Sixwomen Blount, on behalf of Apalachicola Creek Indians, on STP, Units 1 and 2, LRA	ML110750424
3/11/11	Comment (2) of Vicki Adams, approving notice of intent to prepare an EIS and conduct the scoping process for STP, Units 1 and 2	ML110730188
3/14/11	Declaration of Karen Hadden on behalf of SEED Coalition	ML110740852
3/14/11	Declaration of Susan Dancer on behalf of SEED Coalition	ML110740850
3/14/11	Notice of appearance of Susan Dancer on behalf of SEED Coalition	ML110740851
3/14/11	Petition for leave to intervene and request for hearing of SEED Coalition and Susan Dancer	ML110740848
3/16/11	Referral memorandum of the Secretary to the Board regarding license application request for STPNOC, STP, Units 1 and 2	ML110750603

Date	Correspondence Description	ADAMS No.
3/17/11	Referral memorandum of the Secretary to the Board regarding license application request for STPNOC, STP, Units 1 and 2 (reissued)	ML110760289
3/17/11	STP, Units 1 and 2, LRA online reference portal	ML110620203
3/23/11	Establishment of Atomic Safety and Licensing Board in the matter of STPNOC, STP, Units 1 and 2, license renewal	ML110820735
3/24/11	Comment (31) of Jennifer Meador, opposing relicensing of STP, Units 1 and 2	ML111010604
3/28/11	Comment (34) of unknown individual, supporting nuclear power and relicensing of STP, Units 1 and 2	ML111010507
3/28/11	Comment (37) of Carolyn Campbell, opposing STP, Units 1 and 2, relicensing (NRC-2010-0375)	ML111010510
3/28/11	Comment (48) of Beth Ann Larsen, on behalf of self, opposing STP, Units 1 and 2, relicensing application	ML11119A007
3/28/11	Comment (49) of Dzan Nguyen, opposed to relicensing STP, Units 1 and 2	ML11119A008
3/28/11	Comment (55) of Kelly Simon, on behalf of self, opposing relicensing of STP nuclear reactors	ML11119A015
3/28/11	Comment (58) of Cynthia Gebhardt, on behalf of self, opposing STP, Units 1 and 2, relicensing application	ML11119A018
3/28/11	Comment (59) of Rory Holcomb, on behalf of self, opposing STP, Units 1 and 2, relicensing application	ML11119A019
3/29/11	Comment (4) of Julie Sharp, on behalf of National Park Service, in regards to STPNOC STP with determination that no park units will be affected	ML110910179
3/30/11	Comment (32) Of Joy Malacara, opposing relicensing of STP, Units 1 and 2	ML111010479
3/30/11	Comment (33) of Melanie and David Winters, opposing STP, Units 1 and 2, relicensing	ML111010506
3/30/11	Comment (35) of Christine Fry, opposing STP, Units 1 and 2, relicensing (NRC-2010-0375)	ML111010508
3/30/11	Comment (36) of Leona A. Slodge, opposing STP, Units 1 and 2, relicensing	ML111010509
3/30/11	Comment (39) of B. Dunlap and T. Rinehart, opposing relicensing of STP, Units 1 and 2	ML111010517
3/30/11	Comment (40) of Peggy Cravens, opposing the relicensing of STP, Units 1 and 2	ML111010518
3/30/11	Comment (53) of Douglas S. McArthur, opposing relicensing of STP	ML11119A013
3/30/11	Comment (6) of Eva Esparza, opposing STPNOC's notice of intent to prepare an EIS and conduct the scoping process for STP, Units 1 and 2	ML110960078
3/30/11	Comment (60) of unknown individual on behalf of self, opposing relicensing of STP, Units 1 and 2, for an additional 20 years	ML11119A020
3/30/11	Comment (7) of Darby Riley, regarding notice of intent to prepare an EIS and conduct the scoping process for STP, Units 1 and 2	ML110960079
3/30/11	Comment (38) of Melanie Sallis, opposing the relicensing of STP, Units 1 and 2	ML11273A082
3/31/11	Comment (10) of Karen Seal, opposing the licensing of STP, Units 1 and 2	ML110960082
3/31/11	Comment (5) of Peggy Pryor, opposing STP plants	ML110960077
3/31/11	Comment (8) of Kamala Platt, opposing STP relicensing	ML110960080

Date	Correspondence Description	ADAMS No.
3/31/11	Comment (9) of Marion Mlotok, opposing the renewal of STP, Units 1 and 2	ML110960081
4/1/11	Comment (11) of Kassandra Levay, opposing STPNOC's notice of intent to prepare an EIS and conduct the scoping process for STP, Units 1 and 2	ML110960083
4/1/11	Comment (12) of unknown individual, regarding notice of intent to prepare an EIS and conduct the scoping process for STP, Units 1 and 2	ML110960084
4/1/11	Comment (13) of T. Burns, opposing South Texas plants (NRC-2010-0375)	ML110960086
4/1/11	Comment (14) of Jolly J. Clark, opposing the relicensing of STP, Units 1 and 2	ML110960087
4/1/11	Comment (15) of Pat Bulla, regarding the decommissioning of STP, Units 1 and 2, not relicensing it	ML110960088
4/1/11	Comment (16) of William Stout, supporting the decommissioning of STP, Units 1 and 2, not relicensing it	ML110960089
4/1/11	Comment (19) of Carol Geiger, opposing the renewal of STP, Units 1 and 2, licensing	ML110960092
4/1/11	Comment (20) of Veryan Thompson, supporting STP, Units 1 and 2, decommissioning and denying its LRA	ML110960093
4/1/11	Comment (21) of Robert Singleton, opposing license extension for STP, Units 1 and 2	ML110960094
4/1/11	Comment (22) of Karen Hadden, on behalf of sustainable energy and economic development coalition, opposing relicensing of STP, Units 1 and 2	ML110960095
4/1/11	Comment (23) of Alan Alan Apurim, opposing relicensing of STP, Units 1 and 2	ML110960096
4/1/11	Comment (24) of Brandi Clark Burton, on behalf of self, opposing STP, Units 1 and 2, extending its license application renewal for public safety and environmental reasons	ML110960097
4/1/11	Comment (25) of Carol Geiger, on behalf of self, opposing STP, Units 1 and 2, extending its license application renewal	ML110960098
4/1/11	Comment (27) of Juan Garza, on behalf of Kickapoo Traditional Tribe of Texas, on the STP, Units 1 and 2, LRA review	ML110980503
4/1/11	Comment (45) of Maria Hogan, on safety standards of STP, Units 1 and 2, being followed	ML11105A020
4/1/11	Comment (47) of Miguel Acosta, on behalf of Raymond Hernandez of Tap Pilam Coahuiltecan Nation, opposing the renewal license for STP, Units 1 and 2	ML11111A134
4/4/11	Comment (17) of C.J. Keudell, opposing the relicensing of STP, Units 1 and 2	ML110960090
4/4/11	Comment (18) of Tarek Tonsson, opposing the relicensing of STP, Units 1 and 2	ML110960091
4/4/11	Comment (26) of Eric Lane, on behalf of self, opposing STP, Units 1 and 2, extending its license application renewal	ML110960099
4/5/11	Project Manager change for the license renewal of STP, Units 1 and 2 (TAC No. ME4938)	ML110872079
4/7/11	4/7/11—Notice of appearance of Steven P. Frantz (STPNOC)	ML110970467
4/7/11	4/7/11—The NRC staff's answer to petition for leave to intervene and request for hearing of SEED Coalition and Susan Dancer	ML110970659
4/7/11	STPNOC's answer opposing request for hearing and petition for leave to intervene	ML110970544

Date	Correspondence Description	ADAMS No.
4/8/11	Comment (28) of Jenna Findley, opposing STP, Units 1 and 2, relicensing (NRC-2010-0375)	ML111010476
4/8/11	Comment (29) of Margaret Reed, opposing the relicensing of STP, Units 1 and 2	ML111010477
4/8/11	Comment (30) of Scott and Cyndy Reynolds, opposing relicensing of STP Nuclear reactors	ML111010478
4/9/11	Comment (43) of Thomas Nehms, opposing the relicensing of STP, Units 1 and 2	ML111010521
4/11/11	Comment (41) of Shannon Jurak, opposing the relicensing of STP, Units 1 and 2	ML111010519
4/11/11	Comment (42) of Thomas Nelms, opposing the relicensing of STP, Units 1 and 2	ML111010520
4/20/11	Comment (61) of Amy Turner, on behalf of Texas Parks and Wildlife, on proposed license renewal of STP, Units 1 and 2, Matagorda County, TX	ML11119A009
4/26/11	Comment (50) of John Trimble, opposing relicensing of STP, Units 1 and 2 (NRC-2010-0375)	ML11119A010
4/26/11	Comment (56) of unknown individual, opposing STP, Units 1 and 2, LRA	ML11119A016
4/26/11	Comment (57) of Judy Moore, on behalf of self, opposing relicensing of STP nuclear reactors	ML11119A017
5/5/11	Notice of withdrawal of Megan Wright in the matter of STP, Units 1 and 2	ML111250147
5/8/11	Interveners request for oral argument on contentions raised on relicensing	ML111280003
5/8/11	Petitioners' proposed amended petition for leave to intervene and request for hearing of SEED Coalition and Susan Dancer	ML111280002
5/9/11	Notice of withdrawal of Emily Monteith	ML111290341
5/11/11	Certificate of service for amended petition to intervene and request for hearing	ML111310798
5/11/11	Certificate of service for request for oral hearing	ML111310800
5/19/11	Summary of meeting with stakeholders to discuss issues related to the review of the STP, Units 1 and 2, LRA	ML110770661
5/23/11	Memorandum (notice pursuant to 10 CFR § 2.309(i))	ML111430828
5/23/11	Order (scheduling oral argument)	ML111430799
5/31/11	RAIs for the review of the STP LRA	ML11140A015
6/2/11	U.S. Fish and Wildlife Service Consultation #65533—STPNOC	ML11173A235
6/2/11	The NRC staff's answer to proposed amended petition for leave to intervene and request for hearing of SEED Coalition and Susan Dancer	ML111530393
6/2/11	STPNOC's answer opposing amended petition to intervene	ML111530425
6/13/11	Press Release-11-103: "Licensing Board to Hold Teleconference Oral Argument June 27 on South Texas Project Reactor License Renewal Application"	ML11166A046
6/17/11	5/18/11—Summary of telephone conference call held between the NRC and STP, concerning RAI pertaining to the STP LRA—severe accident mitigation alternative RAI	ML11143A166
6/17/11	RAI for the review of the STP LRA	ML11167A113
6/21/11	Plan for the environmental-related regulatory audit regarding the STP, Units 1 and 2, LRA Review (TAC Nos. ME4938 and ME4939)	ML11145A064

Date	Correspondence Description	ADAMS No.
6/27/11	Transcript of STPNOC's oral argument (telephone conference) on June 27, 2011, pages 1–22	ML11182B033
7/5/11	STP, Units 1 and 2, response to RAI for the review of the LRA	ML11193A074
7/5/11	STP, Units 1 and 2, response to RAI for the STP LRA	ML11193A016
7/18/11	Audit report regarding STP LRA—cultural resource	ML11173A304
7/27/11	License renewal environmental review for STP, Units 1 and 2 (open meeting/records request, CPGCD)	ML11217A017
7/28/11	Memorandum revised (notice pursuant to 10 CFR § 2.309(i))	ML11210B458
8/4/11	RAI for the review of the STP LRA (TAC Nos. ME4938 and ME5122)	ML11201A062
8/4/11	Summary of site audit related to the review of the LRA for STP, Units 1 and 2	ML11196A005
8/18/11	RAI for the review of the STP LRA (TAC Nos. ME4938 and ME512)	ML11214A207
8/22/11	Comment (63) of Sandra Horris, on behalf of Coastal Plains Groundwater Conservation District, on relicensing of STP, Units 1 and 2 (NRC-2010-0375)	ML11249A042
8/23/11	STP, Units 1 and 2, response to RAI for LRA	ML11250A067
8/23/11	Summary of telephone conference call held on July 28, 2011, between the NRC and STPNOC, concerning RAI pertaining to the STP LRA	ML11216A263
8/26/11	Memorandum and order (ruling on petition for leave to intervene and request for hearing)	ML11238A160
8/31/11	Documents to support review of the STP LRA, list of transmitted documents including copy of each document, and enclosure to NOC-AE-11002720	ML11256A057
8/31/11	Documents to support review of the STP LRA, WR–11, "A Summary of Historic and Current (past 5 years) Total Dissolved Solids Data for Groundwater Produced by STP Production Wells from the Deep Chicot Aquifer"	ML11256A059
8/31/11	Documents to support review of the STP LRA, WR–5, TCEQ ID No. 1610103/1610051, "Operation Of Public Potable Water System"	ML11256A058
8/31/11	STP, Units 1 and 2, transmittal of documents to support review of the STP LRA	ML11256A056
9/1/11	RAI for the review of the STP LRA	ML112360114
9/6/11	STP, Units 1 and 2, response to RAI for the LRA	ML11255A211
9/12/11	STP, Units 1 and 2, response to RAI for the LRA	ML11259A014
9/12/11	STP, Units 1 and 2, transmittal of document to support review of the LRA	ML11259A031
9/13/11	9/13/11—NRR e-mail capture, STP license renewal, State Historic Preservation Office meeting	ML11259A029
9/22/11	STP, Units 1 and 2, response to RAIs for LRA (TAC Nos. ME4938 and ME5122)	ML11270A060
9/28/11	RAIs for the review of the STP LRA (TAC Nos. ME4938 And ME5122)	ML11269A002
10/18/11	STP, Units 1 and 2, response to RAIs for LRA (TAC Nos. ME4938 and ME5122)	ML11298A085
10/26/11	STP, Units 1 and 2, contact information change, LRA (TAC Nos. ME4936 and ME4937)	ML11305A075
10/26/11	STP, Units 1 and 2, correction to NRC distribution list	ML11307A371
11/17/11	STP, Units 1 and 2, license renewal environmental review (Kickapoo Traditional Council)	ML11269A011

Date	Correspondence Description	ADAMS No.
11/17/11	STP, Units 1 and 2, license renewal environmental review (Tonkawa Tribe of Oklahoma)	ML11269A015
11/17/11	STP, Units 1 and 2, clarification to response to RAI for LRA (TAC Nos. ME4938 and ME5122)	ML11333A094
11/29/11	11/1/11—Summary of telephone conference call between the NRC and STPNOC concerning RAIs pertaining to the STP LRA	ML11307A381
11/29/11	STP, Units 1 and 2, license renewal environmental review (Tap Pilam-Coahuiltecan Nation)	ML11269A112
1/4/12	12/15/11—Summary of telephone conference call between NRC and STPNOC concerning RAI pertaining to the STP LRA	ML11350A222
1/10/12	STP, Units 1 and 2, clarification of Information in support of the review of the LRA	ML12011A188
1/19/12	STP, Units 1 and 2, license renewal environmental review	ML11269A063
2/14/12	1/31/12—Summary of telephone conference call held between the NRC and STPNOC concerning RAIs pertaining to the STP LRA	ML12033A134
2/16/2012	STP, Units 1 and 2, clarification to response to RAI for LRA (TAC Nos. ME4938 and ME5122)	ML12053A259
2/29/2012	RAI for the Review of the STP LRA (TAC Nos. ME4938 And ME5122)	ML12017A128
2/29/2012	1/7/12—Summary of telephone conference call between the NRC and STPNOC concerning RAIs pertaining to the STP	ML12047A285
3/12/2012	STP, Units 1 and 2, response to RAIs for LRA (TAC Nos. ME4938 and ME5122)	ML12079A014
4/17/2012	STP, Units 1 and 2, renewal of the Wastewater Discharge Permit	ML12114A198
5/8/2012	NEPA consultation—Waterborne outbreak	ML12128A061
5/18/2012	Environmental Permit Updated Status	ML12142A002

APPENDIX F
NRC STAFF EVALUATION OF SEVERE ACCIDENT MITIGATION ALTERNATIVES

NRC STAFF EVALUATION OF SEVERE ACCIDENT MITIGATION ALTERNATIVES

F.1 Introduction

South Texas Project Nuclear Operating Company (STPNOC) submitted an assessment of severe accident mitigation alternatives (SAMAs) for the South Texas Project, Units 1 and 2, (STP) as part of its Environmental Report (ER) (STPNOC 2010). This assessment was based on the most recent STP probabilistic risk assessment (PRA) available at that time, a plant-specific offsite consequence analysis performed using the MELCOR Accident Consequence Code System 2 (MACCS2) computer code, and insights from the STP individual plant examination (IPE) and individual plant examination of external events (IPEEE) (HL&P 1992). In identifying and evaluating potential SAMAs, STPNOC considered SAMAs that addressed the major contributors to core damage frequency (CDF) and population dose at STP, as well as SAMA candidates found to be potentially cost beneficial in six other license renewal applications (LRAs). STPNOC initially identified a list of 21 potential SAMAs. This list was reduced to five unique SAMA candidates by eliminating SAMAs that are not applicable to STP for one or more of the following reasons:

- The SAMA has design differences at STP.
- The SAMAs have already been implemented at STP.
- The SAMA has estimated implementation costs that would exceed the dollar value associated with eliminating the severe accident risk at STP.

STPNOC assessed the costs and benefits associated with each of the potential SAMAs and concluded in the ER that none of the candidate SAMAs evaluated are potentially cost beneficial.

As a result of the review of the SAMA assessment, the U.S. Nuclear Regulatory Commission (NRC) staff (the staff) issued requests for additional information (RAIs) to STPNOC by letters dated May 31, 2011 (NRC 2011a), and September 1, 2011 (NRC 2011b), and in conference calls for clarification on July 28, 2011 (NRC 2011c), and January 31, 2012 (NRC 2012). Key questions concerned the following:

- the historical development of the Level 1 and Level 2 PRA and model changes that most impacted CDF,
- changes to STP design and operation since the version of the PRA used for the SAMA analysis (referred to as the STP_REV6 model, dated 2009),
- differences between STP, Units 1 and 2, designs or operation and identification of shared systems,
- the impact of open items and issues from the peer review of the PRA human reliability analysis (HRA),
- the process used to map Level 1 results into the Level 2 analysis and to group containment event tree (CET) end states into release categories,
- the selection of representative analysis cases,
- population assumptions used in the Level 3 analysis,
- the uncertainty analysis,

- the impact of new information on fire- and seismic-initiated sequences, and
- further information on the cost-benefit analysis of several specific candidate SAMAs and low cost alternatives.

STPNOC submitted additional information by letters dated July 5, 2011 (STPNOC 2011a), August 23, 2011 (STPNOC 2011b), January 19, 2012 (STPNOC 2012a), and February 16, 2012 (STPNOC 2012b). In these responses to the RAIs, STPNOC provided:

- a listing of the PRA model changes that had the most impact on CDF,
- identification of design and operation changes since the freeze date and their impact on PRA results,
- identification of design differences between units as well as shared systems,
- identification and an assessment of the impact of open items and issues from the PRA reviews,
- a discussion of the process for binning the source term release categories into release category groups,
- clarification of the bases for selecting representative analysis cases for each release category group,
- a discussion of the uncertainty analysis,
- further details on the external events PRA models including the impact of new information on fire and seismic sequences, and
- additional information regarding several specific SAMAs.

STPNOC's responses addressed the staff's concerns and did not result in the identification of any potentially cost-beneficial SAMAs.

An assessment of the SAMAs for STP is presented in Sections F.2 through F.6.

F.2 Estimate of Risk for STP

STPNOC's estimates of offsite risk at STP are summarized in Section F.2.1. The summary is followed by the staff's review of STPNOC's risk estimates in Section F.2.2.

F.2.1 STPNOC's Risk Estimates

Two distinct analyses are combined to form the basis for the risk estimates used in the SAMA analysis. The first is the STP Level 1 and Level 2 PRA model, which reflects (a) the plant design configuration as of December 31, 2007, and (b) the plant data from January 1, 1998, through December 31, 2007, for component failure and equipment unavailability data (STPNOC 2010).

The second is a supplemental analysis of offsite consequences and economic impacts (essentially a Level 3 PRA model) developed specifically for the SAMA analysis. The SAMA analysis is based on the most recent STP Level 1 and Level 2 PRA model available at the time of the ER, referred to as the STP_REV6 model. The scope of the Level 1 model includes internal and external initiating events.

The STP CDF is approximately 6.4×10^{-6} per year for both internal and external events, as determined from quantification of the Level 1 PRA model. The CDF is based on the risk assessment for internally initiated events, which includes internal flooding, and external events, which includes fire, seismic, external flooding, and tornado events. The internal events CDF is approximately 3.9×10^{-6} per year. The external events CDF is approximately 2.5×10^{-6} per year. The external events CDF includes contributions of approximately 1.0×10^{-6} per year due to fire events, 7.3×10^{-8} per year due to seismic events, and 1.4×10^{-6} per year due to other external events (STPNOC 2010). When determined from the sum of the CET sequences, or Level 2 PRA model, the CDF is approximately 6.2×10^{-6} per year for both internal and external events. The $6.2 \text{x} 10^{-6}$ is used as the baseline CDF in the SAMA evaluations (STPNOC 2010).

Note that the above results, and those given in Tables F–1 through F–5, are based upon the STP model of record (STP_REV6) as presented in the ER (STPNOC 2010) and do not include STPNOC's responses to RAIs. The RAIs consider the impact of new industry information concerning internal fire and seismic initiated events. The results relating to these RAIs are discussed in Sections F.2.2 and F.6.2.

The breakdown of CDF by initiating event is provided in Table F–1, Table F–2, Table F–3, and Table F–4 for internal, fire, seismic, and other external events, respectively (STPNOC 2011a).

Table F–1 shows how internal events contribute about 61 percent of the total CDF. The largest contributors to the internal event CDF are two loss of offsite power (LOOP) events, "Loss of All Offsite Power" and "Loss of 345kV Offsite Power," which contribute 15 percent and 10 percent, respectively, to the total CDF.

Table F–2 shows how fire events make up the next largest contributor with about 16 percent contribution to the total CDF. "Fire Zone 047 Scenario X" and "Fire Zone 071 Scenario X" are the largest contributors with 6 percent and 3 percent contribution, respectively, to the total CDF.

Table F–3 shows how seismic events make up a small contribution of about one percent to the total STP CDF. Seismic events with 0.4 g acceleration and 0.6 g acceleration are the largest contributors to the seismic event CDF, contributing 0.6 percent and 0.3 percent, respectively.

Table F–4 shows how other external events (excluding fire and seismic) make up the next largest contributor, adding up to about 22 percent of the total CDF. "Tornado Induced Failure of Switchyard and Essential Cooling Pond (ECP)" and "Essential Cooling Water (ECW) Failure due to Breach of Main Cooling Reservoir (MCR)" are the largest contributors, with 17 percent and 5 percent contribution, respectively, to the total CDF.

The STP Level 2 PRA model that forms the basis for the SAMA evaluation is an updated version of the IPE Level 2 model with the latest update incorporated in the 2005 Revision (STP_REV5). The Level 2 model is linked to the Level 1 model by passing the status of all top events previously evaluated in the Level 1 model. The Level 1 model includes the status of all systems needed for the Level 2 analysis. The CET, containing only phenomenological events, is then quantified using these inputs.

The CET considers the influence of physical and chemical processes on the integrity of the containment and on the release of fission products once core damage has occurred. The quantified CET sequences are binned into a set of end-states or release categories that are subsequently grouped into four major release groups that provide the input to the Level 3 consequence analysis. The frequency of each major release group was obtained by summing the frequency of the individual accident progression CET endpoints (or release categories) that were binned (categorized) into the major release group. Source terms were developed for nine release categories using the results of Modular Accident Analysis Program (MAAP 4.0.5) computer code calculations. From these results, source terms were chosen to be representative of the four major release groups (STPNOC 2011a). The results of this analysis for STP are provided in Table F.3–2 of ER Attachment F (STPNOC 2010).

Table F–1. STP Core Damage Frequency for Internal Events

Initiating event [a]	CDF (per year)	% Contribution to internal events CDF [b, c]	% Contribution to total CDF
Loss of all offsite power	9.6×10^{-7}	25	15
Loss of 345kV offsite power	6.3×10^{-7}	16	10
Steam generator tube rupture (SGTR)	4.4×10^{-7}	11	7
Excessive loss-of-coolant accident (LOCA)	3.2×10^{-7}	8	5
Steam line break outside containment	2.8×10^{-7}	7	4
Loss of electrical auxiliary building heating, ventilation and air conditioning (HVAC)	2.6×10^{-7}	7	4
Turbine trip	1.8×10^{-7}	5	3
Partial loss of main feedwater	1.5×10^{-7}	4	2
Reactor coolant pump (RCP) seal LOCA	1.5×10^{-7}	4	2
Interfacing system LOCA (ISLOCA)	1.3×10^{-7}	3	2
Loss of DC busses	9.7×10^{-8}	2	2
Small LOCAs	7.5×10^{-8}	2	1
Reactor trip	6.5×10^{-8}	2	1
Other internal events	3.6×10^{-7}	9	6
Total CDF (internal events)	$\mathbf{3.9\times10^{-6}}$	**100**	**64**

[a] The impact of the sensitivity analysis to updated fire and seismic data on the total CDF is not included in these results. Section F.2.2 provides a discussion of these impacts.

[b] Obtained from CDF given in ER Table F.2-1 (STPNOC 2010) divided by the total internal events CDF of 3.89×10^{-6}.

[c] May not total to 100 percent due to round off.

Table F–2. STP Core Damage Frequency for Fire Events

Fire initiator description [a]	CDF (per year)	% Contribution to fire CDF [b, c]	% Contribution to total CDF [c]
Fire zone 047 scenario X	4.0×10^{-7}	39	6
Fire zone 071 scenario X	2.1×10^{-7}	21	3
Fire zone 047 scenario B	1.8×10^{-7}	18	3
Control room fire scenario 18	1.2×10^{-7}	12	2
Fire zone 047 scenario BC	6.4×10^{-8}	6	1
Control room fire scenario 23	2.6×10^{-8}	3	0.4
Fire zone 147 scenario O	1.1×10^{-8}	1	0.2
Control room fire scenario 10	1.0×10^{-9}	<1	<0.1
Total CDF (fire events)	**1.0×10^{-6}**	**100**	**16**

[a] The impact of the sensitivity analysis to update fire and seismic data on the total CDF is not included in these results. Section F.2.2 provides a discussion of these impacts.

[b] Obtained from CDF given in ER Table F.2-1 (STPNOC 2010) divided by fire events CDF of 1.02×10^{-6}.

[c] May not total to 100 percent due to round off.

Table F–3. STP Core Damage Frequency for Seismic Events

Initiating event [a]	CDF (per year)	% Contribution to seismic CDF [b, c]	% Contribution to total CDF [c]
Seismic event, 0.4 g acceleration	4.1×10^{-8}	55	0.6
Seismic event, 0.6 g acceleration	2.1×10^{-8}	28	0.3
Seismic event, 0.2 g acceleration	9.8×10^{-9}	13	0.2
Seismic event, 0.1 g acceleration	2.1×10^{-9}	3	<0.1
Total CDF (seismic events)	**7.3×10^{-8}**	**100**	**1.1**

[a] The impact of the sensitivity analysis to updated fire and seismic data on the total CDF is not included in these results. Section F.2.2 provides a discussion of these impacts.

[b] Obtained from CDF given in ER Table F.2-1 (STPNOC 2010) divided by seismic events CDF of 7.31×10^{-8}.

[c] May not total to 100 percent due to round off.

Table F–4. STP Core Damage Frequency for Other External Events

Initiating event [a]	CDF (per year)	% Contribution to other external events CDF [b, c]	% Contribution to total CDF [c]
Tornado induced failure of switchyard and ECP	1.1×10^{-6}	79	17
ECW failure due to breach of MCR	2.9×10^{-7}	21	5
External flooding scenarios 2–6	9.5×10^{-9}	<1	0.2
Flood induced LOOP	2.1×10^{-9}	<1	<0.1
Total CDF (other external events)	$\mathbf{1.4\times10^{-6}}$	**100**	**22**

[a] The impact of the sensitivity analysis to updated fire and seismic data on the total CDF is not included in these results. Section F.2.2 provides a discussion of these impacts.

[b] Obtained from CDF given in ER Table F.2-1 (STPNOC 2010) divided by other external events CDF of 1.41×10^{-6}.

[c] May not total to 100 percent due to round off.

The offsite consequences and economic impact analyses use the MACCS2 code to determine the offsite risk impacts on the surrounding environment and public. Inputs for these analyses include plant-specific and site-specific input values for core radionuclide inventory, source term and release characteristics, site meteorological data, projected population distribution (within a 50-mi radius) for the year 2050, emergency response evacuation modeling, and economic data. The core radionuclide inventory is based on a plant-specific evaluation. The inventory corresponds to the end-of-cycle values for STP operating at a projected future 4,100 megawatts thermal (MWt). The current licensed power is 3,835 MWt (STPNOC 2010). The magnitude of the onsite impacts (in terms of cleanup and decontamination costs and occupational dose) is based on information provided in NUREG/BR-0184, *Regulatory Analysis Technical Evaluation Handbook* (NRC 1997a).

In the ER, the applicant estimated the dose risk to the population within 80-km (50-mi) of the STP site to be approximately 0.0174 person-Sievert (Sv) (1.74 person-roentgen equivalent man (rem)) per year. The breakdown of the total population dose by containment release mode is summarized in Table F–5. Large early releases are the dominant contributors (39 percent) to the population dose risk at STP. Small early releases (with pre-existing small containment failure) and late releases (with no sprays) are also significant contributors to the population dose risk.

Table F–5. Breakdown of Population Dose by Containment Release Mode

Containment release mode (major release category—RC) [(a)]	Population dose (person-rem [(b)] per year)	% Contribution
RC I—large early releases (<3 hrs)	0.68	39
RC II—small early releases (<3 hrs)	0.59	34
RC III—late releases (>3 hrs)	0.42	24
RC IV—intact containment	0.05	3
Total	**1.74**	**100**

(a) The impact of the sensitivity analysis to updated fire and seismic data on the release category frequency is not included in these results. Section F.2.2 provides a discussion of these impacts.

(b) One person-rem=0.01 person-Sv.

F.2.2 Review of STPNOC's Risk Estimates

STPNOC's determination of offsite risk at STP is based on the following three major elements of analysis:

(1) the Level 1 and 2 risk models that form the bases for the 2005 model (STP_REV5) reviewed by the NRC staff for the approval of the Risk Managed Technical Specification (RMTS) application, which is an updated version of the 1992 IPE submittal (HL&P 1992), which incorporated both internal and external events,

(2) the modifications to the STP_REV5 model that have been incorporated into the current STP PRA (STP_REV6), and

(3) the MACCS2 analyses performed to translate fission product source terms and release frequencies from the Level 2 PRA model into offsite consequence measures.

Each of these analyses was reviewed to determine the acceptability of STPNOC's risk estimates for the SAMA analysis, as summarized below.

The first STP Level 1 PRA was completed in 1989 to support a request for revising certain STP technical specifications. This was subsequently updated and extended to incorporate a Level 2 analysis, as documented in the STP IPE. The 1989 PRA and the IPE incorporated internal fires and all external events as well as internal event initiators. The internal events and fire events portions of the 1989 PRA were reviewed extensively as part of the technical specification change request approval (NRC 1994a). The NRC review of the IPE (NRC 1994b) concluded that the applicant met the intent of Generic Letter (GL) 88-20 (NRC 1988). Although no vulnerabilities were identified in the IPE, four improvements were identified. The ER indicated that all of these improvements have been implemented.

The internal events CDF value from the 1992 IPE (4.3×10^{-5} per year) is near the average of the values reported for other 4-loop Westinghouse plants. Figure 11.6 of NUREG-1560 (NRC 1997b) shows that the IPE based total internal events CDF for 4-loop Westinghouse plants ranges from 3×10^{-6} per year to 2×10^{-4} per year, with an average CDF for the group of 6×10^{-5} per year. It is recognized that other plants have updated the values for CDF subsequent to the IPE submittals to reflect modeling and hardware changes. The internal events CDF result for STP used for the SAMA analysis (6.4×10^{-6} per year) is somewhat lower than that for other plants of similar vintage. This is considered to be reasonable due to the unique design of STP, which uses three independent emergency core cooling system trains and four auxiliary feedwater pumps as well as having a significant amount of physical separation of the redundant trains.

There have been many revisions to the original STP PRA model. The most relevant are the IPE, Revision STP_1999 and the subsequent revisions leading up to the current revision used in the SAMA assessment. A breakdown of the contributors to total CDF and a description of the changes made to the STP PRA, since the peer reviewed Revision STP_1999, were provided in response to NRC staff RAIs (STPNOC 2011a, 2011b). These changes are summarized in Table F–6. The STP_REV6 model reflects the current (as of the date of the ER submittal) STP configuration and design. In response to an RAI, STPNOC stated that a review of plant design and operation changes made since the last model update indicates that one modification will require a PRA model revision. STPNOC does not expect this change to have a significant effect on the SAMA evaluation (STPNOC 2011a). The staff reviewed the response and agreed with the applicant that the prospective change to the PRA model would not have a significant effect on the SAMA evaluation.

The STP PRA model is a single unit model rather than a model that incorporates explicit events in both units. In response to an RAI, STPNOC states that the STP, Units 1 and 2, are designed to be identical; therefore, the PRA model applies to both STP, Units 1 and 2 (STPNOC 2011a). However, STPNOC noted that there are two differences between Units 1 and 2 resulting from the phased implementation of design changes over several different refueling outages. One, involving load tap changers for engineered safety features transformers, was found to have less than a 0.5 percent increase in CDF and large early release frequency (LERF). The other, involving the addition of hand switches for the steam generator (SG) power operated relief valves in the control room, will exist for only a few months and is expected to result in a decrease in CDF and LERF (temporary modification to conservatively decrease CDF).

Table F–6. STP PRA Historical Summary

PRA version	Summary of significant changes from prior model	CDF [a] (per year)							LERF [a] (per year)
		Internal events	Seismic	Fire	External floods	Flood MCR	High wind	Total	
IPE/IPEEE [b] (1992)	Information from IPE/IPEEE report (HL&P 1992)	4.3×10^{-5}	1.4×10^{-6}	1.4×10^{-6}	1.4×10^{-6}	1.4×10^{-6}	1.4×10^{-6}	4.4×10^{-5}	9.9×10^{-7}
STP_1999 (9/2001)	2002 WOG peer review	8.8×10^{-6}	7.3×10^{-8}	1.4×10^{-6}	1.4×10^{-8}	2.9×10^{-7}	1.1×10^{-6}	1.2×10^{-5}	5.8×10^{-7}
STP_REV4 (9/2003)	Reviewed by the NRC staff for RMTS approval Incorporated updated plant-specific train unavailability data, updated initiating events and component failure data Incorporated latest operator error modeling and improved LOOP recovery modeling Included safety injection accumulator modeling for large and medium LOCAs Included hot leg recirculation modeling for Large LOCA Removed credit for 150-ton air conditioning chillers Improved modeling of support system initiating events	6.6×10^{-6}	7.3×10^{-8}	1.0×10^{-6}	1.4×10^{-8}	2.9×0^{-7}	1.1×10^{-6}	9.1×10^{-6}	5.4×10^{-7}
STP_REV41 [c]	Reviewed by the NRC staff for RMTS approval Incorporated operator depressurization for small LOCA Corrected modeling error for long-term	6.6×10^{-6}	NA	NA	NA	NA	NA	9.2×10^{-6}	NA

PRA version	Summary of significant changes from prior model	CDF [(a)] (per year)							LERF [(a)] (per year)
		Internal events	Seismic	Fire	External floods	Flood MCR	High wind	Total	
	response for medium LOCA Requantified frequency for inadvertent opening of one or two pressurizer safety valves Corrected conditional split fractions definitions to correct errors in basic event importance calculations Re-binned several maintenance duration data variables to correct input problems with RISKMAN version being used Split fault tree basic events containing several components to better reflect individual component importance.								
STP_REV42	Reviewed by the NRC staff for RMTS approval Corrected issues found during component risk ranking	NA	NA	NA	NA	NA	NA	9.3 x 10-6	5.1×10^{-7}
STP_REV5 (9/2005)	Reviewed by the NRC staff for RMTS approval Incorporated plant modifications, procedure changes and data update through 2004 Incorporated modifications to Class IE vital AC system and main steam isolation valves Level 2 update including containment capability analysis Updated HRA to use of EPRI HRA	7.7×10^{-6}	7.3×10^{-8}	9.7×10^{-7}	1.4×10^{-8}	2.9×10^{-7}	1.1×10^{-6}	1.0×10^{-5}	6.1×10^{-7}

PRA version	Summary of significant changes from prior model	CDF [a] (per year) Internal events	Seismic	Fire	External floods	Flood MCR	High wind	Total	LERF [a] (per year)
	calculator								
STP_REV51	Added RMTS macros	7.7×10^{-6}	7.3×10^{-8}	9.7×10^{-7}	1.4×10^{-8}	2.9×10^{-7}	1.1×10^{-6}	1.0×10^{-5}	6.1×10^{-7}
STP_REV6 (2009)	Updated equipment reliability data Updated initiating event data Updated planned maintenance data Updated treatment of operator action for interfacing system LOCA	3.9×10^{-6}	7.3×10^{-8}	1.0×10^{-6}	1.3×10^{-8}	2.9×10^{-7}	1.1×10^{-6}	6.4×10^{-6}	5.0×10^{-7}
(1/2012) [d]	Updated fire analysis for impact of new information in NUREG/CR-6850 (NRC 2005) Updated seismic analysis for impact of 2008 USGS seismic hazard (USGS 2008)	6.5×10^{-6}	3.0×10^{-6}	2.2×10^{-6}	NA	NA	NA	1.1×10^{-5}	7.3×10^{-7}

NA—Not available, and value would not impact SAMA Review

[a] All CDF values are point estimate values unless otherwise indicated.

[b] Total external events CDF is given as 3.2 percent of the total or 1.4×10^{-6} per year.

[c] Based on a response to an NRC staff RAI (STPNOC 2011a), which indicated that the CDF was higher than that for STP_REV4 by 1.2 percent.

[d] Provided for information only. The PRA version is not considered a formal update. The CDF and LERF values were provided in response to NRC RAI (STPNOC 2012a). All values are based on truncation value of 1×10^{-14} whereas prior results are based on a truncation value of 1×10^{-12}. Values for floods and high winds are not explicitly provided but are not expected to change from prior values.

In response to the same RAI, STPNOC indicated that the only shared systems between units are the common switchyard, MCR, and the ECP (STPNOC 2011a). The NRC staff concludes that since there are no other shared systems, modeling of the other unit's features is not required, and a single unit model is appropriate for the SAMA assessment.

The NRC staff noted that the STP PRA results (ER Table F.2–1) do not include any internal flooding initiated sequences. The NRC staff requested additional information (NRC 2011a), and STPNOC, in response, indicated that the high degree of separation between redundant divisions at STP resulted in all internal flooding sequences being screened out in the IPE and IPEEE (STPNOC 2011a). The NRC staff considered these sequences, as part of the RMTS review, discussed below. The staff concludes that the internal flood screening remains valid.

The NRC staff considered the peer reviews and other assessments performed for the STP PRA and the potential impact of the review findings on the SAMA evaluation. The most relevant of these are the 2002 peer review of the STP_1999 model, the STP self-assessment to the requirements of Regulatory Guide (RG) 1.200, *An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities* (NRC 2007a), and the NRC staff's review of the STP models REV4, REV41, REV42, and REV5 in support of STPNOC's RMTS application. STPNOC stated (STPNOC 2006) that the general assessment of the peer review was that the STP PRA could effectively be used to support applications involving risk significance determinations supported by deterministic analyses once the items noted in the element summaries and fact and observations (F&O) sheets were addressed. All F&O items were incorporated into STP_REV4, the original basis for the RMTS request, with two major exceptions. These exceptions were the Level 2 update and reevaluation of the internal flood modeling. The resolutions of the F&Os associated with the two exceptions were incorporated into STP_REV5.

Revision 5 was performed to ensure that the STP PRA satisfies the requirements of Capability Category II of the American Society of Mechanical Engineers (ASME) PRA Standard (ASME 2002, 2003, 2005), as modified by RG 1.200, Appendix B. In response to an NRC RAI on the RMTS application, STPNOC provided information that described how the STP PRA meets the ASME criteria (STPNOC 2007). The HRA update, incorporated into Revision 5 of the PRA, was the subject of a follow-on peer review. As a result of the peer review, STPNOC found the F&Os from this review to not impact the RMTS application. In addition, these F&Os would be fully evaluated as part of the Revision 6 PRA (STPNOC 2007). In response to an RAI, STPNOC identified the content of the 10 Level A and B F&Os and stated that a preliminary review of the F&Os concluded that their resolution is not expected to have a significant impact on the STP PRA model or on the SAMA analysis (STPNOC 2011a).

The results of the NRC staff's review of the STP PRA through Revision 5 are documented in a safety evaluation report (SER) appended to the NRC's approval of the STP RMTS (NRC 2007a). The staff reviewed the scope and resolution of the 2002 peer review F&Os and concluded that the items were properly addressed by the applicant based on the documented resolutions. Based on the applicant's assessments and the NRC staff's reviews, the staff determined that the STP PRA internal events models met the requirements of RG 1.200, Revision 1, and were acceptable for the RMTS application.

Based on the following information, the NRC staff concludes that the internal events Level 1 PRA model is of sufficient quality to support the SAMA evaluation:

- The STP internal events PRA model has been peer-reviewed and the peer review findings were all addressed.

- The model has been reviewed by the NRC staff as part of the RMTS application approval.
- STPNOC has satisfactorily addressed NRC staff questions regarding the PRA.

The STP PRA model includes seismic, fire, high winds, floods, and other external initiating events as well as internal initiating events. The updated external core damage results are described in ER Section F.2.1 and included in Table F–2 and Table F–3 along with the internal events results.

The STP IPEEE was submitted as part of the IPE in 1992 (HL&P 1992), in response to Supplement 4 of GL 88-20 (NRC 1991), and was based on the external events portion of the prior STP PRA submitted and reviewed by the NRC staff to support an STP license amendment (NRC 1994a). No fundamental weaknesses or vulnerabilities to severe accident risk concerning the external events were identified in the STP IPEEE. In a letter dated December 15, 1998 (NRC 1998), the NRC staff stated that on the basis of the staff's reviews of the PRA and IPEEE submittal, the staff concludes that the STP IPEEE process is capable of identifying the most likely severe accidents and severe accident vulnerabilities. Therefore, the STP IPEEE has met the intent of Supplement 4 to GL 88-20.

The STP IPEEE seismic analysis used a seismic PRA following NRC guidance (NRC 1991) and used the prior 1988 probabilistic safety assessment or PSA with enhancements recommended by the NRC guidance. The seismic PRA included a seismic hazard analysis, a fragility analysis, a plant logic analysis, and quantification of seismic CDF and various plant damage states.

The seismic hazard analysis estimated the annual frequency of exceedingly different levels of ground motion. The STP IPEEE used the Electric Power Research Institute (EPRI) (EPRI 1989) hazard curves and provided a sensitivity study result using the Lawrence Livermore National Laboratory (LLNL) (NRC 1989) curve. Four discrete accelerations (0.1 g, 0.2 g, 0.4 g, and 0.6 g) were used to represent the full range of possible accelerations with point estimate values of the frequency for each acceleration determined from the mean exceedance frequency from the hazard curves.

The seismic fragility for safety-related structures, equipment, and components was determined from the results of an assessment of the median factor of safety against failure and its statistical variability under the safe-shutdown earthquake. System and fragility analysts supported the fragility analysis by plant walk downs. Fragilities for 2 structures and 18 components with median capacities less than 2.0 g were included in the model. Point estimate fragilities were then determined for each of the seismic initiating event accelerations evaluated.

The plant logic analysis determines the consequences of various structural and component failures in terms of CDF and release categories. A seismic failure event tree was used to represent the seismic failure impact of various plant components. The resulting seismic end-states were then inputted to support front line system trees that also consider non-seismic unavailabilities.

The seismic CDF resulting from the STP IPEEE was calculated to be 2×10^{-7} per year based on the EPRI hazard curve and 2×10^{-5} per year based on the LLNL hazard curve (HL&P 1992; NRC 1989). The current CDF value, based on the EPRI hazard curve, is 7×10^{-8} per year. The STP IPEEE did not identify any vulnerabilities due to seismic events or any potential improvements to reduce seismic risk.

In order to gain a perspective on the impact of the most recent USGS study of seismic hazard on the STP seismic risk, the NRC staff considered the analysis published for Generic Issue 199

(NRC 2010). This analysis, using a simplified methodology and the 2008 USGS hazard curves (USGS 2008), gave a seismic CDF ranging from 9×10^{-7} to 6×10^{-6} per year for STP depending on spectral acceleration frequency (the peak ground acceleration or 10, 5, or 1 Hz). These results range from 8 to 14 times the corresponding seismic CDF value based on the EPRI hazard curves and used in the SAMA assessment in the ER.

In response to an NRC RAI (NRC 2011b), STPNOC updated the results of the seismic risk analysis to consider recent information for the determination of the seismic hazard frequency (STPNOC 2012a). The update considered the EPRI, LLNL, and the 2008 USGS hazard curves. In addition, STPNOC modified the seismic model to include:

- an increase in the number of seismic initiators from 4 to 6 to incorporate higher accelerations than in the original model to be compatible with the USGS hazard curves which extend to 2.1 g,
- the elimination of credit for a sequence specific recovery term that was non-conservatively applied in the STP_REV6 model, and
- an update to seismic fragility curves for many selected components based on a review of the original calculations and a plant walkdown associated with this update.

The result of this update yielded a seismic CDF of 3.0×10^{-6} per year based on the 2008 USGS hazard curves. The NRC staff considers these hazard curves to be the most current data available. The impact of these curves on the SAMA analysis was provided in response to the NRC RAI and is discussed further in Sections F.3.2 and F.6.2.

For SAMA sensitivity consideration, STPNOC has satisfactorily addressed RAIs regarding the seismic PRA (taking into account the 2008 USGS hazard curves, which are the most current data available). Hence, the NRC staff concludes that the updated seismic PRA model including the impact of the 2008 USGS seismic hazard curves provides an acceptable basis for identifying and evaluating the benefits of SAMAs.

The STP IPEEE fire analysis used a fire PRA following NRC guidance (NRC 1991) and represented an update of the previous 1988 PSA. These analyses involved a two-phase evaluation process—a spatial interaction analysis and the fire risk assessment. In the spatial interaction analysis, a large set of internal fire scenarios was identified and screened based on consideration of initiation frequency, spatial propagation, impact of mitigation, and the impact on components to plant safety. The resulting fire scenarios considered important were then analyzed in more detail. The resulting fire induced CDF of the unscreened areas was calculated to be 5×10^{-7} per year (NRC 1998).

The 1988 STP fire PSA was reviewed by Sandia National Laboratory (SNL). The SNL review concluded that the fire analysis was acceptable. This review was updated by the NRC staff in the review of the fire PRA contained in the STP IPEEE with the conclusion that the analysis examined the significant initiating events and dominant accident sequences for STP (NRC 1998). The IPE and IPEEE PRA was also used to support STPNOC's request for changes in certain technical specifications, which was granted in 1994 (NRC 1994).

The fire analysis was subsequently updated in 1994 to address Thermolag® fire barrier performance. This fire analysis was supported by a comprehensive plant walkdown, in May 1994, by STP personnel.

As part of the RMTS approval process, the applicant confirmed that all of the high-level requirements for a fire PRA, given in RG 1.200, Revision 1, are addressed in the STP fire PRA model and supporting documentation. In response to a staff concern regarding the screening of fire sequences for the RMTS application, the applicant determined that there were no screened sequences that should be included in the PRA model used for the RMTS application (STPNOC 2007).

The NRC staff's RMTS SER states that, based on STPNOC's submittal and the staff's focused reviews, the STP PRA fire model addresses the technical characteristics and attributes of these elements, identified in RG 1.200, Revision 1, as they relate to issues that could impact the fire model's adequacy for implementation of RMTS. Therefore, the staff finds that the STP PRA fire model is acceptable for the RMTS application (NRC 2007a).

The NRC staff noted that the STP fire PRA may underestimate fire risk since it does not incorporate the latest guidance in NUREG/CR-6850, *EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities* (NRC 2005), and requested that STPNOC assess the impact of this updated guidance on the SAMA analysis (NRC 2011a). In response to this RAI, STPNOC provided the results of an assessment of the impact of the information and insights contained in NUREG/CR-6850 (NRC 2005) concerning fire ignition frequencies, hot short probabilities, and fire non-suppression probabilities on the eight non-screened fire scenarios included in the STP_REV6 model (STPNOC 2012a). This assessment yielded a modified fire initiated CDF of 2.2×10^{-6} per year, which is about 2.2 times higher than that used in the SAMA analysis. The impact of this modified fire CDF on the SAMA analysis is discussed in Sections F.3.2 and F.6.2.

Based on the following information, the NRC staff concludes that the fire PRA model, modified to address new information and insights contained in NUREG/CR-6850 (NRC 2005), provides an acceptable basis for identifying and evaluating the benefits of SAMAs:

- the STP fire PRA model has been updated since the IPEEE,
- the updated fire PRA was reviewed by the NRC staff for the RMTS application, and
- STPNOC has satisfactorily addressed NRC staff RAIs regarding the fire PRA.

The STP IPE and IPEEE analysis of high winds, floods, and other external events was based on the analysis in the 1988 PSA. A wide range of external events was considered; however, no vulnerabilities were identified in the STP IPEEE due to high winds, floods, and other external events.

For high winds, the STP design is such that critical structures can withstand winds in excess of 360 mph without major damage. The frequency of tornado winds in excess of 360 mph was determined to be 8×10^{-9} per year. Since there is considerable safety margin in the design, failures would not be expected until wind speeds exceed the design value. Tornado missiles were also considered and the associated risk found to be small.

The likelihood of the ECW intake structure being clogged by debris generated by tornados, hurricanes, or MCR failure were investigated with the dominant contribution being from tornadoes. The frequency of tornadoes that cause blockage and failure of the switchyard was found to be 1.2×10^{-6} per year (initiating frequency), leading to the currently assessed CDF of 1.1×10^{-6} per year.

External flooding of the STP site due to storms, offsite dam breaks, and onsite dam breaks were considered and evaluated in the STP IPE and IPEEE. Of all the sources affecting plant safety, the source of greatest importance was found to be the MCR. Many scenarios due to MCR failure that resulted in impacts to various plant equipment were evaluated with the most important being MCR failure leading to ECW failure. The current MCR failure frequency is 3.2×10^{-7} per year (MCR failure rate), leading to the currently assessed CDF of 2.9×10^{-7} per year.

A review of transportation and nearby facility accidents confirmed that there were no severe accident vulnerabilities from these accidents (transportation and nearby facility external events). The total contribution to CDF from these other non-fire and non-seismic external events is 1.4×10^{-6} per year.

For the STP RMTS license amendment approval, the NRC staff also reviewed the external events modeled in the STP PRA and found that the data and assumptions applied were reasonable and conservative. Based on the applicant's submittals and the staff reviews, the staff concluded that the STP PRA external events models complied with the guidance of RG 1.200, Revision 1, and was acceptable for the RMTS application (NRC 2007b).

Given that the STP IPEEE external events PRA model has been reviewed by the NRC staff, that the current model has been reviewed by the NRC staff as part of the RMTS approval, and that STPNOC has satisfactorily addressed NRC staff questions regarding the PRA, the NRC staff concludes that the external events Level 1 PRA model, combined with the results of the analysis of the impacts of new fire and seismic information, is of sufficient quality to support the SAMA evaluation.

The NRC staff reviewed the general process used by STPNOC to translate the results of the Level 1 PRA into containment releases, as well as the results of the Level 2 analysis, as described in the ER and in response to NRC RAIs (STPNOC 2011a). As indicated above, the Level 2 STP PRA model that forms the basis for the SAMA evaluation is essentially an updated version of the IPE model.

The Level 2 analysis is linked to the Level 1 model by extending the model to include the CET, which characterizes the accident phenomena. The CET considers the influence of physical and chemical processes on the integrity of the containment and on the release of fission products once core damage has occurred. Conditions specifically considered on entry into the CET include reactor pressure at the time of core damage, steam generator heat removal, availability of water in the reactor cavity, containment isolation and bypass status, containment spray operation, containment heat removal, and the initiating event.

The STP CET addresses events occurring prior to vessel breach (including the potential for in-vessel recovery), the phenomena associated with both in-vessel and ex-vessel accident progression, containment integrity challenges, and the potential for containment failure. The quantified CET sequences result in 63 possible end-states (or release categories) based on combinations of reactor coolant system conditions at the time of vessel breach, the availability of water to cool the core debris, the availability of containment spray, and the mode and timing of containment failure. These release categories are then combined into the four major release groups: I—large early release, II—small early release, III—late release, and IV—intact containment (STPNOC 2011a). The 15 highest frequency release categories that contribute to the major release groups are described in Table F.3-5 of the ER, Attachment F (STPNOC 2010).

Source terms were developed by the applicant for eight release categories using the results of MAAP 4.0.5 computer code calculations (STPNOC 2011a). The source term for the intact release category were estimated from the Wolf Creek SAMA submittal, which is acceptable to the NRC staff based on both the Wolf Creek and STP plants being Westinghouse 4-loop PWR plants and the intact containment release category being a small contributor to the total population dose risk. The results of these analyses for STP are provided in Table F.3-2 of the ER, Attachment F (STPNOC 2010).

Representative source terms for each of the four major release groups were then selected from the source terms for the nine release categories. This was done by reviewing the relevant accident frequencies and release characteristics and selecting the representative accident sequence and source term that was considered the one that best represented how a change in major release group frequency would be reflected in terms of consequence. The representative sequences and source terms selected for the major release groups are identified along with consequence results in Table F.3-6 of the ER, Attachment F (STPNOC 2010).

In the ER, the applicant validated the selection of representative source terms for the major release groups by recalculating the base case consequences using the set of nine release categories, for which source terms were available, with their associated frequencies instead of the four major release groups. As shown in ER Table F.3-8, the total dose-risk consequence (person-rem per year) is identical to that using the representative source terms for the four major release groups. The resulting offsite economic consequence risk (dollars per year) is about 18 percent higher; however, this would only increase the maximum averted cost-risk (MACR), which is discussed in Section F.6.1, by about 1.5 percent, which the applicant considered a very minor change (within acceptable SAMA sensitivity consideration by the staff).

In an RAI, the NRC staff stated that while the reduced set of four representative sequences provided essentially the same result as using the full set of nine sequences, this would not necessarily be true for the cost-benefit analysis of individual SAMAs (NRC 2011a). Since the source terms for the representative sequences are not necessarily those that would yield the largest consequence, any SAMA that impacted a release category frequency whose source term is higher than that for the selected representative sequence would have its benefit underestimated. In response to the RAI, STPNOC provided a sensitivity analysis using the most conservative relevant available source term for each of the nine major release categories. The result was an increase in population dose risk of over 300 percent to 0.0532 person-Sv per year (5.32 person-rem per year) and a corresponding increase in offsite economic cost risk of over 400 percent. However, while the results showed that selecting alternate conservative source terms for the consequence analysis significantly increases the benefit of the SAMAs evaluated, the conclusions of the SAMA analysis were unchanged (STPNOC 2011a). This is discussed further in Section F.6.2.

The ER notes that some of the MAAP source term release fractions were still increasing based on calculation times of 24 to 48 hours. A sensitivity case was run with the releases extrapolated to 72 hrs. The resulting population dose risk increased by 5 percent, and the offsite economic cost risk increased by 3 percent.

As indicated above, the current STP Level 2 PRA model is an update of the model used in the IPE. No vulnerabilities were identified in the IPE back-end (i.e., Level 2) analysis. Risk-related insights and improvements discussed in the IPE submittal were discussed previously. The NRC staff and contractor review of the IPE Level 2 analysis concluded that the applicant has made reasonable use of the PSA techniques in performing the back end analysis and that the techniques employed are capable of identifying severe accident vulnerabilities (NRC 1994b).

The LERF model was included in the Westinghouse Owner's Group (WOG) peer review discussed previously, and all F&Os have been resolved (STPNOC 2007). The NRC staff's review of the RMTS application concluded that all F&Os (including those pertaining to LERF) were properly addressed. As stated previously, the staff concluded that the internal events PRA satisfied the guidance of RG 1.200, Revision 1 (NRC 2007b).

Based on the NRC staff's review of the Level 2 methodology, the staff finds that STPNOC has adequately addressed NRC staff RAIs, that the LERF model has been peer reviewed and all F&Os resolved, and that the LERF model was recently reviewed and found to be in conformance with RG 1.200 and the ASME PRA standard.

Based on these findings and the results of the sensitivity analysis, which showed that the conclusions of the SAMA analysis are not changed by using the full set of nine release categories, the NRC staff concludes that the Level 2 PRA provides an acceptable basis for evaluating the benefits associated with various SAMAs.

STPNOC used the MACCS2 code and a core inventory from a plant-specific calculation to determine the offsite consequences of activity release (STPNOC 2010). STPNOC indicated that the core inventory was generated using ORIGEN2.1 based on a conservative projected future power of 4,100 MWt for STP.

The NRC staff reviewed the process used by STPNOC to extend the containment performance (Level 2) portion of the PRA to an assessment of offsite consequences (essentially a Level 3 PRA). This included consideration of the source terms used to characterize fission product releases for the applicable containment release categories and the major input assumptions used in the offsite consequence analyses. Plant-specific input to the code includes the source terms for each source term category and the reactor core radionuclide inventory (both discussed above), site-specific meteorological data, projected population distribution within an 80-km (50-mi) radius for the year 2050, emergency evacuation modeling, and economic data. This information is provided in Section F.3 of Attachment F to the ER (STPNOC 2010).

All releases were modeled as being from the top of the reactor building. The thermal content of each of the releases was assumed to be the same as ambient (a non-buoyant plume). Sensitivity analyses were performed for the elevation and thermal content of the releases. Decreasing the release height from the top of the reactor building to ground level and 25 percent, 50 percent, and 75 percent of containment height decreased the population dose risk by 1 to 2 percent and offsite economic cost risk by 2 to 7 percent. Increasing the release heat to 1 and 10 MW for each plume segment increased the population dose risk by 0 to 3 percent and the offsite economic cost risk by 2 to 7 percent. Building wake effects were also investigated by increasing and decreasing the wake size by a factor of two. The population dose risk showed no change, and the offsite economic cost risk either showed no change or increased by 1 percent. The NRC staff notes that previous SAMA analyses have shown only minor sensitivities to release height, buoyancy, and building wake effects. Based on the information provided, the staff concludes that the release parameters used are acceptable for the purposes of the SAMA evaluation.

STPNOC used site-specific meteorological data for the 2006 calendar year as input to the MACCS2 code. The development of the meteorological data is discussed in Section F.3.5 of Attachment F to the ER. The data were collected from the onsite meteorological monitoring system and the National Weather Service measurements at nearby Palacios Municipal Airport. Missing meteorological data were first filled in from the onsite backup tower. Gaps in onsite data were filled in from the hourly data at the Palacios Municipal Airport. Remaining data gaps were to be filled in by (in order of preference) using corresponding data from the primary tower 60-meter level (taking the relationship between the levels as determined from immediately preceding hours), interpolation (if the data gap was less than 4 hours), or using data from the same hour and a nearby day of a previous year. A sensitivity analysis of available data of record was completed using MACCS2 and the meteorological data for the years 2006 and 2008 and found that data for the year 2006 resulted in the largest dose and economic cost risk and this was used for the baseline cost-benefit analysis as appropriate. The population dose risk decreased by 0 to 7 percent and the offsite economic cost decreased by 2 to 11 percent for years 2008 and 2007, respectively. An additional sensitivity case was completed for rainfall in the last spatial segment. The base case assumed rainfall at all times. The sensitivity study allowed the rainfall to follow the onsite meteorology. The resulting population dose risk decreased by 23 percent, and the offsite economic cost risk decreased by 35 percent. The

NRC staff notes that previous SAMA analyses results have shown little sensitivity to year-to-year differences in meteorological data and concludes that the use of the 2006 meteorological data in the SAMA analysis is reasonable.

The population distribution used by the applicant as input to the MACCS2 analysis was based on the year 2000 census data from an updated study for the potential construction of additional units (STPNOC 2009). County growth rates were applied to obtain the year 2050 population (Texas State Data Center 2006). In response to an NRC RAI, the applicant stated that the total population in year 2000 for the SAMA analysis was 1.4 percent higher than the SECPOP2000 values presented in Section 2.6.1 of the ER (STPNOC 2011a). This was due to the updated study using a population based on the construction of additional units that is not included in the SECPOP2000 data. SECPOP2000 is a computer coded developed for the NRC by Sandia National Laboratories to calculate the population within 20 and 50 miles of the site. In the RAI response, STPNOC also provided the year 2050 rosette population distribution. The transient population within the emergency planning zone (EPZ), was included in the residential population data for year 2000 and projected to year 2050 (STPNOC 2011a). STPNOC further clarified that the sector multipliers for the major metropolitan areas within the 50-mi radius included any expected high growth rates based on the county-weighted population projections (STPNOC 2011a). The NRC staff considers the methods and assumptions for estimating population reasonable and acceptable for purposes of the SAMA evaluation.

The emergency evacuation model was modeled as a single evacuation zone extending out 16 km (10 mi) from the plant (the EPZ). The applicant assumed that 95 percent of the population would evacuate. This assumption is conservative relative to the NUREG-1150 study (NRC 1990), which assumed evacuation of 99.5 percent of the population within the EPZ. The evacuated population was assumed to move at an average radial speed of approximately 1.34 meters per second (mps) (3.0 mph) with a delayed start time of 60 minutes after declaration of a general emergency for one-half the population. The evacuation speed was projected to conditions associated with year 2050 by conservatively assuming that all of the roads in 2007 transported traffic at their maximum throughput and that no new roads would be constructed. In response to an NRC RAI, the applicant clarified that the year 2007 evacuation study population was based on the exponential growth rate from year 2000 to year 2050 (STPNOC 2011a). Transient population was not calculated separately. A general emergency declaration was assumed to occur when plant conditions degraded to a point where it was judged that there was a credible risk to the public, based on STP emergency action levels. Times for declaration of emergency are presented in Table F.3-4 of the ER. A sensitivity study was completed where the delayed population was increased and decreased by a factor of two. The population dose risk increased and decreased by 1 percent, respectively, and the offsite economic cost risk showed no change. Another sensitivity study was performed for the evacuation speed, where the speed was increased and decreased by a factor of two. The increased evacuation speed resulted in a population dose risk decrease by 1 percent and no change in offsite economic cost risk. The decreased evacuation speed resulted in a population dose risk increase of 2 percent and no change in offsite economic cost risk. The NRC staff concludes that the evacuation assumptions and analysis are reasonable and acceptable for the purposes of the SAMA evaluation.

SECPOP2000 (NRC 2003) was used to access site-specific agriculture and economic data from the 1997 National Census of Agriculture for each of the counties surrounding STP to a distance of 80 km (50 mi). The data file accessed by SECPOP2000 for that information was modified to correct two errors in the issued version. These errors are generally known as the missing notes parameter error and the missing county numbers error. In response to an NRC RAI, the applicant clarified that a third error associated with column formatting of regional economic data was also corrected (STPNOC 2011a). Region-wide wealth data (i.e., farm wealth and non-farm wealth) were also based on county-weighted averages for the region within 80 km (50 mi) of the site using data in the 1997 National Census of Agriculture, as accessed by SECPOP2000. In addition, generic economic data that applied to the region as a whole, as described in Section F.3.3 of the ER, were revised from the MACCS2 sample problem input in order to account for cost escalation since 1986 (the year the input was first specified). An escalation factor of 1.94, representing cost escalation from 1986 to January 2009, was applied to parameters describing cost of evacuating and relocating people, land decontamination, and property condemnation.

The NRC staff concludes that the methodology used by STPNOC to estimate the offsite consequences for STP, combined with the results of the sensitivity analysis associated with the selection of representative source terms, provides an acceptable basis from which to proceed with an assessment of risk reduction potential for candidate SAMAs. Accordingly, the NRC staff based its assessment of offsite risk on the CDF and offsite doses reported by STPNOC.

F.3 Potential Plant Improvements

The process for identifying potential plant improvements, an evaluation of that process, and the improvements evaluated in detail by STPNOC are discussed in this section.

F.3.1 Process for Identifying Potential Plant Improvements

STPNOC's process for identifying potential plant improvements (SAMAs) consisted of the following elements:

- review of the most significant split fractions from the current, plant-specific PRA,
- review of potential plant improvements identified in the STP IPE and IPEEE,
- review of cost-beneficial SAMA candidates identified in LRAs for six other nuclear power plant sites, and
- review of generic SAMA candidates from Nuclear Energy Institute (NEI) 05-01 (NEI 2005) to identify SAMAs that might address areas of concern in the STP PRA.

Based on this process, an initial set of 21 candidate SAMAs, referred to as Phase I SAMAs, were identified. In Phase I of the evaluation, STPNOC performed a qualitative screening of the initial list of SAMAs and eliminated SAMAs from further consideration using the following criteria:

- The SAMA is not applicable to STP due to design differences.
- The SAMA has already been implemented at STP or would achieve results that have already been achieved at STP by other means.
- The SAMA has estimated implementation costs that would exceed the dollar value associated with eliminating all severe accident risk at STP.

Based on this screening, 16 SAMAs were eliminated, leaving 5 SAMAs for further evaluation. The results of the Phase I screening analysis are shown in Table F.5-3 of Attachment F to the ER. The remaining SAMAs, referred to as Phase II SAMAs, are listed in Table F.6-1 of Attachment F to the ER (STPNOC 2010). In Phase II, a detailed evaluation was performed for each of the five remaining SAMA candidates, as discussed in Sections F.4 and F.6.

F.3.2 Review of STPNOC's Process

STPNOC's efforts to identify potential SAMAs included explicit consideration of potential SAMAs for both internal and external events since the STP PRA incorporates all initiating events including internal, fire, seismic, high winds, and floods. The initial list of SAMAs generally addressed the hardware considered to be important to CDF and release category frequency from risk reduction worth (RRW) perspectives at STP and included selected SAMAs from prior SAMA analyses for other plants.

STPNOC provided a tabular listing of the Level 1 PRA split fractions sorted according to their RRW (STPNOC 2010). SAMAs impacting these split fractions would have the greatest potential for reducing risk. STPNOC initially identified a RRW cutoff of 1.24, which corresponds to about a 24 percent change in CDF given 100-percent reliability of the SAMA. This equates to a benefit of approximately $50,000 for a single unit or $100,000 for both units. This is stated to be the minimum implementation cost associated with a procedure change. The applicant indicated that, at this cutoff, only two split fractions would need to be assessed for potential SAMAs. Since this would only provide limited insights into potential SAMAs, STPNOC extended the Level 1 importance review to include the top 40 split fractions, which corresponds to a RRW of 1.022. This is the equivalent of a two-unit benefit of approximately $11,000. All split fractions in the Level 1 listing were reviewed to identify potential SAMAs and all were addressed by one or more SAMAs (STPNOC 2010).

STPNOC also provided and reviewed the top 40 Level 2 PRA split fractions, corresponding to a RRW of 1.027, for the release categories contributing over 97 percent of the population dose-risk and over 99 percent of the offsite economic cost risk. Major release categories I (large-early), II (small early), and III (late) were included in this assessment. The Level 2 split fractions for release Category IV (containment intact) were not included in the review to prevent split fractions unimportant to dose and cost risk from biasing the importance listing. All split fractions in the Level 2 listing were reviewed to identify potential SAMAs, and all were addressed by one or more SAMAs (STPNOC 2010).

As a result of the review of the Level 1 and Level 2 split fractions, 15 SAMAs were identified. The applicant reviewed the cost-beneficial Phase II SAMAs from prior SAMA analyses for five Westinghouse PWR sites and one General Electric BWR site. The applicant's review identified six additional SAMAs. It was determined that the other Phase II SAMAs reviewed were already represented by a SAMA identified from the importance list reviews, have low potential for risk reduction at STP (i.e., do not address split fractions on the importance lists), or were not applicable to STP.

The NRC staff noted that three SAMAs that were found to be cost beneficial at Prairie Island, were not addressed by STPNOC. Similarly, three SAMAs were found to be cost beneficial at Indian Point, were not addressed by STPNOC (NRC 2011a). STPNOC responded to an RAI indicating that the SAMAs in question had either (a) been implemented at STP or (b) the cost of implementing at STP exceeded the STP MACR (STPNOC 2011a), which justifies the screening of the SAMAs. The staff agrees with this assessment.

Wolf Creek SAMA 13, "provide an alternate fuel oil tank with gravity feed capability," was considered already implemented at STP by an existing capability that requires a pump. The NRC staff noted that this has less capability than a gravity system and asked STPNOC to further justify the screening of this SAMA. In response to the RAI, STPNOC provided additional information on fuel oil storage at STP. The current STP fuel oil transfer system uses a gravity feed line between the fuel oil storage tank and the standby diesel generator (SBDG). Each SBDG is supplied from its own dedicated storage tank with a 7-day fuel oil supply. The system described in the disposition of this SAMA is necessary only to refill these dedicated fuel oil storage tanks (STPNOC 2011a).

SAMA 16, “provide a portable engine driven instrument air compressor,” was identified from a review of industry cost-beneficial SAMAs and was screened out on the basis of having an excessive cost. The basis for this SAMA was Prairie Island SAMA 22, which used nitrogen bottles rather than a portable air compressor. In response to a staff RAI to consider this lower cost alternative, the applicant indicated that loss of instrument air was not identified as a significant contributor to STP risk (STPNOC 2011a). There is only one instrument air split fraction with a RRW greater than 1.000. Its RRW of 1.016 corresponds to an averted cost-risk of $8,100, which would not result in a cost-beneficial SAMA using nitrogen bottles even at the 95th percentile CDF.

STPNOC considered the potential plant improvements described in the STP IPE (HL&P 1992), which included both internal and external events, in the identification of plant-specific candidate SAMAs. As a result of the review of the IPE, four improvements were identified and are listed in Section F.5.1.4 of Attachment F of the ER. The review of the IPE did not lead to any additional SAMA candidates since the four improvements identified in the IPE have already been implemented at STP (STPNOC 2010).

The applicant also considered the potential for cost-beneficial SAMAs that address the external event contributors screened out in the IPE and IPEEE because of “low risk.” For each of the screened initiator types, a potential averted cost-risk (PACR) was determined based on an estimate of the event occurrence frequency and assuming that the PACR is proportional to this frequency compared to the CDF. The PACR for each of the seven screened event types is given in Section F.5.1.5 of the ER. All are less than the minimum implementation cost for the site of $100,000 associated with a procedure change. This assessment includes internal floods, which were screened out in the IPE and IPEEE. In response to an NRC RAI, the applicant indicated that a review of the internal flood screening was performed in support of the RMTS license amendment with the conclusion that the earlier screening remained valid (STPNOC 2011a).

In response to an NRC RAI, the applicant clarified that the generic list of industry-based SAMA candidates provided in NEI 05-01 (NEI 2005) was used as an idea source to generate SAMAs for the important contributors identified from the STP PRA (STPNOC 2011a).

As discussed in Section F.2.2, in response to an NRC RAI, STPNOC provided an assessment of the impact of updated information concerning fire and seismic risks on the overall STP risk. The postulated fire and seismic changes affect the risk profile and increase the maximum possible benefit if all risks were eliminated. Because of these changes, the importance analysis review for the identification of candidate SAMAs and the screening of potential SAMAs was redone. This reassessment is documented in Tables 8, 9 and 10 of the January 19, 2012, submittal (STPNOC 2012a). One additional SAMA (SAMA 1a—install a “seismic safe” system) was identified. This SAMA is similar to SAMA 1 and includes earthquake resistant heat removal systems that could operate in the event of a seismically induced station blackout (SBO). This SAMA was screened as having an excessive cost.

Based on this information, the NRC staff concludes that the set of SAMAs evaluated in the ER, together with those identified in response to NRC staff RAIs, addresses the major contributors to both internal and external event CDF.

The NRC staff questioned the applicant about potentially lower cost alternatives to some of the SAMAs evaluated (NRC 2011a, 2012a), including:

- alternate SAMA(s) for sequences that are mitigated by SAMA 1 but do not need tornado protection;
- use of the Technical Support Center (TSC) diesel generator (DG) to both supply the positive displacement pump (PDP) and support auxiliary feedwater (AFW) operation;
- installing an alternate intake structure for the ECW either in the ECP or the MCR that would minimize the likelihood of debris preventing ECW cooling or using temporary and portable pumps with a movable suction that could provide water to the ECW system; and
- strengthening the ECW pump seismic restraints, which was identified as limiting in the fragility update, in lieu of installing the complex “seismic safe” system (STPNOC 2012a).

In response to the RAIs, the applicant addressed the suggested lower cost alternatives and determined that they were either not feasible or were not cost beneficial (STPNOC 2011a, 2012b). This is discussed further in Section F.6.2.

The NRC staff notes that the set of SAMAs submitted is not all-inclusive since additional, possibly even less expensive, design alternatives can always be postulated. However, the NRC staff concludes that the benefits of any additional modifications are unlikely to exceed the benefits of the modifications evaluated and that the alternative improvements would be unlikely to cost less than the least expensive alternatives evaluated when the subsidiary costs associated with maintenance, procedures, and training are considered.

The NRC staff concludes that STPNOC used a systematic and comprehensive process for identifying potential plant improvements for STP, and the set of SAMAs evaluated in the ER, together with those evaluated in response to NRC staff inquiries, is reasonably comprehensive and, therefore, acceptable. This search included reviewing insights from the STP plant-specific risk studies that included internal initiating events as well as fire, seismic, and other external initiated events, and reviewing plant improvements considered in previous SAMA analyses.

F.4 Risk Reduction Potential of Plant Improvements

In the ER, the applicant evaluated the risk-reduction potential of the five SAMAs that were not screened out in the Phase I analysis and retained for the Phase II evaluation. The SAMA evaluations were performed using realistic assumptions with some conservatism.

STPNOC used model re-quantification to determine the potential benefits for each SAMA. The CDF, population dose, and offsite economic cost reductions were estimated using the STP STP_REV6 PRA model. The changes made to the model to quantify the impact of SAMAs are detailed in Section F.6 of Attachment F to the ER (STPNOC 2010). Table F–7 lists the assumptions considered to estimate the risk reduction for each of the evaluated SAMAs, the estimated risk reduction in terms of percent reduction in CDF and population dose, and the estimated total benefit (present value) of the averted risk. The estimated benefits reported in Table F–7 reflect the combined benefit in both internal and external events. The determination of the benefits for the various SAMAs is further discussed in Section F.6.

The impact of SAMA 10, “enhance procedures to ensure the SGs are filled or maintained filled in SGTR events to scrub fission products,” was modeled by reassigning the SGTR CDF contribution for Release Categories I (7.48×10^{-9} per year) and III (1.35×10^{-7} per year) to Release Categories II and IV, respectively. In response to an NRC RAI regarding the source of these values, the applicant indicated that because SAMA 10 is dependent on the availability of secondary side makeup, only a fraction of SGTR scenarios are relevant to the SAMA 10 evaluation. The relevant frequencies were obtained from an examination of the PRA model's results (STPNOC 2011a).

The NRC staff noted that the evaluation of SAMA 12, "enhance procedures to prevent clearing of RCS cold leg water seals," did not consider the condition in which non-condensable gases such as hydrogen are present since this condition is not modeled in the PRA. Additionally, the staff noted that SBO sequences were excluded in the modeling of this SAMA because AC power is needed to start an RCP. The staff asked STPNOC to assess whether these potential non-conservatisms impact the SAMA analysis (NRC 2011a). In response to the RAI, the applicant clarified that the scenario leading to hydrogen gas generation condition is represented conservatively in the induced SGTR event scenarios. The sequences for the scenarios are included in the assessment of SAMA 12 (STPNOC 2011a). The applicant further clarified that excluding the SBO sequences is appropriate because:

(a) Induced SGTR is not an issue for SBO scenarios in which offsite power is recovered in time to prevent core damage.

(b) Plant procedures do not instruct the operators to start the RCPs for SBO scenarios in which offsite power is restored only after core damage.

For these reasons, the applicant concluded that the evaluation of SAMA 12 is not underestimated.

The NRC staff has reviewed STPNOC's bases for calculating the risk reduction for the various plant improvements and concludes, with the above clarifications, that the rationale and assumptions for estimating risk reduction are reasonable and generally conservative (i.e., the estimated risk reduction is higher than what would actually be realized). Accordingly, the NRC staff based its estimates of averted risk for the various SAMAs on STPNOC's risk reduction estimates.

F.5 Cost Impacts of Candidate Plant Improvements

STPNOC estimated the costs of implementing the 21 Phase I SAMAs through the development of site-specific cost estimates and use of other applicants' estimates for similar improvements. The costs were developed on a site basis (i.e., two units). If the cost estimate was for a single unit based on other applicants' estimates for similar improvements, the cost estimate was multiplied by two to derive the costs on a site basis. The site-specific cost estimates did not include (a) contingency cost (unexpected implementation obstacles) or (b) the cost of replacement power during extended outages required to implement the modifications (STPNOC 2010). This approach is in accordance with NEI 05-01 and conservative. The cost estimates based on other applicants' estimates did not account for inflation, which is also conservative.

In response to an NRC RAI regarding the source of the cost estimates, the applicant replied that the scope and definition of the SAMA were initially developed by the PRA analyst and then reviewed and modified by the STP design staff to account for any plant-specific issues that could interfere with or improve the SAMA design. The major cost contributors were then identified, and their cost magnitudes were estimated by the design engineers (cost estimating is a normal part of STPNOC's design engineers' functions as appropriate) (STPNOC 2011a).

The NRC staff reviewed the applicant's cost estimates, presented in Table F-6.1 of Attachment F to the ER in response to NRC RAIs (STPNOC 2011a). For certain improvements, the NRC staff compared the cost estimates to estimates developed elsewhere for similar improvements, including estimates developed as part of other applicants' analyses of SAMAs, for operating reactors.

The NRC staff noted that the estimated cost of $7.6M for SAMA 17a, "install Westinghouse RCP shutdown seals," is higher than other estimates for Westinghouse improved seals such as the estimate by Tennessee Valley Authority for Watts Bar Unit 2 of $1.1M (TVA 2010). In response to the RAI, STPNOC indicated that the STP RCP seal design is different from that used at Watts Bar and other Westinghouse plants (STPNOC 2011a). Because of this unique design, STP would incur an entire new seal design and associated engineering costs while the other plants would be able to spread the costs over a larger number of units. STPNOC provided the details of the STP cost estimate, which included engineering, procedure revision, modified seal housing, new seals, and installation. The NRC staff notes that even with some cost savings that might be possible, not included in STPNOC's estimate, the cost is expected to be well above the Watts Bar estimate and the STP MACR. The NRC staff considers STPNOC's justification for the cost of implementing SAMA 17a reasonable.

The NRC staff also noted that the estimated cost of $4.5M for SAMA 14, "provide capability to cross-tie emergency 4 KV divisions on a single unit," seems high given that an inter-unit cross-tie is already available. In response to the RAI, the applicant stated that the original intent of SAMA 14 was to provide the capability to perform the cross-tie between emergency 4 KV AC buses within a unit rapidly enough to prevent an RCP seal LOCA. The most effective means for achieving this capability was a direct bus-to-bus connection, which does not currently exist at STP. An indirect path is, however, available through an emergency transformer using existing hardware. Using this path would require significant engineering and procedure development costs due to the potential for creating single failure potential among multiple divisions of equipment. While the estimated costs for the work associated with this alternative is not cost beneficial, STPNOC also notes that the available time to prevent RCP seal failure is such that navigating through the procedures and implementing the cross-tie in time to prevent seal failure is unlikely (STPNOC 2011a). The NRC staff considers STPNOC's justification for the cost of implementing SAMA 14 reasonable.

In response to an NRC RAI (STPNOC 2011a), the applicant provided the details of the cost estimates for two SAMAs: SAMA 3b, "install fire wrap on PDP cables in cable spreading room," and SAMA 11, "modify fire protection system to supply containment spray headers." The detailed cost estimate for SAMA 11 supports the cost used and the conclusion in the SAMA analysis (as discussed in the response). For SAMA 3b, the applicant estimated the engineering portion of the cost to be $250,000 per unit, which appears high to the NRC staff. The staff notes that this estimated cost may be valid due to the need to identify the PDP cables (as explained by the applicant). Furthermore, if the engineering costs were reduced by $50,000 per unit, the resulting total cost of $700,000 ($800K minus 2x$50K) is still well above the benefit reported for this SAMA (see Table F–7). The NRC staff concludes that, with the above clarifications, the cost estimates provided by STPNOC are sufficient and appropriate for use in the SAMA evaluation.

1 **Table F–7. SAMA Cost-Benefit Screening Analysis for STP**

SAMA [a]	Assumptions	% Risk reduction		Total benefit ($)		Cost ($)
		CDF	Population dose	Baseline (internal + external)	Baseline with uncertainty [b]	
3b [c]—Install fire wrap on PDP cables in cable spreading room	Eliminate failure of the PDP due to a fire in the cable spreading room	<1	<1	3K	7K	800K
4—Develop procedures to isolate CCW inside containment	eliminate failure of the operator action to isolate CCW	2	10	27K	72K	100K
10—Enhance procedures to ensure the SGs are filled or maintain filled in SGTR events to scrub fission products	Reassign a portion of the SGTR CDF contribution for the large early release category (7.48E-06 per year) and late release category (1.35E-07 per year) to the small early release category and intact containment release category, respectively	0	2	3K	8K	100K
12—Enhance procedures to prevent clearing of RCS cold leg water seals	Reassign the induced SGTR CDF contribution (2.4E-09 per year) for sequences in which offsite power is available from the large early release category to the intact containment release category	0	0	<1K	<1K	100K
13—Develop procedures to open doors or use portable fans for alternate SBDG room cooling or both	Eliminate failure of the operator action to provide SBDG room cooling	<1	0	1K	3K	100K
15—Develop emergency procedures for alternate essential ECWIS room cooling	Eliminate failure of the operator action to provide ECWIS room cooling	1	2	8K	20K	100K

[a] The impact of the sensitivity analysis to updated fire and seismic data is not included in these results. Section F.6.2 provides a discussion of these impacts.
[b] Based on the response to NRC staff RAI 1.d (STPNOC 2011b), the NRC staff increased the baseline benefits by a factor of 2.7 to account for uncertainties.
[c] SAMA 3b retained as a Phase II SAMA based on the results of the uncertainty analysis.

F.6 Cost–Benefit Comparison

STPNOC's cost-benefit analysis and the NRC staff's review are described in the following sections.

F.6.1 STPNOC's Evaluation

The methodology used by the applicant was based primarily on NRC's guidance for performing cost-benefit analysis (i.e., NUREG/BR-0184 (NRC 1997a)). The guidance involves determining the net value for each SAMA according to the following formula:

Net Value = (APE + AOC + AOE + AOSC) − COE
where:
APE = present value of averted public exposure ($)
AOC = present value of averted offsite property damage costs ($)
AOE = present value of averted occupational exposure costs ($)
AOSC = present value of averted onsite costs ($)
COE = cost of enhancement ($)

If the net value of a SAMA is negative, the cost of implementing the SAMA is larger than the benefit associated with the SAMA, and it is not considered cost beneficial. STPNOC's derivation of each of the associated costs is summarized below.

NUREG/BR-0058 has been revised to reflect the NRC's policy on discount rates. Revision 4 of NUREG/BR-0058 states that two sets of estimates should be developed, one at 3 percent and one at 7 percent (NRC 2004). The applicant provided a base set of results using the 3 percent discount rate and a sensitivity study using the 7 percent discount rate (STPNOC 2010).

Averted Public Exposure (APE) Costs

The APE costs were calculated using the following formula:

APE = Annual reduction in public exposure (Δ person-rem per year)

x monetary equivalent of unit dose ($2,000 per person-rem)

x present value conversion factor (15.04 based on a 20-year period with a 3-percent discount rate)

As stated in NUREG/BR-0184 (NRC 1997a), it is important to note that the monetary value of the public health risk after discounting does not represent the expected reduction in public health risk due to a single accident. Rather, it is the present value of a stream of potential losses extending over the remaining lifetime, in this case, the renewal period, of the facility. Thus, it reflects the expected annual loss due to a single accident, the possibility that such an accident could occur at any time over the renewal period, and the effect of discounting these potential future losses to present value. For the purposes of initial screening, which assumes elimination of all severe accidents due to internal and external events, the applicant calculated an APE of approximately $52,300 for the 20-year license renewal period (STPNOC 2010).

Averted Offsite Property Damage Costs (AOC)

The AOCs were calculated using the following formula:

AOC = Annual CDF reduction

x offsite economic costs associated with a severe accident (on a per event basis)

x present value conversion factor

For the purposes of initial screening, which assumes all severe accidents due to internal and external events are eliminated, the applicant calculated an annual offsite economic risk of about $1,600 based on the Level 3 risk analysis. This results in a discounted value of approximately $24,400 for the 20-year license renewal period (STPNOC 2010).

Averted Occupational Exposure (AOE) Costs

The AOE costs were calculated using the following formula:

AOE = Annual CDF reduction
x occupational exposure per core damage event
x monetary equivalent of unit dose
x present value conversion factor

The applicant derived the values for averted occupational exposure from information provided in Section 5.7.3 of the NUREG/BR-0184 (NRC 1997a). Best estimate values provided for immediate occupational dose (3,300 person-rem) and long-term occupational dose (20,000 person-rem over a 10-year cleanup period) were used. The present value of these doses was calculated using the equations provided in the handbook in conjunction with a monetary equivalent of unit dose of $2,000 per person-rem, a real discount rate of 3 percent, and a time period of 20 years to represent the license renewal period. For the purposes of initial screening, which assumes all severe accidents due to internal and external events are eliminated, the applicant calculated an AOE of approximately $4,000 for the 20-year license renewal period (STPNOC 2010).

Averted Onsite Costs

Averted onsite costs (AOSC) include averted cleanup and decontamination costs and averted power replacement costs. Repair and refurbishment costs are considered for recoverable accidents only and not for severe accidents. The applicant derived the values for AOSC based on information provided in Section 5.7.6 of NUREG/BR-0184 (NRC 1997a).

The applicant divided this cost element into two parts—the onsite cleanup and decontamination cost, also commonly referred to as averted cleanup and decontamination costs, and the replacement power cost.

Averted cleanup and decontamination costs (ACC) were calculated using the following formula:

ACC = Annual CDF reduction
x present value of cleanup costs per core damage event
x present value conversion factor

The total cost of cleanup and decontamination subsequent to a severe accident is estimated in the NUREG/BR-0184 (NRC 1997a) to be $\$1.5 \times 10^9$ (undiscounted). This value was converted to present costs over a 10-year cleanup period and integrated over the term of the proposed license extension. For the purposes of initial screening, which assumes all severe accidents due to internal and external events are eliminated, the applicant calculated an ACC of approximately $124,500 for the 20-year license renewal period (STPNOC 2010).

Long-term replacement power costs (RPC) were calculated using the following formula:

RPC = Annual CDF reduction
x present value of replacement power for a single event
x factor to account for remaining service years for which replacement power is required

x reactor power scaling factor

The applicant based its calculations on the rated STP net electric output of 1,365 megawatt-electric (MWe) per unit and scaled up from the 910 MWe reference plant in NUREG/BR-0184 (NRC 1997a). Therefore, the applicant applied a power-scaling factor of 1,365/910 (or STP net electric output divided by reference plant output) to determine the replacement power costs. For the purposes of initial screening, which assumes all severe accidents due to internal and external events are eliminated, STPNOC calculated an RPC of approximately $53,000 and an AOSC of approximately $178,000 for the 20-year license renewal period (STPNOC 2010).

Using the above equations, the applicant estimated the total present dollar value equivalent associated with eliminating severe accidents from internal and external events at STP to be about $258,200 for a single unit, rounded to $259,000. Because all SAMA costs and benefits were provided on a site basis, the applicant doubled this value to obtain the two-unit site value of $518,000. This represents the dollar value associated with eliminating severe accident risks for all internal and external events at the two STP units (referred to as the maximum averted cost-risk (MACR)).

STPNOC's Results

If the implementation costs for a candidate SAMA exceeded the calculated benefit, the SAMA was considered not to be cost beneficial. In the baseline analysis contained in the ER (using a 3 percent discount rate), STPNOC identified no potentially cost-beneficial SAMAs. STPNOC also did not identify any potentially cost-beneficial SAMAs even after consideration of analysis uncertainties.

F.6.2 Review of STPNOC's Cost-Benefit Evaluation

The cost-benefit analysis performed by STPNOC was based primarily on NUREG/BR-0184 (NRC 1997a) and discount rate guidelines in NUREG/BR-0058 (NRC 2004). The analysis was executed consistently with this guidance. No SAMAs were determined to be cost beneficial in STPNOC's baseline analysis in the ER.

The applicant considered the impact that possible increases in benefits from analysis uncertainties would have on the results of the SAMA assessment. In the ER, STPNOC presents the results of an uncertainty analysis of the internal and external events CDF for STP, which indicates that the 95th percentile value is a factor of 1.6 greater than the mean CDF for STP. The applicant considered whether any additional Phase I SAMAs might be retained for further analysis if the MACR is increased by a factor of 1.6. One such SAMA was identified—SAMA 3b, "install fire wrap on PDP cables in cable spreading room."

The applicant also considered the impact on the Phase II analysis if the estimated benefits from internal and external events were increased by the 1.6 uncertainty factor. The additional Phase I SAMA—SAMA 3b—was included in this sensitivity analysis. No SAMAs became cost beneficial in STPNOC's analysis (STPNOC 2010).

In Section F.7.1 of the ER, the total CDF of 6.39×10^{-6} per year is described as being the mean from the RISKMAN Monte Carlo quantification. In response to the NRC RAI on the uncertainty analysis, STPNOC provided further information describing how the analysis was performed. Since the quantification of the complete STP Level 1 PRA results in a large number of sequences, for which an uncertainty analysis is impractical, a reduced set of sequences is used. The results of the Monte Carlo analysis were then scaled so that the mean of the distribution matched the mean of the CDF point estimates. The total CDF of 6.39×10^{-6} per year is, therefore, a point estimate (STPNOC 2011a).

In response to an NRC RAI (NRC 2011a), STPNOC provided an uncertainty analysis that indicated the 95th percentile CDF for the reduced set of sequences used is 1.59×10^{-5} per year while the mean CDF and point estimate CDF for these sequences are 8.52×10^{-6} per year and 5.89×10^{-6} per year, respectively. The uncertainty multiplier was then revised to be the ratio of the 95th percentile CDF to the point estimate, both for the reduced set of sequences, or 1.59×10^{-5} divided by 5.89×10^{-6} or 2.7 (STPNOC 2011b). The applicant considered whether any additional Phase I SAMAs might be retained for further analysis if the MACR is increased by a factor of 2.7. No additional SAMAs were identified.

The applicant also considered the impact on the Phase II analysis if the estimated benefits from internal and external events were increased by the 2.7 uncertainty factor. No SAMAs became cost beneficial in STPNOC's analysis (STPNOC 2011b).

The NRC staff noted that the original 1.6 uncertainty ratio developed for STP appeared to be low considering the larger uncertainty bands associated with external events. The applicant responded that, with the exception of seismic initiating events, probability distributions for all initiating events were included in the Monte Carlo uncertainty analysis and that use of point estimates for the seismic sequences was considered justified because of the small seismic CDF contribution (STPNOC 2011a). However, as discussed in Section F.2.2, the seismic CDF may be considerably larger than that used in the cost-benefit analyses presented in the ER.

Based on the following information, the NRC staff considers the use of the 2.7 uncertainty multiplier for the SAMA analysis. This is consistent with the guidance provided in NEI 05-01 and acceptable:

- STPNOC's revised analysis used the higher uncertainty factor of 2.7, which is generally higher than the 95th percentile uncertainty factor used in other SAMA analyses.
- STPNOC performed a separate assessment of the impact of the higher seismic CDF on the SAMA analysis.
- The increased uncertainty in seismic risk would not be expected to impact the benefit of SAMAs not specifically addressing seismic failures.

STPNOC provided the results of additional sensitivity analyses in the ER, including use of a 7 percent discount rate and variations in MACCS2 input parameters. These analyses did not identify any additional potentially cost-beneficial SAMAs (STPNOC 2010).

As discussed in Section F.2.2, the selection of representative sequences and associated source terms to be used for the four major release categories could yield non-conservative risk benefits. In response to an NRC RAI, the applicant provided the results of a sensitivity analysis that used the most conservative relevant available source term for each of the nine major release categories (STPNOC 2011a). STPNOC revised the baseline analysis using the conservative source terms (using a 3 percent discount rate) and identified no potentially cost-beneficial SAMAs. The NRC staff also increased the revised baseline benefits by a factor of 2.7 to account for uncertainties and identified no potentially cost-beneficial SAMAs. The results for the revised baseline and revised baseline with uncertainty are provided in Table F–8.

Table F–8. SAMA Cost-Benefit Screening Analysis for STP Using Conservative Source Terms

SAMA	Total benefit ($)		Cost ($)
	Conservative source terms revised baseline (internal + external)	Conservative source terms revised baseline with uncertainty[(a)]	
3b—Install fire wrap on PDP cables in cable spreading room	7K	18K	800K
4—Develop procedures to isolate CCW inside containment	35K	94K	100K
10—Enhance procedures to ensure the SGs are filled or maintain filled in SGTR events to scrub fission products	30K	80K	100K
12—Enhance procedures to prevent clearing of RCS cold leg water seals	<1K	<1K	100K
13—Develop procedures to open doors or use portable fans for alternate SBDG room cooling or both	4K	10K	100K
15—Develop emergency procedures for alternate ECWIS room cooling	14K	38K	100K

[(a)] Based on the response to NRC RAI 1.d (STPNOC 2011b), the NRC staff increased the revised baseline benefits by a factor of 2.7 to account for uncertainties.

SAMAs identified primarily on the basis of the internal events analysis could provide benefits in certain external events, in addition to their benefits in internal events. Since the STP_REV6 PRA model is an integrated internal and external events model, STPNOC's evaluation accounted for the potential risk reduction benefits associated with both internal and external events.

As discussed in Section F.2.2, the NRC staff asked STPNOC to assess the impact of the updated fire and seismic information on the SAMA analysis (NRC 2011a). In this analysis, STPNOC revised the baseline analysis using the updated fire and seismic information and increased these revised baseline analyses by 2.7 to account for uncertainties (using a 3 percent discount rate) and identified no potentially cost-beneficial SAMAs. The NRC staff also increased these revised benefits to account for the conservative source terms and identified no potentially cost-beneficial SAMAs. The results of these analyses are provided in Table F–9.

Table F–9. SAMA Cost-Benefit Screening Analysis for STP Using Updated Fire and Seismic Risk Analysis and Conservative Source Terms

SAMA	Total benefit ($)		Cost ($)
	Updated fire and seismic risk assessment (internal + external) with uncertainty[(a)]	Updated fire and seismic risk assessment (internal + external) with uncertainty[(a)] and conservative source terms[(b)]	
3b—Install fire wrap on PDP cables in cable spreading room	18K	44K	800K
4—Develop procedures to isolate CCW inside containment	71K	94K	100K
10—Enhance procedures to ensure the SGs are filled or maintain filled in SGTR events to scrub fission products	8K	84K	100K
12—Enhance procedures to prevent clearing of RCS cold leg water seals	3K	4K	100K
13—Develop procedures to open doors or use portable fans for alternate SBDG room cooling or both	16K	51K	100K
15—Develop emergency procedures for alternate ECWIS room cooling	22K	41K	100K

[(a)] Baseline benefits increased by a factor of 2.7 to account for uncertainties (STPNOC 2012a, 2012b).

[(b)] The impact of conservative source terms is obtained from the results provided in Table 2-11 of the July 5, 2011, submittal (STPNOC 2011a) compared with the results of the original submittal (STPNOC 2010).

As indicated in Section F.3.2, the NRC staff asked the applicant to evaluate potentially lower cost alternatives to the SAMAs considered in the ER (NRC 2011a), as summarized below:

- SAMA 1, “involving using a portable AC generator for long term AFW support and protecting the Technical Support Center (TSC) emergency diesel generator (EDG) from tornado events,” was identified as a means of mitigating a large number of important basic events. While the tornado protection is important for high wind initiated sequences, many other sequences would be mitigated without the cost of the tornado protection. STPNOC provided the results of a cost estimate that did not include the costs associated with the tornado protection. The revised cost of $2.4 million is much larger than the MACR; hence, such an alternative was determined not to be cost beneficial (STPNOC 2011a).

- An additional alternate to SAMA 1 would be to use the TSC DG to both supply the PDP and support AFW operation rather than requiring a portable AC generator. STPNOC provide the results of a cost estimate for this alternative. The revised cost of $1.9 million remains above the MACR;

hence, this alternative was determined not to be cost beneficial (STPNOC 2011a).

- The tornado induced failure of the switchyard and emergency cooling pond could be mitigated by installing an alternate intake structure for the ECW either in the ECP or the MCR that would minimize the likelihood of debris preventing ECW cooling or using a temporary and portable pumps with a movable suction that could provide water to the ECW system. In response to the RAI, STPNOC provided the results of a cost estimate for a large surface area debris cage as a less costly alternative to an additional intake structure. This cost was $828,000, which is approximately equal to the 95th percentile MACR. The cost for the even less costly portable truck-mounted pump alternative was given as $350,000. While less than the MACR, this cost is more than the benefit associated with eliminating the tornado initiated sequence (17 percent of the total CDF), or $143,000 at the 95th percentile; hence, this alternative was determined to not be cost beneficial (STPNOC 2011a).

- Strengthening ECW pump seismic restraints was identified as an alternative to the SAMA 1a “seismic safe” system. While not mitigating all seismically induce SBOs, it is potentially less costly than the complex “seismic safe” system. STPNOC assessed the benefit of eliminating the risk to ECW pump seismic failures using the Fussell-Vesely importance results and found the benefit to be $54,000 using the 2.7 uncertainty multiplier. However, it is not cost beneficial because it is less than the minimum SAMA implementation cost (for procedure changes) of $100,000 (STPNOC 2012b). If adjusted to incorporate the potential impact of the more conservative source terms, the NRC staff estimates that the benefit could be somewhat greater than $100,000. However, based on the expected cost of strengthening the seismic restraints, which would involve replacing 24 seismic bolts deeply imbedded in concrete, and that the analysis conservatively assumes all of the risk would be eliminated by replacing the seismic bolts, the NRC staff concludes that this alternative is unlikely to be cost beneficial.

As indicated in Section F.4, the NRC staff questioned STPNOC on the risk reduction potential for certain SAMAs (NRC 2011a, 2011b). In response to the RAIs, STPNOC addressed each SAMA and addressed the staff concerns.

The NRC staff concludes that the costs of all of the SAMAs evaluated would be higher than the associated benefits.

F.7 Conclusions

STPNOC compiled a list of 21 SAMAs based on a review of the most significant split fractions from the plant-specific internal and external event PRA, insights from the plant-specific IPE, cost-beneficial SAMAs from LRAs for other plants, and review of other industry documentation. An initial qualitative screening removed SAMA candidates that:

- modified features not applicable to STP due to design differences,

- were determined to have already been implemented at STP or would achieve results that have already been achieved at STP by other means, or

- have estimated implementation costs that would exceed the dollar value associated with completely eliminating all severe accident risk at STP.

Based on this screening, 16 SAMAs were eliminated, leaving 5 candidate SAMAs for evaluation.

For the remaining SAMA candidates, a cost-benefit analysis was performed, with the results shown in Table F–7. The cost-benefit analyses showed that none of the SAMA candidates were potentially cost beneficial in the baseline analysis. STPNOC performed additional analyses to evaluate the impact of parameter choices and uncertainties on the results of the SAMA assessment. In this process, one additional SAMA was identified for detailed cost-benefit analysis. However, additional analyses did not result in the discovery of any of the SAMA candidates being potentially cost beneficial.

The NRC staff reviewed the STPNOC analysis and concludes that the methods used, and the implementations of those methods, were sound. The treatment of SAMA benefits and costs supports the general conclusion that the SAMA evaluations performed by STPNOC are reasonable and sufficient for the license renewal submittal.

The staff concurs with STPNOC's conclusion that none of the candidate SAMAs are potentially cost beneficial. This conclusion is based on the generally conservative treatment of costs and benefits. This conclusion is consistent with the low residual level of risk indicated in the STP PRA and the fact that STPNOC has already implemented the plant improvements identified from the IPE and IPEEE.

F.8 References

10 CFR Part 50. *Code of Federal Regulations*, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. *Code of Federal Regulations*, Title 10, *Energy*, Part 51, "Environmental protection regulations for domestic licensing and related regulatory functions."

10 CFR Part 54. *Code of Federal Regulations*, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

10 CFR Part 100. *Code of Federal Regulations*, Title 10, *Energy*, Part 100, "Reactor Site Criteria."

[ASME] American Society of Mechanical Engineers. 2002. "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications." ASME RA-S-2002, April 5, 2002.

[ASME] American Society of Mechanical Engineers. 2003. "Addenda to ASME RA-S-2002, Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications." ASME RA-Sa-2003, December 5, 2003.

[ASME] American Society of Mechanical Engineers. 2005. "Addenda to ASME RA-S-2002, Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications." ASME RA-Sb-2005, December 30, 2005.

[EPRI] Electric Power Research Institute. 1989. "Probabilistic Seismic Hazard Evaluations at Nuclear Plant Sites in the Central and Eastern United States; Resolution of the Charleston Earthquake Issues." EPRI NP-6395-D, EPRI Project P101-53, Palo Alto, CA. April 1989.

[HL&P] Houston Lighting and Power Company. 1992. "South Texas Project Electric Generating Station Level 2 Probabilistic Safety Assessment and Individual Plant Examination." August 1992. ADAMS No. ML0617001702, ML0617001790, ML0617001850.

[NEI] Nuclear Energy Institute. 2005. *Severe Accident Mitigation Alternative (SAMA) Analysis Guidance Document*, NEI 05-01 (Rev. A). Washington, D.C. November 2005.

[NRC] U.S. Nuclear Regulatory Commission. 1988. Generic Letter 88-20, "Individual Plant Examination for Severe Accident Vulnerabilities." November 23, 1988. ADAMS No. ML031150465

[NRC] U.S. Nuclear Regulatory Commission. 1989. *Seismic Hazard Characterization of 69 Nuclear Plant Sites East of the Rocky Mountains.* Washington DC: NRC. NUREG/CR-5250, Volume 5. 1989.

[NRC] U.S. Nuclear Regulatory Commission. 1990. Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants—Final Summary Report. Washington DC: NRC. NUREG-1150, Volume 1. 1990.

[NRC] U.S. Nuclear Regulatory Commission. 1991. *Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities.* Washington, DC: NRC. Generic Letter No. 88-20, Supplement 4. June 28, 1991. ADAMS No. ML031150485

[NRC] U.S. Nuclear Regulatory Commission. 1994a. Letter from Suzanne C. Black, Director, to William T. Cottle, Houston Lighting & Power Company. Subject: "Issuance of Amendment Nos. 59 and 47 to Facility Operating License Nos. NPF-76 and NPF-80 and Related Relief Request—South Texas Project, Units 1 and 2 (TAC Nos. M76048 and M76049)." February 17, 1994. ADAMS No. ML021300134.

[NRC] U.S. Nuclear Regulatory Commission. 1994b. Memorandum to: Steven A. Varga (USNRC-NRR) to M. Wayne Hodges (USNRC-RES), Subject: Review of South Texas Project Individual Plant Examination (IPE) Submittal—Internal Events. December 1994.

[NRC] U.S. Nuclear Regulatory Commission. 1997a. *Regulatory Analysis Technical Evaluation Handbook.* Washington, DC: NRC. NUREG/BR-0184. ADAMS No. ML050190193.

[NRC] U.S. Nuclear Regulatory Commission (NRC). 1997b. *Individual Plant Examination Program: Perspectives on Reactor Safety and Plant Performance.* Washington, DC: NRC. NUREG-1560. ADAMS No. ML063550244, ML063550228, and ML063470259.

[NRC] U.S. Nuclear Regulatory Commission. 1998. Letter from Thomas W. Alexion, U.S. NRC, to William T. Cottle, STP Nuclear Operating Company. Subject: Review of south Texas Project, Units 1 and 2 Individual Plant Examination of External Events (IPEEE) Submittal (JAC Nos. M83676 and M83677). Washington, D.C. December 15, 1998.

[NRC] U.S. Nuclear Regulatory Commission. 2003. SECPOP2000: Sector Population, Land Fraction, and Economic Estimation Program. Washington, DC: NRC. NUREG/CR-6525, Rev. 1. August 2003. ADAMS No. ML032310279.

[NRC] U.S. Nuclear Regulatory Commission. 2004. *Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission.* Washington, DC: NRC. NUREG/BR-0058, Rev. 4. ADAMS No. ML003738939.

[NRC] U.S. Nuclear Regulatory Commission. 2005. *EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities.* Washington, DC: NRC NUREG/CR-6850. September 2005.

[NRC] U.S. Nuclear Regulatory Commission. 2007a. Letter from Mohan C. Thadani, U.S. NRC, to James J. Sheppard, STPNOC. Subject: "South Texas Project Units 1 and 2, Issuance of Amendments Re: Broad-scope Risk-informed Technical Specifications Amendments (TAC Nos. MD2341 and MD2342). Washington, D.C. July 13, 2007. ADAMS No. ML071780186.

[NRC] U.S. Nuclear Regulatory Commission. 2007b. *An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities.* Regulatory Guide 1.200, Revision 1. Washington, D.C. January 2007. ADAMS No. ML063170035.

[NRC] U.S. Nuclear Regulatory Commission. 2010. NRC Information Notice 2010-18: Generic Issue 199, *Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States on Existing Plants.* Washington, D.C. September 2, 2010. ADAMS No. ML101970221.

[NRC] U.S. Nuclear Regulatory Commission. 2011a. Letter from Tam Tran, Project Manager, to G. T. Powell, STPNOC. Subject: Requests for Additional Information for the Review of the South Texas Project, License Renewal Application. Washington, D.C. May 31, 2011. ADAMS No. ML11140A015.

[NRC] U.S. Nuclear Regulatory Commission. 2011b. Letter from Tam Tran, Project Manager, to G. T. Powell, STPNOC. Subject: Requests for Additional Information for the Review of the South Texas Project, License Renewal Application. September 1, 2011. ADAMS No. ML112360114.

[NRC] U.S. Nuclear Regulatory Commission. 2011c. Memorandum from Tam Tran, Project Manager. Subject: Summary of Telephone Conference Call Held on July 28, 2011 between the U. S. Nuclear Regulatory Commission and STP Nuclear Operating Company, Concerning Requests for Additional Information Pertaining to the South Texas Project, License Renewal Application. August 23, 2011. ADAMS No. ML11216A263.

[NRC] U.S. Nuclear Regulatory Commission. 2012. Memorandum from Tam Tran, Project Manager. Subject: Summary of Telephone Conference Call Held on January 31, 2012 between the U. S. Nuclear Regulatory Commission and STP Nuclear Operating Company, Concerning Requests for Additional Information Pertaining to the South Texas Project, License Renewal Application. February 14, 2012. ADAMS No. ML12033A134.

[STPNOC] South Texas Project Nuclear Operating Company. 2006. Letter from David W. Rencurrel, STPNOC to USNRC Document Control Desk, Subject: South Texas Project Units 1 and 2, Docket Nos. STN 50-498, STN 50-499 Revised Broad Scope Risk-Informed Technical Specification Amendment Request." Wadsworth, Texas. June 6, 2006. ADAMS No. ML061630315.

[STPNOC] South Texas Project Nuclear Operating Company. 2007. Letter from Charles T. Bowman, STPNOC, to U.S. Nuclear Regulatory Commission Document Control Desk, Subject: South Texas Project Units 1 and 2, Docket Nos. STN 50-498, STN 50-499, Response to NRC Requests for Additional Information on STPNOC Proposed Risk Managed Technical Specifications (TAC Nos. MD 2341 and MD 2342). Wadsworth, Texas. February 28, 2007. ADAMS No. ML070670369.

[STPNOC] South Texas Project Nuclear Operating Company. 2009. "South Texas Project Units 3 and 4 Combined License Application (COLA) (Environmental Report), Rev. 3." September 2009. ADAMS No. ML092931600.

[STPNOC] South Texas Project Nuclear Operating Company. 2010. "South Texas Project—License Renewal Application, Applicant's Environmental Report, Operating License Renewal Stage, South Texas Project, Units 1 and 2." September 2010. ADAMS No. ML103010263.

[STPNOC] South Texas Project Nuclear Operating Company. 2011a. Letter from G. T. Powell, STPNOC, to U.S. Nuclear Regulatory Commission Document Control Desk, Subject: South Texas Project Units 1 and 2, Docket Nos. STN 50-498, STN 50-499, Response to Request for

Additional Information on South Texas Project License Renewal Application (TAC No. ME4938). July 5, 2011. ADAMS No. ML11193A016.

[STPNOC] South Texas Project Nuclear Operating Company. 2011b. "Additional Information on South Texas Project License Renewal Application (TAC No. ME4938)." August 23, 2011. ADAMS No. ML11250A067.

[STPNOC] South Texas Project Nuclear Operating Company. 2012a. Letter from D. W. Rencurrel, STPNOC, to U.S. Nuclear Regulatory Commission Document Control Desk, Subject: South Texas Project Units 1 and 2, Docket Nos. STN 50-498, STN 50-499, Supplemental Response to Request for Additional Information on South Texas Project License Renewal Application—SAMA (TAC Nos. ME4938 and ME5122). January 19, 2012. ADAMS No. ML12030A081.

[STPNOC] South Texas Project Nuclear Operating Company. 2012b. Letter from D. W. Rencurrel, STPNOC, to U.S. Nuclear Regulatory Commission Document Control Desk, Subject: South Texas Project Units 1 and 2, Docket Nos. STN 50-498, STN 50-499, Clarification to Supplemental Response to Request for Additional Information on South Texas Project License Renewal Application—SAMA (TAC Nos. ME4938 and ME5122). February 16, 2012. ADAMS No. ML12053A259.

[TVA] Tennessee Valley Authority. 2010. Letter from Masoud Bajestani, TVA, to U.S. Nuclear Regulatory Commission Document Control Desk. Subject: Watts Bar Nuclear Plant (WBN) Unit 2—Request for Additional Information Regarding Severe Accident Management Alternatives (TAC No. MD8203). July 23, 2010. ADAMS No. ML102100588.

Texas State Data Center, 2006. Available at: <http://txsdc.utsa.edu/> (Accessed May 2012).

[USGS] U. S. Geological Survey. 2008. *2008 NSHM Gridded Data.* Available at: <http://earthquake.usgs.gov/hazards/products/conterminous/2008/data/#fileformat> (Accessed May 2012).

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11. ABSTRACT (200 words or less)
This supplemental environmental impact statement has been prepared in response to an application submitted by STP Nuclear Operating Company (STPNOC) to renew the operating licenses for South Texas Project (STP), Units 1 and 2, for an additional 20 years. This supplemental environmental impact statement (SEIS) includes the preliminary analysis that evaluates the environmental impacts of the proposed action and alternatives to the proposed action. Alternatives considered include: new nuclear generation, natural gas-fired combined-cycle generation, supercritical coal-fired generation, combination alternative, purchased power, and not renewing the license (the no-action alternative).

The U.S. Nuclear Regulatory Commission's (NRC's) preliminary recommendation is that the adverse environmental impacts of license renewal for STP are not great enough to deny the option of license renewal for energy planning decisionmakers. This recommendation is based on the following:

- the analysis and findings in NUREG–1437, Volumes1 and 2, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants;"
- the environmental report submitted by STPNOC;
- consultation with Federal, State, local, and Tribal government agencies;
- the NRC's environmental review; and
- consideration of public comments received during the scoping process.

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