Nuclear Operating Company

South Texas Project Electric Generating Station 4000 Avenue F – Suite A Bay City, Texas 77414

December 18, 2008
U7-C-STP-NRC-080073

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

South Texas Project
Units 3 and 4
Docket Nos. 52-012 and 52-013
Response to Requests for Additional Information

Reference: Letter, Paul Kallan to Scott Head, "Request for Additional Information, Letter Number Two Related to the Environmental Report for the South Texas Combined License Application", dated November 18, 2008, ML083190269 (U7-C-NRC-STP-080110)

Attached are thirty-five responses to NRC questions from the Reference letter. They Include

02.03-02	02.05-11	04.03.01-03	09.02.03-01
02.03-03	02.06-01	04.04-10	09.02.03-02
02.03-06	02.07-05	04.04-12	09.03-01
02.03-07	04.02-05	05.03.01.02-01	09.03-02
02.03-08	04.02-06	05.03.01.02-03	09.03-04
02.04.01-03	04.02-07	05.03.03.01-01	09.03-09
02.04.01-06	04.02-08	07.01-01	10.05S-02
02.04.02-11	04.02-11	07.02-06	10.05S-03
02.05-06	04.03.01-02	07.02-07	

Where the above responses include references to enclosed files, please refer to the enclosed CD/DVD. Some of the file formats and names on the enclosed CD/DVD do not comply with the requirements for electronic submission in NRC Guidance Document, "Guidance for Electronic Submissions to the NRC," dated November 20, 2007. Many of these files are not formatted as pdf files. The NRC Staff requested the files be submitted in their native formats required by the software in which they are utilized to support the Environmental Report development.

The response to RAI 02.03-06 in Attachment 3 contains preliminary modeling information that is currently being verified and validated. Final results from this activity are expected to be provided to the NRC prior to January 23, 2009.

There are no commitments in this letter.

If you have any questions, please feel free to contact me at (361) 972-7136, or Russell W. Kiesling at (361)-972-4716

I declare under penalty of perjury that the foregoing is true and correct.

Executed on _____

Scott Head
Manager, Regulatory Affairs
South Texas Project, Units 3 & 4

rwk

Attachments:

1. Question 02.03-02
2. Question 02.03-03
3. Question 02.03-06
4. Question 02.03-07
5. Question 02.03-08
6. Question 02.04.01-03
7. Question 02.04.01-06
8. Question 02.04.02-11
9. Question 02.05-06
10. Question 02.05-11
11. Question 02.06-01
12. Question 02.07-05
13. Question 04.02-05
14. Question 04.02-06
15. Question 04.02-07
16. Question 04.02-08
17. Question 04.02-11
18. Question 04.03.01-02
19. Question 04.03.01-03
20. Question 04.04-10
21. Question 04.04-12
22. Question 05.03.01.02-01
23. Question 05.03.01.02-03
24. Question 05.03.03.01-01
25. Question 07.01-01
26. Question 07.02-06
27. Question 07.02-07
28. Question 09.02.03-01
29. Question 09.02.03-02
30. Question 09.03-01
31. Question 09.03-02
32. Question 09.03-04
33. Question 09.03-09
34. Question 10.05S-02
35. Question 10.05S-03

Enclosure: CD/DVD containing supporting documentation including:

Folder RAI 02.03-02
Folder RAI 02.04.01-03
Folder RAI 02.04.01-06
Folder RAI 02.04.02-11
Folder RAI 02.05-06
Folder RAI 05.03.01.02-03

cc: w/o attachment except*
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Question 02.03-02

Question Number: 02.03-02

QUESTION:

Describe the existing storm water treatment and outfalls, and the water bodies into which they discharge.

Full Text (Supporting Information):

Provide a better copy of Figure 1-1 from STPNOC 2004 Storm Water Pollution Prevention Plan included in the earlier response.

RESPONSE:

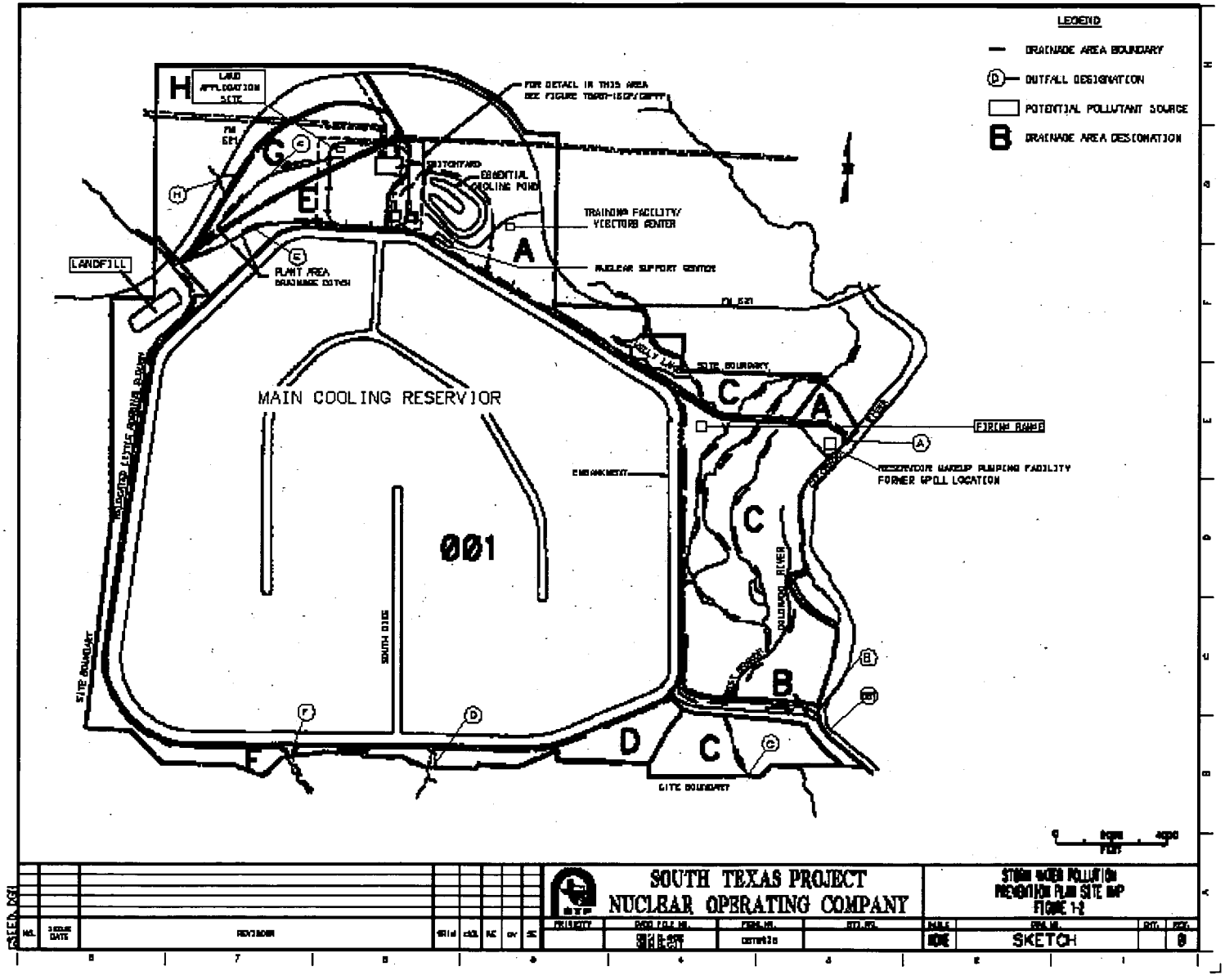
Figure 1-2 Site Map from the facility Storm Water Pollution Prevention Plan is attached. This figure indicates the current storm water drainage areas and monitoring locations. This figure is also included as a pdf file on the enclosed CD/DVD in the folder entitled RAI 02.03-02 so it can be viewed at higher magnification.

The storm water monitoring locations can also be found on Figure 6.3-3 of Rev. 2 of the Environmental Report. This figure, however, does not show the STP site property boundary.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 02.03-02



Question 02.03-03

Question Number: 02.03-03

QUESTION:

Provide information regarding water rights under severe droughts.

Full Text (Supporting Information):

From the earlier response, it is not clear who STPNOC will request the emergency relief from under the stipulations of Texas Water Code Section 11.148. Clearly state this.

RESPONSE:

During a drought worse than the drought of record, should the level of the MCR drop to 30 feet mean sea level, STPNOC and the Lower Colorado River Authority would pursue emergency relief from pumping restrictions pursuant to Texas Water Code Section 11.148 from the Texas Commission of Environmental Quality (formerly the Texas Natural Resources Conservation Commission) or other applicable statues as necessary to prevent the water elevation of the MCR from dropping below its minimum operating level of 25.5 feet mean sea level.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 02.03-06

Question Number: 02.03-06

QUESTION:

Provide details of MCR operation during existing two–unit and future four-unit operation to help staff independently estimate water-use and water-quality impacts.

Full Text (Supporting Information):

ER RAI Letter No. 2, dated November 18, 2008:

Provide an update on the modeling effort currently underway for the MCR water budget and water quality. Include details pertaining to the approach adopted in the development of these models. Also include details regarding input data requirements for these models, with particular emphasis on modeling/simulation time steps. Describe the anticipated approach adopted for using these models to predict impacts on water use in the Colorado River Basin and on water quality in the Colorado River.

ER RAI Letter No. 1, dated May 16, 2008:

Part 1: Provide details of operating policy for the MCR including details of water withdrawal conditions and limits defined by the Lower Colorado River Authority (LCRA) permit. Provide details on differences in the operating policy of the MCR for operation with all four units compared to the existing operation with two units.

Part 2: When was the maximum operating water level in the MCR increased from 45 to 47 ft mean sea level (MSL)? Why was this necessary? Discuss the impact of an increase in maximum water level of the MCR from 47 to 49 ft MSL on natural and forced evaporation and on seepage losses from the MCR.

Part 3: Why is a discharge of 1200 cfs in the Colorado River near the RMPF considered the threshold for "high flow?" How is the discharge in the Colorado River near the RMPF monitored?

Part 4: Provide water budget and water quality models of the MCR for two-unit and for four-unit operation taking into account the water withdrawal policy, LCRA permit limits, discharges to the MCR, seepage losses from the MCR, and blowdown from the MCR.

Part 5: Provide details of frequencies of operation of the RMPF for existing two-unit operation and for future four-unit operation.

Part 6: Provide details of existing water use for Units 1 and 2 as well as estimated water use for all four units, including (1) maximum annual makeup from Colorado River, (2) maximum monthly makeup from the Colorado River for each month, (3) maximum annual consumptive use, and (4) maximum monthly consumptive use for each month.

Question 02.03-06

Part 7: Provide an explanation as to why there has been no release of water to the Colorado River from operation of Units 1 and 2.

Part 8: Describe the assessment performed or provide the analysis to support the conclusion that the impact on water quality in the Colorado River from the operation of the MCR blowdown would be SMALL. Include the description of chemical and thermal impacts.

Part 9: Describe the impact of a prolonged drought on water quality in the MCR and how this may affect the water quality impact on the Colorado River during a subsequent blowdown.

RESPONSE:

A response to each part of ER RAI 02.03-06 provided in ER RAI Letter No. 1 was submitted to the NRC in STP letter ABR-AE-08000063, dated August 14, 2008. Additional information with respect to the four- unit operation is provided in the following supplemental responses to Parts 4, 5 and 6 of RAI 02.03-06.

Restatement of Question Parts 4, 5 and 6:

Part 4: Provide water budget and water quality models of the MCR for two-unit and for four-unit operation taking into account the water withdrawal policy, LCRA permit limits, discharges to the MCR, seepage losses from the MCR, and blowdown from the MCR.

Part 5: Provide details of frequencies of operation of the RMPF for existing two-unit operation and for future four-unit operation.

Part 6: Provide details of existing water use for Units 1 and 2 as well as estimated water use for all four units, including (1) maximum annual makeup from Colorado River, (2) maximum monthly makeup from the Colorado River for each month, (3) maximum annual consumptive use, and (4) maximum monthly consumptive use for each month.

Supplemental Response to Question Parts 4, 5 and 6:

A water budget and water quality model for four-unit operation is developed for the MCR to predict the blowdown characteristics in response to the discharge limits specified in the TPDES permit (Permit No. WQ0001908000, dated July 27, 2005) and the diversion rules from the Colorado River established in the Certificate of Adjudication 14-5437 and the Water Delivery Plan, the contractual agreement between the LCRA and STPNOC. The simulation is conducted using a time step of one day for the modeling period of May, 1948 to December, 2005. Input parameters of the model are listed below:

- Colorado River flow rates and conductivity levels. The time history of river flow rate was obtained from the USGS gauging station 'Colorado River Bay City, TX' (Site No. 08162500). The conductivity data were collected from USGS (at the Bay City gauge), TCEQ (near the FM521 bridge) and measurements taken at the RMPF.
- Evaporative loss from the MCR due to plant operation. A one-dimensional multi-layer hydrothermal model was developed to simulate the thermal performance in the MCR and to estimate the evaporative loss as a result of the heat loading from the projected operation of four units. The model simulates the heat exchange across the open surface of a cooling pond based on a given set of meteorological condition and plant operating parameters for the specified pond configuration. The thermal model was calibrated with historical plant operation data and meteorological data from 2002 to 2005.
- Consumptive use (i.e., evaporative loss from the MCR) is limited to 80,125 acre-ft/year, in accordance with the Certificate of Adjudication 14-5437.
- Station load factor. A station load factor of 93% is used in the evaluation of water availability to sustain the four-unit operation and the expected blowdown quantity and quality on a long-term average basis. Full load operation (i.e., station load factor of 100%) is assumed in the evaluation of maximum monthly and maximum annual consumptive use and makeup flow rate from the Colorado River.
- Water temperature at the blowdown location. It is a simulation result of the hydrothermal model.
- Rainfall data. National Climate Data Center (NCDC) daily rainfall data from two meteorological stations: Victoria (WBAN # 12922) and Victoria Regional Airport (WBAN # 12912) for the period 1948 to 2005 are used to represent the natural inflow to the MCR.
- Seepage rate. The seepage loss rate used is 5700 acre-ft/year, in accordance with UFSAR 1 & 2. The seepage rate was validated in the calibration of the water budget model using historical operational data from the existing units and found to be reasonable.
- Makeup rules. The makeup/diversion rules have been provided in the response to Question Part 1.
- Blowdown rules. The blowdown rules implemented in the model are discussed below.

Blowdown Rules:

1. Blowdown is permitted only when the MCR water level is between 40 ft MSL and 49 ft MSL.
2. Blowdown in conjunction with makeup water diversion is permitted only when the river water conductivity is less than 2100 µS/cm.[Note 1]
3. Blowdown is permitted only when the river flow at the blowdown facility is greater than or equal to 2500 cfs. This value is estimated by subtracting the reservoir makeup flow from the measured flow rate at the Bay City gauge.
4. If Rules #1, 2[Note 1] and 3 are met, and the conductivity level in MCR is greater than or equal to 3000 µS/cm, commence blowdown.
5. Stop blowdown when any of Rules 1, 2[Note 1] or 3 are not met or when the MCR conductivity is less than or equal to 2100 µS/cm.
6. Spillway Gate operation is required when MCR level reaches 49.5 ft MSL during abnormal or emergency situations.

7. Blowdown (designed leakage through the relief well system) is 3,850 acre-ft/year, which constitutes a portion of the total seepage loss of 5,700 acre-ft/year from the MCR.

Notes:

[1]For Rule #2, blowdown without makeup may occur during significant rainfall events to reduce MCR level when the MCR level is near or above 49 ft MSL.

In terms of the flow rates for makeup and blowdown, the following rules have been implemented in the model:

Flow Rate Rules:

8. Allowable diversion rate (makeup) = 0.55 (Q_{BC} – 300 cfs)
9. Maximum diversion rate (makeup) = 1200 cfs
10. Maximum annual diversion is 102,000 acre-ft
11. Maximum blowdown rate = 308 cfs, Average daily blowdown rate = 222 cfs
12. Blowdown flow rate, $Q_{BD} = \alpha (Q_{BC} - Q_M)$

α= 0.125, Q_{BC} = River flow rate at Bay City gage, Q_M = makeup flow

Also a rule was specified about the temperature of the water during blowdown.

Temperature Rule:

13. Blowdown is permitted only when the MCR water temperature is below or equal to 95°F.

Finally the river water diversion rules when blowdown is not permitted as described below were incorporated in the model (these rules are similar to those described in the Water Delivery Plan and given in response to Question Part 1):

River Water Diversion (Makeup) Rules - Periods when blowdown is not permitted:

14. If the MCR water level is between 36 ft MSL and 40 ft MSL and the river water conductivity is less than or equal to the MCR water conductivity, divert river water to the MCR to provide makeup. Flow rate rules # 8, 9, and 10 apply.
15. If the MCR water level is between 32 ft MSL and 36 ft MSL, and the river water conductivity is less than or equal to 10,000 µS/cm, divert river water to the MCR to provide makeup. Flow rate rules # 8, 9 and 10 apply.
16. When the MCR level is below 35 ft MSL, LCRA begins staged deliveries of firm water at the rate of 40,000 acre-ft per year (rolling 5 year average) to ensure that MCR level does not drop below 27 ft MSL. Rules # 8 and 10 do not apply to the staged firm water deliveries.

Question 02.03-06

In accordance with the makeup and blowdown rules described above, the inventory (i.e., volume of water) in the MCR at the end of each day is calculated in the model as follows:

(volume of water at the beginning of the day) + (make up water, if available/allowed) + (precipitation) + (firm supply of makeup, if necessary) – (evaporation) – (seepage) – (blowdown, if necessary/allowed) = (volume of water at the end of the day)

After the change in volume for each day is determined, the conductivity level of the MCR is calculated based on the assumption that the MCR is fully mixed.

Initially, the model is validated using the following historical operational data of Units 1 & 2 from 01/01/2003 to 12/31/2005 including:

- Daily diversion flows from the Colorado River
- Heat load from Units 1 & 2 to MCR.
- Historical data for the water level and conductivity of the MCR.

The long-term simulation for the four-unit operation covers the period from 05/01/1948 to 12/31/2005. The model predicts the daily variations of water levels in the MCR, the conductivity levels in the MCR, diversion from the Colorado River and blowdown to the Colorado River. The conductivity level in the MCR was initially set to 2400 μS/cm at the start of the model simulation. A sensitivity analysis using different starting conductivity levels demonstrated that this initial condition has minimal impacts to the long-term simulation results. Initial modeling results support the conclusion that the water available for diversion in the Colorado River can sustain four-unit operations.

As described above, evaluations are underway to provide the full results of the MCR water budget and water quality model study for four-unit operation. During the final review, it was determined that additional analyses would be required to further evaluate three of the input parameters: the total seepage loss from MCR, the maximum allowable MCR water level, and the station load factor. The results of these additional analyses will be provided in a January 2009 submittal to fully address Parts 4, 5 and 6 of RAI 02.03-06. Preliminary results from the additional analyses indicate that the conclusions stated above are still valid.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 02.03-07

Question Number: 02.03-07

QUESTION:

Provide details of the process followed in the selection of the site hydrogeologic conceptual model.

Full Text (Supporting Information):

(A) The process description is good, but could be interpreted as leading to a single alternative conceptual model. The process described does not explicitly describe the alternate conceptual models considered, and the logic that produced the plausible conservative conceptual model on which analyses are based. Identify the alternative conceptual models considered and the logic that identified the plausible conservative conceptual model employed. **(B)** A contradiction exists in item "(a) Drawdown at offsite wells." It is stated that based on the conceptual model and drawdown during construction dewatering and water production there "may" be potential impacts to offsite wells. In the next paragraph, it is stated that drawdown during dewatering will "remain within the STP site boundaries." Based on these statements, it is not clear what impacts from dewatering are expected. Clarify. **(C)** Since drawdown values are presented, it will be necessary to review calculation packages. Identify and provide the calculation package(s).

RESPONSE:

(A) The original response for RAI 2.3-7, submitted to the NRC in STP letter ABR-AE-08000048, dated July 2, 2008, has been updated in this response to present the alternative conceptual models identified, and to present the logic that identified the plausible, prudently conservative conceptual model used in the discussion.

The final hydrogeologic conceptual model presented in Subsection 2.3.1.2 of the Environmental Report (ER) was developed from multiple conceptual hydrogeologic models that were considered, based on framework and scale differences. Consideration of these differences was not mutually exclusive, but was intertwined during a series of steps designed to develop a tenable site hydrogeologic conceptual model. Four steps were involved in the development of the scale-dependent conceptual models, as outlined below:

- A regional "desktop" study based on published state, federal and informational sources;
- A review of documentation from obtainable sources addressing existing STP Units 1 & 2, including the STP Units 1 & 2 UFSAR;
- A site-specific geotechnical, geologic, and hydrogeologic field study conducted for proposed Units 3 & 4; and
- An evaluation of the site-specific data in conjunction with the regional, local and STP site information.

Question 02.03-07

Intertwined with these four steps, two main hydrostratigraphic frameworks were investigated during formulation of the conceptual site model; STP site-specific conceptual models and a regional hydrogeologic conceptual model. The basis for the site-specific conceptual model was the existing Units 1 & 2 UFSAR. The regional conceptual model contained greater uncertainty due to limited information on near site conditions and future groundwater development within the county.

The first step of site model conceptualization involved formulating an understanding of the hydrogeologic conditions in Southern Texas and Matagorda County by reviewing regional geologic and hydrogeologic information from the United States Geological Survey (USGS) and the State of Texas. One regional conceptual hydrostratigraphic model considered was based on the USGS Groundwater Atlas of the United Sates – Oklahoma, Texas (ER Section 2.3.1.2.1, Reference 2.3.1-21) and other USGS publications. This conceptual model includes five permeable zones (denoted A through E) and two confining units (D and E, both units located down dip at the top of permeable zones D and E respectfully) within the Coastal Lowlands Aquifer System. A second regional conceptual hydrostratigraphic model considered was based on information obtained from the Texas Water Development Board. This conceptual model, which is generally accepted in Texas, includes three aquifers – the Chicot, Evangeline and Jasper, and two confining units – the Burkeville and Catahoula. The Chicot Aquifer includes all of permeable zone A and most of B. The Evangeline Aquifer includes the rest of permeable zone B and all of C. The Jasper Aquifer is roughly equivalent to permeable zones D and E. The Burkeville and Catahoula correlate to confining units D and E. Both conceptual models include the Vicksburg-Jackson confining unit as the basal confining unit to the Coastal Lowlands Aquifer System. ER Figure 2.3.1-16 illustrates the correlation between the USGS and Texas nomenclature.

During the first step in model conceptualization, this information along with additional research concentrated on the hydrogeologic conditions of Matagorda County was used to evaluate geologic structures, hydrogeologic properties, flow paths, regional sources and sinks, water use, and surface water interactions within the county. The resulting regional conceptual hydrogeologic model is discussed in Subsection 2.3.1.2.2 and other 2.3.1.2 subsections. Due to the scale of the regional conceptual model, an uncertainty in understanding temporal and localized effects on the regional flow systems from groundwater use and surface water interactions in the vicinity of the STP site was evident. This included interactions between the shallow and deep aquifer zones within the Chicot Aquifer, groundwater flow directions and gradients within these zones, and current and estimated groundwater use projections. The uncertainty of applying the regional scale data to the local level resulted in the identification of multiple alternative conceptual models for further consideration in the development of the plausible site hydrogeologic conceptual model. These include:

- Uncertainty of the degree of hydraulic separation between the local Shallow and Deep aquifers within the regional Chicot Aquifer:
    - Is there large-scale communication between the aquifers or is there an adequate confining unit that minimizes hydraulic communication between the aquifers?
    - Have man-induced activities resulted in hydraulic communication between the aquifers?

- Deep Aquifer:
  - Regional flow direction has been documented to be predominantly towards the south-southeast. However, a localized flow component to the northwest has also been observed. Have regional cones of depression due to large-scale pumping altered the regional southeast gradient in the vicinity of the site, resulting in a north-northwest flow direction (Figures ER 2.3.1-21 and -22), or is there hydraulic communication between the Deep Aquifer and surface water to the northwest that creates an area of discharge?
- Shallow Aquifer:
  - Information searches suggest a regional groundwater flow direction towards the south-southeast but with uncertainty when applying the regional flow characteristics to the site area.
  - Does the Colorado River or the alluvium associated with the river behave as a hydrogeologic sink for the Shallow Aquifer?
  - Due to the depositional history of the area, multiple continuous and discontinuous sand lenses are likely to be present within the stratigraphic framework that can be expected to have a controlling affect on localized flow directions and magnitudes.
  - Due to the deposition history, preferred pathways such as paleochannels can be expected to be present at the site.
  - Localized pumping and man-made influences could alter flow directions in the relatively Shallow Aquifer sands.

During the second step in model conceptualization, the understanding of the groundwater system was increased through a thorough review of existing documentation that addresses local hydrogeologic conditions such as the STP Units 1 & 2 UFSAR and the Annual Environmental Operating Report (2005). This information included aquifer pumping tests, geotechnical borings, observation wells, permeability tests, dewatering activities, Main Cooling Reservoir (MCR) design requirements, groundwater use, and other information generated for Units 1 & 2. The review of these data provides identification of aquifer units, hydrogeologic parameter values, vertical and horizontal flow gradients and groundwater flow paths. These hydrogeologic properties are expected to be similar for the proposed Units 3 & 4 facility, and was used to reduce uncertainty and narrow the alternative conceptual models selected for the site as documented below:

- The Units 1 & 2 geological borings, geotechnical investigations and aquifer pumping test results indicate a pronounced confining unit separating the Shallow and Deep aquifers, eliminating or greatly reducing hydraulic communications between the aquifers:
  - No large man-made impacts (e.g., cones of depression and water quality) to the aquifer were documented within the vicinity of the site boundaries. Regional water, petroleum and gas wells do exist in the area.
- The Shallow Aquifer is comprised of both discontinuous sand lenses and continuous layers separated by silts and clays. Two aquifer zones were identified; the Upper Shallow Aquifer and the Lower Shallow Aquifer based on Units 1 & 2 geotechnical borings, aquifer pumping tests, and observation well potentiometric head measurements:
  - The zones are confined to semi-confined, each comprised of multiple sand units.
  - Groundwater flow directions are southeasterly towards the Colorado River.

  - The excavation and construction of Units 1 & 2 resulted in an area of direct communication between the Upper and Lower Shallow aquifers (compacted backfilled sand material).
- Alternative conceptual models for the Shallow Aquifer include:
  - Uncertainty about whether Kelly Lake and Little Robbins Slough are areas of discharge for the Shallow Aquifer, or whether groundwater flows beyond these features.
  - Due to potential seepage from the MCR and the operation of the MCR relief wells, has the STP site pre-construction groundwater flow directions beneath the proposed location for Units 3 & 4 been altered to a point that the groundwater flow direction can no longer be described as southeasterly?
- Alternative conceptual models for the Deep Aquifer include:
  - Uncertainty in groundwater flow directions in the Deep Aquifer at the site due to site production wells.
  - Uncertainty in future groundwater development plans within Matagorda County that could change regional flow directions and gradients.

Incorporating the conceptual site model with regional concepts, the Chicot Aquifer was subdivided into two distinct aquifers – the confined "Deep Aquifer" and the semi-confined to confined "Shallow Aquifer" (separated into Upper and Lower Shallow Aquifer zones). This conceptual model is discussed in Subsection 2.3.1.2.3.1 of the ER. The Shallow Aquifer identified in the Units 1 & 2 UFSAR was targeted for further hydrogeologic investigation as part of the Units 3 & 4 subsurface site investigation (SI). The Deep Aquifer identified in the regional data and the Units 1 & 2 UFSAR was further evaluated through well permits, STP historical records and literature searches. The UFSAR and supporting information suggested approximately 100 feet of hydraulic separation between the Shallow and Deep aquifers. The critical hydrogeologic unknowns for Units 3 & 4 were to understand localized flow paths and the possible effects on these flow paths from operating the MCR and the STP maintained wetlands (located to the north of Units 1 & 2). In addition, information from state water divisions and local groundwater districts was used to postulate future groundwater use projections for Matagorda County.

The third step involved incorporating information gathered from the site-specific Units 3 & 4 SI. The SI included geotechnical borings, installation of groundwater observation wells, water level monitoring, water quality analyses, and aquifer tests. The site-specific conceptual model is discussed in Subsection 2.3.1.2.3.2 of the ER. The SI hydrogeologic target zones identified as the result of the regional and site specific information presented in the Units 1 & 2 UFSAR were, in general, confirmed with the exception of a few outliers (where the sands of the Lower Shallow Aquifer were not well defined at two of the well cluster locations). The results of this evaluation are described as follows:

- Long-term monitoring of the Deep Aquifer at the site suggests flow is to the north towards the Unit 1 & 2 production wells operating in the northern portion of the site.
- The Upper Shallow Aquifer is generally composed of a single predominately sand zone. The Lower Shallow Aquifer is generally composed of two predominate sand zones.

- Seepage from the MCR into the Upper Shallow Aquifer acts as a hydraulic barrier to flow south of Units 3 & 4. Flow direction in the vicinity of Units 3 & 4 is predominately to the southeast and east, but a component of flow is also deflected towards the southwest as the result of the MCR.
- Kelly Lake and Little Robbins Slough could be groundwater discharge areas for the Upper Shallow Aquifer but data collected to date could not confirm this concept.
- The magnitude of the impact the MCR may have on the Lower Shallow Aquifer is undetermined. Although information collected from the Units 3 & 4 study suggests flow is predominately towards the southeast towards the Colorado River, it is postulated that mounding in the aquifer is plausible due to the influence of the MCR.

The fourth step involved evaluation of the SI field data with the regional and local information, and historical STP information. This included evaluation of:

- Regional and local groundwater movement;
- Vertical gradients between the aquifers;
- Site-specific slug test results and local and regional pumping test results; and
- Water levels to assess possible localized influence of the MCR and the northeast wetland on the Shallow Aquifer.

From this effort, site-specific data were integrated with existing STP information and regional information to formulate the final conceptual site model. The final conceptual model was developed as part of the preparation of FSAR Section 2.4S.12 and was summarized in ER Subsection 2.3.1.2. The most plausible conceptual model selected was an east to southeast flow direction in the Upper Shallow Aquifer from Unit 3 with a possible southwesterly flow direct from Unit 4. Groundwater flow in the Lower Shallow Aquifer is in general, southeasterly to the Colorado River. The MCR has a more pronounced effect on the groundwater flow direction in the Upper Shallow Aquifer than in the Lower Shallow Aquifer.

To further reduce the uncertainty as to the direction of groundwater flow within the Shallow Aquifer from Units 3 & 4 and to be less reliant on the uncertainty of the historical STP groundwater observation well network, additional Units 3 & 4 groundwater observation well clusters were installed in 2008 and a groundwater model is under development to refine the hydrogeologic conceptual model for this site. Based on groundwater level data collected during September 2008, there is preliminary evidence to suggest that the MCR is not having an obvious impact on groundwater levels and flow in the Lower Shallow Aquifer compared with that on the Upper Shallow Aquifer. In addition, the convergence of levels between the Shallow Aquifers and Kelly Lake indicates Kelly Lake is an area of discharge from both the Upper and Lower Shallow Aquifers and that it is postulated that surface water and groundwater interactions occur along the relocated portion of Little Robbins Slough, western site boundary.

Question 02.03-07

(B) Drawdown from Units 3 & 4 construction dewatering within the Shallow Aquifer is not expected to impact off-site hydrogeologic features. A Hydraulic Gradient Impact study was initiated during the early phases of the COLA process to provide a construction dewatering conceptual design for Units 3 & 4 and to evaluate the expected impact to the groundwater potentiometric surface in the vicinity of existing Units 1 & 2 and the MCR containment dike. Subsequent to the submittal of the initial STP COLA, a more detailed construction dewatering plan has been developed that will include the use of slurry walls. The use of slurry walls would limit the dewatering cone of depression and reduce the drawdown estimates stated above. A summary of the current construction dewatering approach is provided in COLA Rev. 2 in ER Section 2.3.1.2.6 and details are provided in FSAR Section 2.5S.4.5.2. The construction dewatering approach and the environmental impacts as the result of construction dewatering is discussed in ER Section 4.2.

However, peak withdrawals from the existing on-site Deep Aquifer production wells during construction and increased withdrawals to operate Units 3 and 4 is postulated to potentially increase impacts within the Deep Aquifer beyond the site boundary (increased aquifer drawdown). The statement in the original response to RAI 2.3-7 "...increase groundwater withdrawals from the Deep Aquifer during construction and operation of Units 3 & 4 may potentially impact off-site wells" is in reference to increasing the withdrawal rate of the site production wells to support Units 3 & 4 construction and operations. The environmental and potentiometric impacts of the increased groundwater demand are discussed in ER Section 4.2.

(C) Calculations are available in a reading room for audit and inspection by the NRC.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 02.03-08

Question Number: 02.03-08

QUESTION:

Provide groundwater observations for a sufficiently long period to reveal seasonal trends. If available, also provide long-term trend data on groundwater in the vicinity of the proposed facility.

Full Text (Supporting Information):

The RAI response and proposed revision includes the revised table providing the groundwater observations revealing seasonal trends; however, the series of figures (Figure 2.3.1-25) showing quarterly aquifer response to stress should also be revised to show the full year seasonal response in the data set. The current figure shows February and April results only. Provide the full sequence of figures.

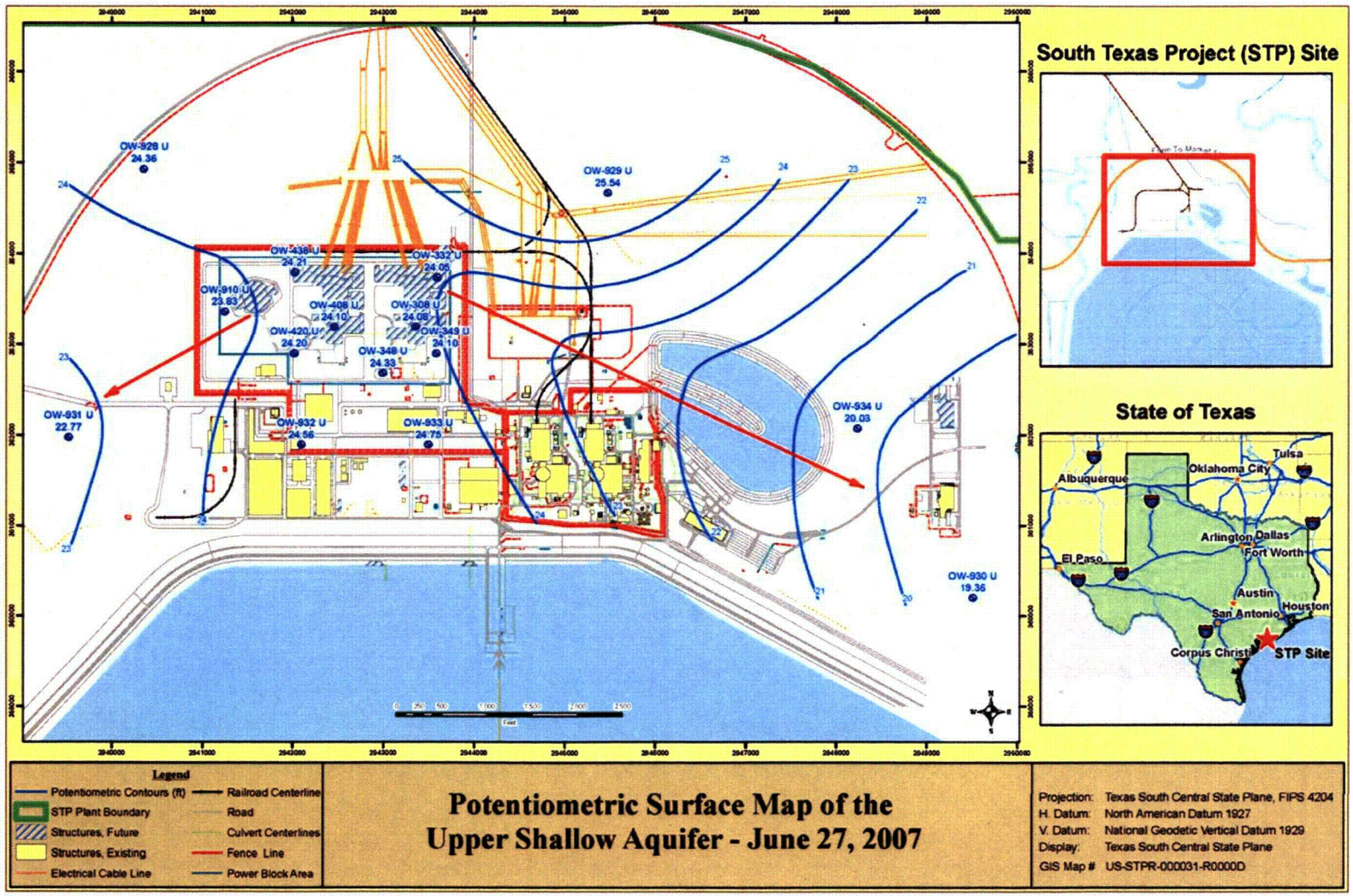
RESPONSE:

A full year of monthly water level measurements from the STP Units 3 & 4 Upper and Lower Shallow Aquifer groundwater observation wells was completed on December 17, 2007. A table of these readings was provided in the original response to RAI 2.3-8 submitted to the NRC in STP letter ABR-AE-08000048, dated July 2, 2008. However, figures illustrating the groundwater levels for the later quarters of 2007 were not provided. To provide the full sequence of figures, seasonal potentiometric surface maps of both the Upper Shallow Aquifer and Lower Shallow Aquifer for June, September, and December 2007 are included in this response and will be included in an updated Figure 2.3.1-25.

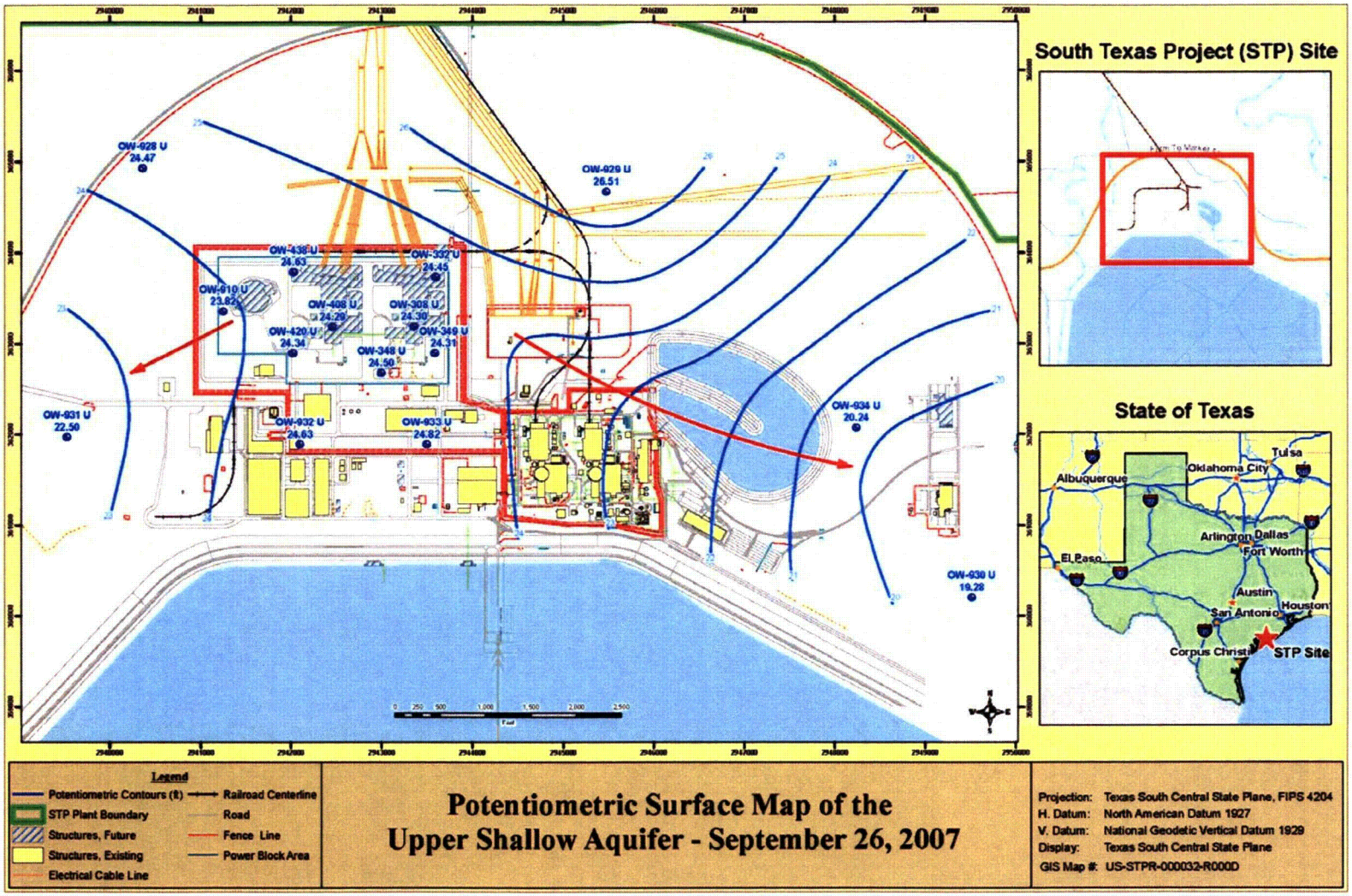
CANDIDATE COLA REVISION:

Figure 2.3.1-25 will be updated to include the attached figures described above. Pointers to this figure in the COLA text will be altered as needed.

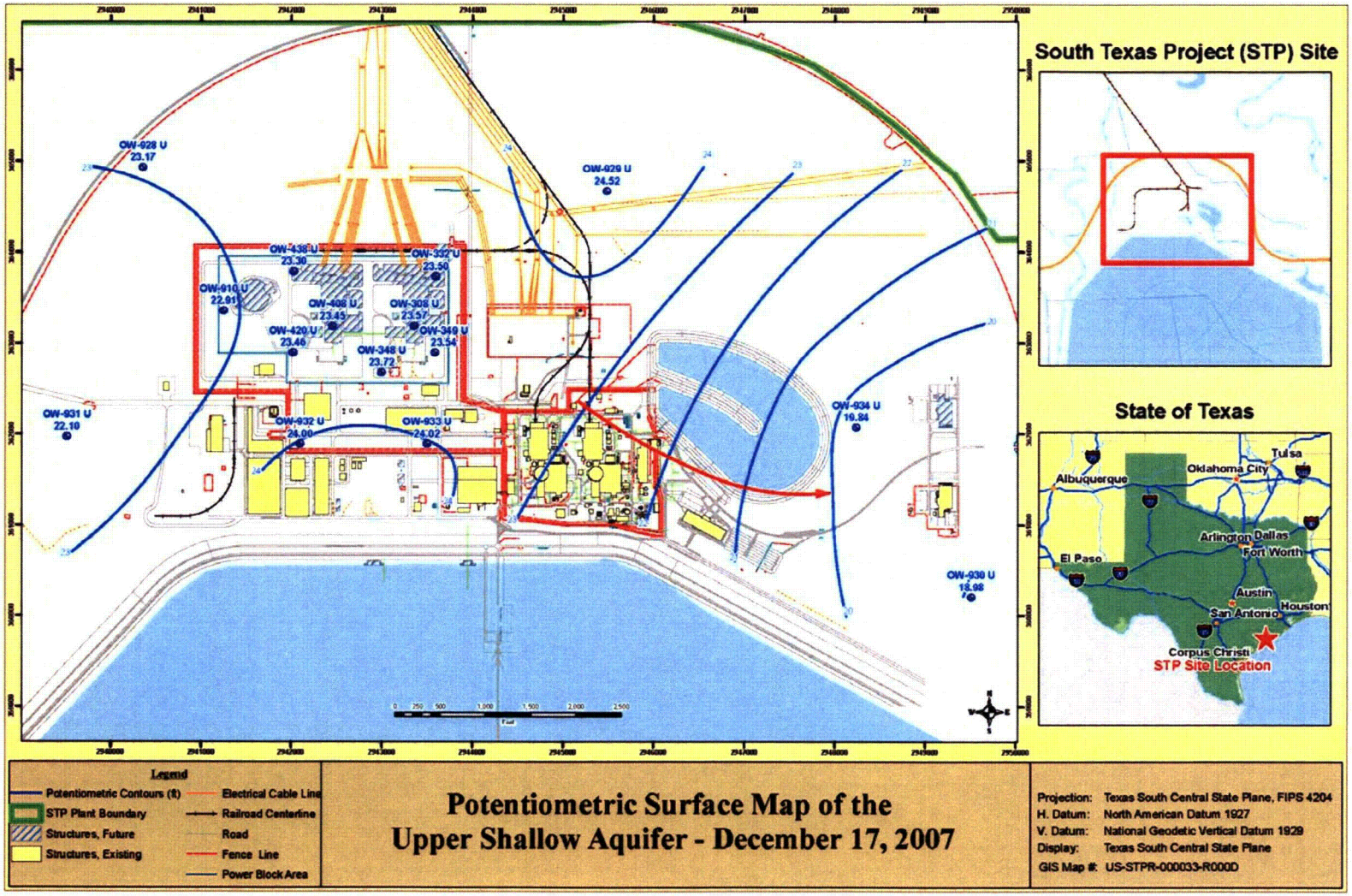
Question 02.03-08



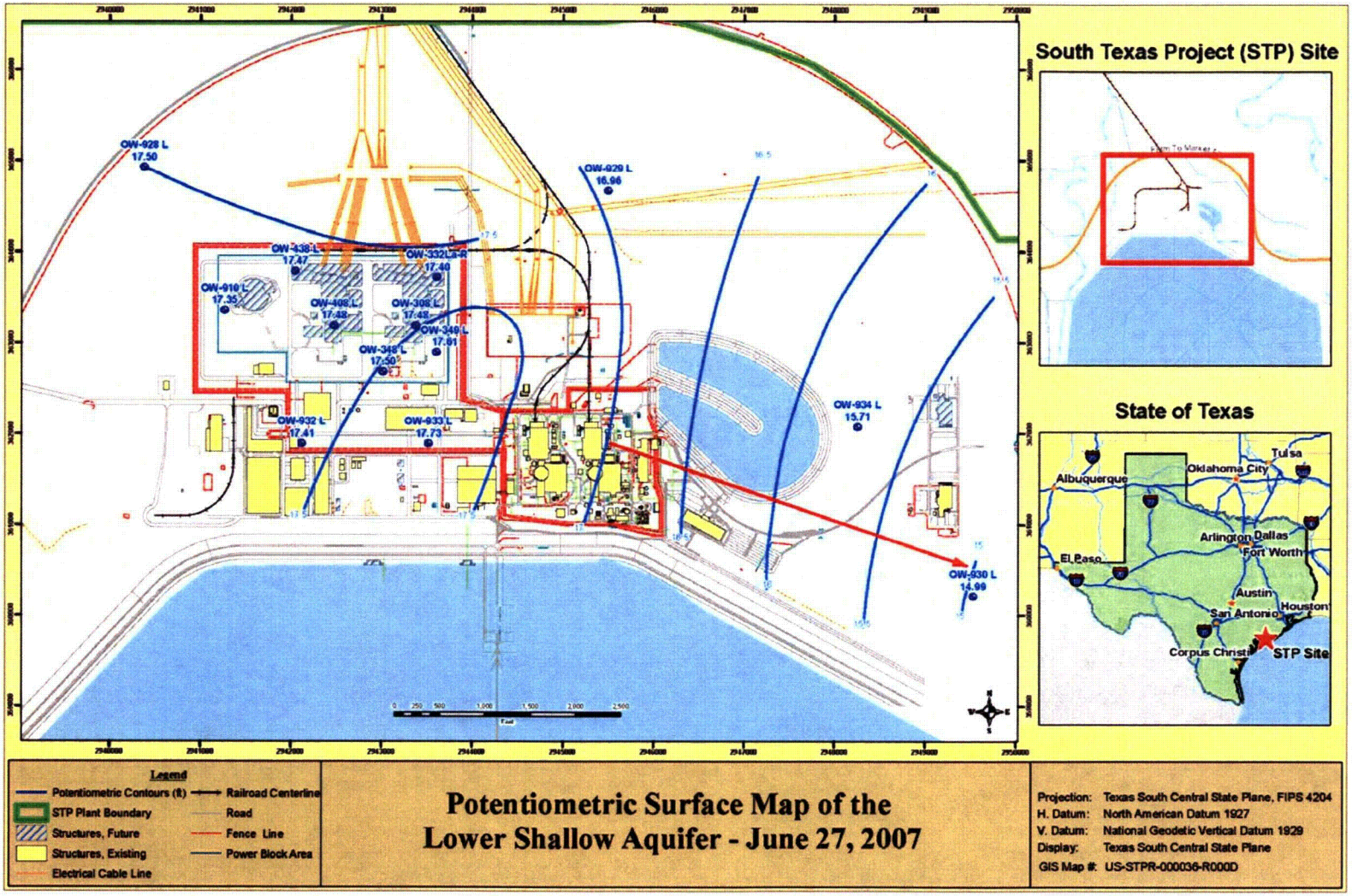
Question 02.03-08



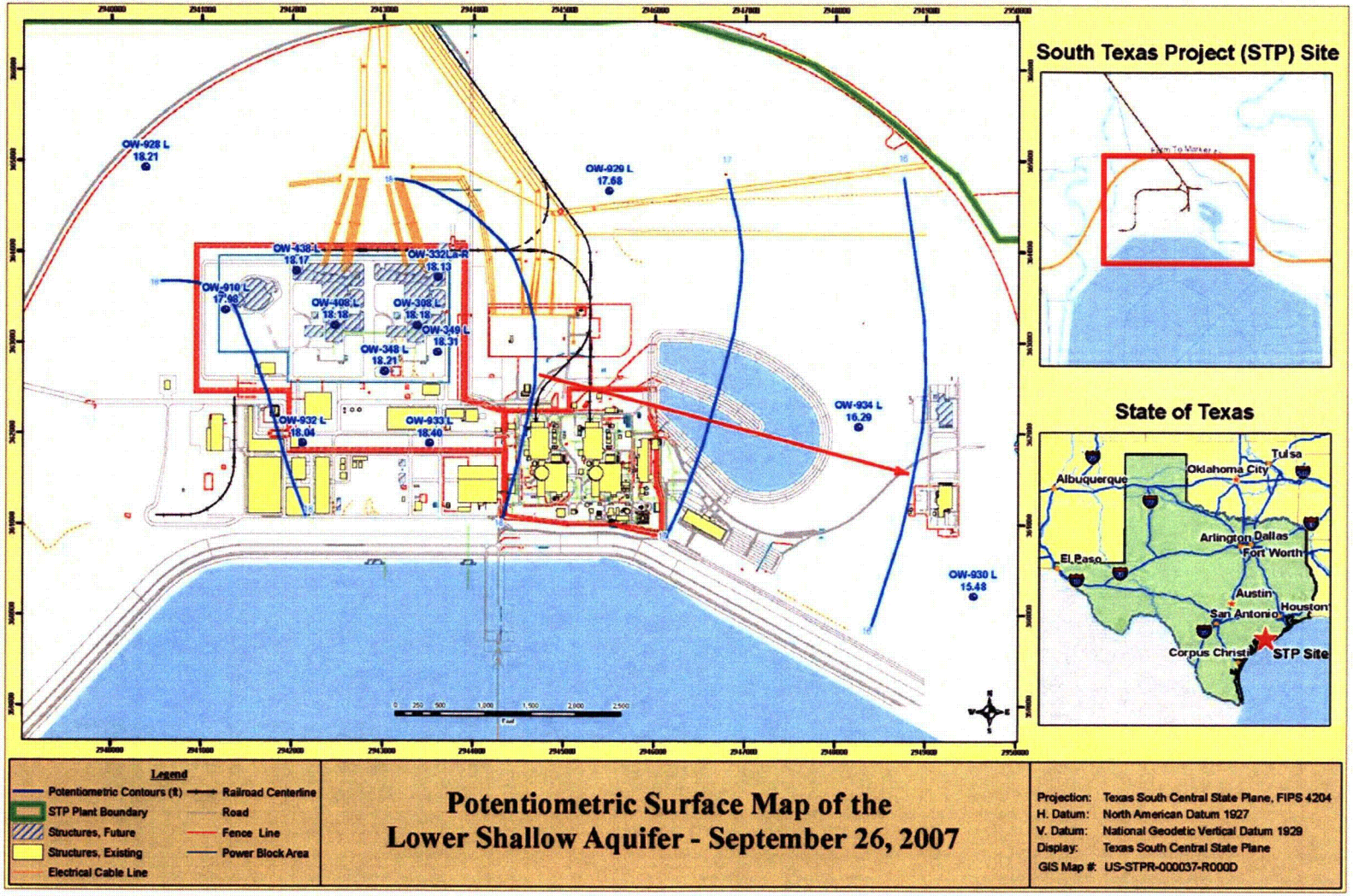
Question 02.03-08



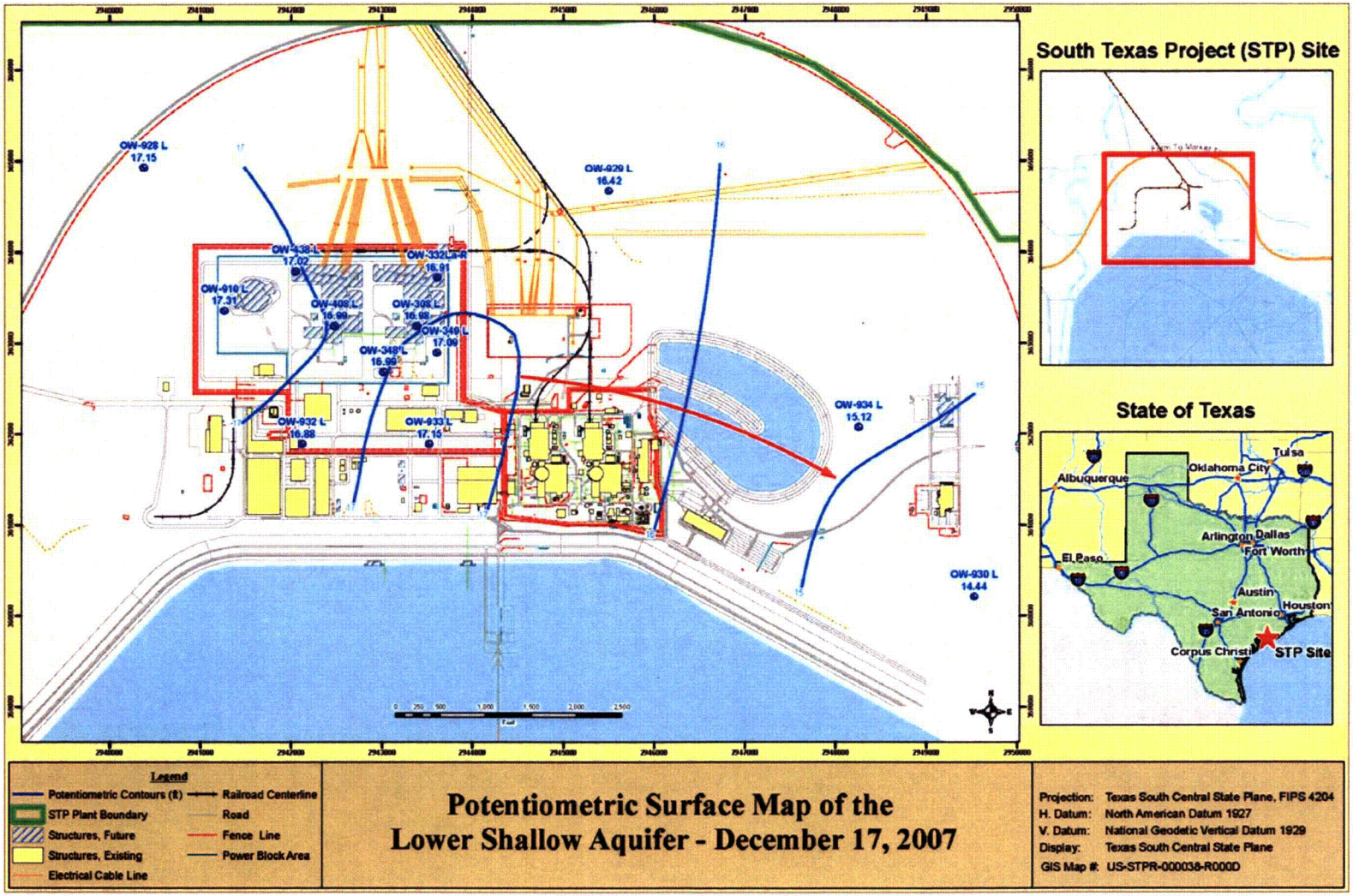
Question 02.03-08



Question 02.03-08



Question 02.03-08



Question 02.04.01-03

Question Number: 02.04.01-03

QUESTION:

Provide information and maps depicting all wetlands identified on the STP site during field surveys in 2006, 2007 and 2008.

Full Text (Supporting Information):

Information provided at the site audit and during communications with the applicant indicates that additional wetland surveys and delineations have been conducted since the site ER was issues. Provide updated and complete information describing and mapping water features and related wetland features on the STP site that were not described in ER references 2.4-3 "Ecological Survey Report Units 3 and 4 Licensing Project, ENSR 2007 Report". Include any additional information requested by the Army Corps of Engineers to describe wetland and associated aquatic features on the STP site, including: (1) Field data sheets that describe the wetland identification and delineation for all surveys done on the site after the completion of the ENSR 2007 report. (2) Maps and tables indicating the locations, acreages and type of each of these identified wetlands. (3) Information describing whether each identified wetland would be impacted, either permanently or temporarily, by the project. (4) Survey data and information for wetland features associated with drainage ditches. (5) Detailed descriptions and maps at viewable scales that identify where existing ditches and water features are planned to be re-routed. (6) Information detailing how the re-located portion of Little Robbins Slough was considered (i.e., was it identified as a wetland or on-site water feature).

RESPONSE:

(1) Field data sheets describing the wetland identification and delineation for all surveys done on the site after the completion of the ENSR 2007 report (both wetlands and ditch segments) are provided in the following file on the enclosed CD/DVD in the folder entitled RAI 02.04.01-03:

- Field Sheet.pdf. There are no field data sheets for (1) Little Robbins Slough, because USACE had already made their jurisdictional determination, or (2) wetland number 026, which could not be reached by pedestrian survey due to "impenetrable vegetation." USACE, ENSR, and STPNOC agreed the site is most likely a wetlands and ENSR provided an acreage estimate based on GIS.

(2) Maps and tables indicating the locations, acreages and type of each of these identified wetlands are included in the following files on the enclosed CD/DVD in the folder entitled RAI 02.04.01-03:

- Updated Wetlands Table.pdf [wetland identification number, acreage, habitat type, likely impact of construction]
- Wetlands Map Revision Color.pdf [map showing the locations of all wetlands and ditches that have been assessed]

- Wetlands Map Revision CIR.pdf [color infrared map showing the locations of all wetlands and ditches that have been assessed]

(3) Wetland Impact information is provided on the enclosed CD/DVD in the folder entitled RAI 02.04.01-03.
- Updated Wetlands Table.pdf (table describing whether each identified wetland would be impacted, either permanently or temporarily, by the project)

(4) Survey data and information for wetland features associated with drainage ditches are provided in the following files on the enclosed CD/DVD in the folder entitled RAI 02.04.01-03:
- Wetlands Map Revision Color.pdf [map showing the locations of all wetlands and ditches that have been assessed]
- Wetlands Map Revision CIR.pdf [color infrared map showing the locations of all wetlands and ditches that have been assessed]
- Ditch data.pdf – widths, lengths and acreages of assessed portions of the drainage ditch system
- Ditch.pdf – this file contains aerials of all assessed portions of the drainage ditch system and indicates water lines (channel width) and top of the bank (ordinary high water mark) boundaries.

(5) Detailed descriptions and maps at viewable scales that identify where existing ditches and water features are planned to be re-routed are included in the ENSR (2008) Habitat Assessment Report. The relocated ditch is shown in Figure 3 of the Habitat Assessment Report (the GIS coverage including this ditch to be restored is included in the Figure 3 coverages for RAI 02.04.01-06). Habitats impacted will include 7.02 acres of scrub-shrub community and 0.54 acre of maintained/disturbed areas.

(6) The re-located portion of Little Robbins Slough is considered jurisdictional waters (a relatively permanent waterbody) by STPNOC and USACE, although STPNOC points out in the USACE meeting notes (Meeting Notes from USACE consultation.pdf in the folder entitled RAI 02.04.01-03d on the enclosed CD/DVD) that the slough is outside the project area. Regardless, Little Robbins Slough will not be impacted by construction.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 02.04.01-06

Question Number: 02.04.01-06

QUESTION:

Provide custom digital GIS coverages (shape files or geodatabases) for figures showing the construction areas and habitats on STP

Full Text (Supporting Information):

Provide the native digital GIS coverages for Figure 2.2-3 and Figure 3.9S-1 from the ER, Figure 3 describing habitats on STP site from the June 2008 ENSR report, and the updated GIS layers that map the spatial locations of wetlands, waterbodies, and water features on STP.

RESPONSE:

The GIS file(s) for ER Figure 2.2-3 are available in the folder entitled RAI 02.04.01-06 on the enclosed CD/DVD under the "ER Figure 2.2-3" folder.

ER Figure 39S-1 was originally produced as a "Microstation/CAD" file, which is available in the folder entitled RAI 02.04.01-06 on the enclosed CD/DVD under the "ER Figure 3.9S-1" folder. This is the original ER figure. The figure shows the original positions of the construction and staging areas. This figure indicated the presence of large borrow/spoils areas/construction parking, and laydown areas to the west of the proposed site of units 3&4. These staging areas in these locations are no longer planned. The new locations of permanently disturbed construction areas are shown in ENSR (2008) Figure 3. Updated engineering drawings will be provided in future COLA revisions as they become available.

The GIS files for ENSR (2008) Figure 3 are available in the folder entitled RAI 02.04.01-06 on the enclosed CD/DVD under "Figure 3 GIS" folder within the "ENSR" folder.

Wetland GIS layers are available in the folder entitled RAI 02.04.01-06 on the enclosed CD/DVD in the "Wetlands and Water GIS" folder within the "ENSR" folder.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 02.04.02-11

Question Number: 02.04.02-11

QUESTION:

Provide dataset for collection of species by sample location and gear type that is summarized in the ENSR 2008 report.

Full Text (Supporting Information):

Raw data used to prepare Tables 2 and 3 in the ENSR 2008 report is needed to prepare Essential Fish Habitat consultation and for independent validation of impact evaluation using Jaccard coefficients (ENSR 2008 report: "Aquatic Ecology - Colorado River Monitoring Report Unit 3 and 4 Licensing Project", prepared by ENSR Corporation, June 2008.)

RESPONSE:

Based on conference call discussions among STPNOC, ENSR, Tetra Tech, and NRC staff on November 6th, 2008, STPNOC agreed to provide data tables (rather than raw data) that would allow NRC/PNNL staff to conduct an independent evaluation of the Jaccard coefficient-based statements in the subject report. Data used to generate tables in the ENSR (2008) report are provided for each sampling gear in the folder entitled RAI 02.04.02-11 on the enclosed CD/DVD. Per discussions with NRC, additional data on lengths of fish collected near the Reservoir Makeup Pumping Facility (RMPF) and Blowdown Structure (see Figure 2a in ENSR 2008) are also provided for each sampling gear.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 02.05-06

Question Number: 02.05-06

QUESTION:

Provide a discussion of non-zoning controls on land development.

Full Text (Supporting Information):

Provide citations to references (and copies of the references) supporting the original answer to demonstrate where the data came from and how the conclusions in the original response were reached.

RESPONSE:

Selected statements from the original response, along with reference citations supporting each statement, are provided below. Copies of these reference documents are available in the folder entitled RAI 02.05-06 on the enclosed CD/DVD.

The City of Angleton has restrictions in regards to water supplies that are enforced on a case-by-case basis and dependant upon water availability *[Source: Telephone conversation with representative of Angleton Public Works and A Micek Tetra Tech]* and Palacios has limitations on new water and sewer connections, depending on location or whether line extensions are required [*Source: Telephone conversation with representative of the City of Palacios and P Baxter Tetra Tech on 08.06.2008*].

The Texas Department of Transportation Planning Division and the Texas DOT Design Division have been interviewed to confirm that transportation issues do not impede land development in Texas. [*Source: Telephone conversations with representatives of TX DOT (Design Division and Planning Division) and P Baxter Tetra Tech on 08.06.2008*].

In Texas, the zoning ordinance (which controls the use of property through restrictions and development standards) applies to all areas within the city limits. As a city annexes land, that property then becomes zoned as well. The extra-territorial jurisdiction (added land) of the municipality is not subject to zoning regulations. There are no zoning restrictions outside the city limits. Texas counties cannot pass zoning ordinances. [*Source: Citizens Guide to Texas Zoning, Texas A & M University, Real Estate Center, 1999*].

Only the City of Palacios, in Matagorda County, has adopted a zoning ordinance for the area within its city limits, created by the Palacios Economic Development Corporation. Neither Matagorda County nor Bay City has zoning at this time. [*Source: E-mail communication, Executive Director, Matagorda County Economic Development Corporation].*

Palacios, TX
Palacios has limitations on new water and sewer connections, depending on location or whether line extensions are required. [*Source: E-mail communication, Executive Director, Matagorda County Economic Development Corporation*].

Question 02.05-06

Bay City, TX
Since Bay City has no city zoning, locations of housing and businesses and constraints on water hook-ups are decided on a case-by-case basis, and depend primarily on what utilities are required and available to serve the proposed units(s). However, Bay City has room for expansion of housing and business. It has available land, can annex more, and has utility plant capacity (including water and sewer system capacity) for more hook-ups. The highway system has additional capacity to accommodate residential type traffic. [*Source: E-mail communication, Executive Director, Matagorda County Economic Development Corporation*].

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 02.05-11

QUESTION:

Confirm whether the 2000 Census is the most recent data available for housing availability in the counties near STP.

Full Text (Supporting Information):

STPNOC asserts there are no differences except scale between the 2000 Census and more recent data. Support that assertion by doing an analysis of the differences. In other words, prove the hypothesis by comparing 2000 Census data and more recent information (2005 Census updates, Texas statistics, etc., along with recent housing information available from sources other than Census). If this analysis does not support the hypothesis, then revise the analysis based upon more recent data.

RESPONSE:

In the response to RAI 2.5-11 of ABR-AE-08000063 Attachment 8, two sentences cannot be supported. The sentences were as follows:

> "Although the cited values are dated, all the cited characteristics are from the same time-base-line and can reasonably be assumed to have changed in approximately the same proportion. For example, while the absolute number of owner-occupied housing units has undoubtedly increased; the percentage that those units represent of the inventory will not have changed substantially."

This assertion cannot be made because the U. S. Census Bureau (USCB) does not collect and provide detailed housing data for years in between the decennial census. Additionally, a search was performed for additional non-USCB sources of this type of data, both, national and regional/local, which was unable to locate any. A brief summary of these findings is below.

Every 10 years, during the decennial census, the USCB collects, summarizes, and presents detailed data that includes demographic, business/government, and housing information. The 2000 Census data represent, both, a complete, direct survey of 100% of households and comprehensive detailed sample data. In the years between the decennial census, the USCB collects additional housing data through the use of additional sampling surveys. These surveys are not comprehensive and their results are based on sample data coupled with other information. The three major sampling surveys that include housing data are the American Housing Survey, American Community Survey, and the Current Population Survey/Housing Vacancy Survey. None of these surveys would be useful for the STP analyses. In the American Housing Survey, housing data is presented for the United States and metropolitan areas only. In the American Community Survey, housing data is limited and is not provided for counties with fewer than 65,000 residents. Because Matagorda County has fewer than 65,000 residents, it was not included in the American Community Survey. In the Current Population Survey/Housing

Vacancy Survey, housing data is presented for the United States, four census regions, states, and metropolitan areas, only.

The only other USCB-sponsored source of post-USCB 2000 housing data that would be available is through the Population Estimates Program. This program prepares estimates of the total population; estimates of the population by age, sex, race, and Hispanic origin; and estimates of the number of housing units. The 2007 population estimates start with a base population for April 1, 2000, and calculate population estimates for July 1 for years 2000 to 2007. The population estimates use a variety of administrative records data to measure the population change including data on births, deaths, migration, and housing units. However, the information from this program is not useful because it only provides the total number of housing units in a county. No further detail is calculated and provided.

Additionally, an exhaustive search of other economic reporting agencies, including, but not limited to, the U.S. Department of Housing and Urban Development, U.S. Postal Service, Texas State Data Center, and Texas A & M Real Estate Center, revealed no additional sources of this type of data. In all of these agencies, housing data was limited, not available at the county level, or altogether unavailable. To date, no other reliable source has been located for such data.

Therefore, with respect to (1) updating the original analysis, or (2) providing a proven hypothesis that supports the statements that were made; these actions would not be possible, as there is no detailed post-USCB 2000 housing data that could be used for either of these actions.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 02.06-01

Question Number: 02.06-01

QUESTION:

Provide a summary of past and expected surface settlements and how future settlements may impact surface water drainages, a description of various dewatering options, and relative settlements expected for each dewatering option.

Full Text (Supporting Information):

The response draws heavily on the assumed similarity of construction dewatering for existing STP Units 1&2 and proposed STP Units 3&4. A summary comparison of the two events is needed to support this assumption. Provide comparative information for the completed units (1&2) and proposed units (3&4) including the area dewatered, depth of dewatering, duration of dewatering, measured and expected dewatering production rates, and distances from dewatering to the site boundary and wetlands.

RESPONSE:

During the construction of Units 1 & 2, groundwater was required to be maintained at a level of less than 5 feet below the excavation, which was approximately 65 feet deep and covered approximately 30 acres. The dewatering rates used were approximately 2900 gpm initially and 1300 gpm, thereafter. Water from the dewatering activities was used to recharge the aquifer outside of the area of excavation (STPEGS 2006). Additional details of the dewatering activities during the construction of Units 1 & 2 can be found in the Final Safety Analysis Report for Units 1 & 2. Curtain wall technology was not used during the dewatering activities associated with the construction of Units 1 & 2.

Deep zone groundwater levels returned to normal once dewatering activities ceased. This demonstrated there was no significant depletion of the lower portion of the shallow aquifer zone due to dewatering. Subsidence due to dewatering for the construction of Units 1 & 2 was predicted to be less than 3 feet. However, this did not occur and no visible signs of subsidence have been observed. Outside perimeter dewatering continued through 1987, representing a time when both units were substantially constructed and undergoing testing.

The goal for Units 3 & 4 is to maintain the groundwater levels at approximately 3 feet below the excavation, which would extend over approximately 90 acres (approximate area within the slurry wall) to a depth of approximately 90 feet. STPNOC will install a slurry wall around the planned excavation to a depth of approximately 125 feet. STPNOC anticipates dewatering to the required depths can be achieved by initially pumping at rate of approximately 6700 gpm and reducing the rate as needed to approximately 1000 gpm. The 1000 gpm value is a preliminary estimate that is currently considered to be high and therefore conservative. The value represents the estimated steady state pumping rate (10-20% of initial). The final dewatering plan and will be finalized once a contractor has been selected.

Question 02.06-01

The distance from the proposed excavation dewatering to the northern STP site boundary is approximately 2500 feet. The distance from the excavation to the closest wetland is approximately 1000 feet. However, the distance from the proposed slurry wall to the closest wetland is approximately 150 feet west of the northwest corner slurry wall. Figure 2.5S.4-48 of Rev. 2 of the Units 3 & 4 FSAR along with Rev. 2 ER Figure 2.4-3 were used to estimate the location of the property boundary and wetland locations.

STPNOC anticipates that dewatering would continue through at least the construction phase of the project. Due to the proposed slurry wall installation, subsidence is not expected to occur. STPNOC anticipates the proposed slurry wall would limit dewatering impacts to the excavation area. Therefore no impacts to surrounding surface water features are anticipated. A system of piezometers will be installed both inside and outside the excavation area to monitor the groundwater levels during construction. Additional piezometers will also be installed outside of the slurry wall. Monitoring would be performed as described in Rev. 2 of the Units 3 & 4 FSAR Section 2.4S.12.4.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 02.07-05

QUESTION:

The July 2, 2008 response to RAI 2.7-5 mentions a "Construction Environmental Control Plan." Provide more information about the plan.

Full Text (Supporting Information):

Does such a plan exist? If so, provide more information about the plan. If not, provide information regarding specific mitigation efforts that will be incorporated into the plan and specify when the plan will be created. Will there be external review and approval and approval?

RESPONSE:

The Construction Environmental Control Plan (CECP) is an "umbrella document" which is used to describe the methods and controls incorporated during construction to reduce the likelihood of releases to the environment (includes releases to the air, water ways and soil) during the construction of STP Units 3 & 4. The CECP will refer the reader to specific plans (such as the Storm Water Pollution Prevention Plan or the Waste Management Plan) when a greater level of detail is required.

The plan will be reviewed and approved by STP Nuclear Operating Company (STPNOC). This plan does not require the approval of regulating agencies, but can be made available to those agencies who request to view the plan during construction. An initial draft version of the plan has been produced and the plan will be available for use by those performing construction activities, prior to the start of construction.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 04.02-05

QUESTION:

Provide information regarding the locations of drainage ditches and retention ponds.

Full Text (Supporting Information):

The previous response stated that the final location of the main drainage ditch, which is to be relocated north of the STP Units 3 and 4, is still undetermined. Provide details of the process that is being followed to determine the final location of this ditch and when the decision may occur.

RESPONSE:

The location of the relocated drainage channel was determined based upon proposed facility layout for Units 3 & 4 and current proposed site conditions. The location is shown in Rev. 2 of the Environmental Report on ER Figure 3.1-6 Topographical Map of the Site and Vicinity (page 3.1-10). Additional drainage details can be found in Rev. 2 of the Final Safety Analysis Report for Units 3 & 4 in Section 2.4S.2.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 04.02-06

Question Number: 04.02-06

QUESTION:

Describe the analytical process used to determine impacts to surface water hydrology would be SMALL.

Full Text (Supporting Information):

The previous response details what would be done during construction of STP Units 3 and 4, but still fails to provide a description of the analytical thought process used to determine impact levels. Provide an explanation why the activities detailed in the previous response would ensure that the impacts on surface water from the construction activities related to drainage ditches, swale relocation, soil removal, and grading, are SMALL.

RESPONSE:

The area proposed for the construction of Units 3 & 4 has previously been disturbed. The proposed activities would be performed in accordance with existing Federal and state permit requirements. Avoidance of the site's non-juristictional wetlands, if possible, would also be attempted. The exposure of soil to weather during grading and excavation could promote soil erosion and storm water runoff which could carry potential pollutants to nearby surface drainage features. Sedimentation basins could be used along with other forms of sediment traps to reduce the potential impacts to site surface water bodies. The potential impacts to the surface water streams and drainage features would be limited to the period of construction and, therefore, temporary.

As discussed in ER Rev. 2 Section 4.2.1.1, STPNOC would perform the proposed activities under the State of Texas' Construction Storm Water Program which would include submitting a Notice of Intent for coverage under the Texas Pollutant Discharge Elimination System (TPDES) General Permit to discharge storm water associated with construction activity to surface water in the state and developing a Storm Water Pollution Prevention Plan (SWPPP) for the proposed activities. As part of the SWPPP, STPNOC would also implement best management practices including structural and operational measures to prevent the movement of pollutants offsite via storm water runoff. Construction operations under the SWPPP would allow for monitoring of procedures during construction. Should construction procedures require changing to prevent impacts to the site's existing streams or surface water drainage features, the SWPPP provides the mechanism to do so.

The construction of a new drainage ditch system and additional grading of the surface soils to direct storm water movement away from the facility areas would also lessen the potential for sediment and pollutant runoff to existing site drainage features.

As discussed in ER Section 4.2 and previously submitted in response to RAI 4.2-6, the primary alternative for disposal of water from the dewatering activities is to discharge to the MCR. Other

possible discharge options as previously discussed include discharging to existing surface water drainage features if it is observed during monitoring of the dewatering process that site streams or surface water drainage features are being impacted. However, the water could be discharged at flow rates that would reduce the likelihood of erosion. Soil retention techniques (silt fencing, grass strips, etc.) could also be used to reduce the potential for erosion and sediment transport. Potential impacts to water quality are included in ER Section 4.2 and the previous RAI 4.2-6 submittal.

Due to the lack of sensitive ecological resources and the use of best management practices during construction activities, which would mitigate the potential for impact to all site resources during construction, STPNOC has determined impacts to be SMALL.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 04.02-07

Question Number: 04.02-07

QUESTION:

Provide a list and description of pre-construction activities mentioned in ER Section 1.1.2.7.

Full Text (Supporting Information):

In STP's previous response, Power Block Earthwork (Excavation) is mentioned as a pre-construction activity. However, it is unclear if structural fill in some of the excavations will be placed prior to or following the COL being granted. Also, it is unclear if the fabrication of the reactor building base mat reinforcing module would or would not be an "in-place" assembly. Please clarify with respect to the definition of "construction" in 10 CFR 50.10(a)(1).

RESPONSE:

Structural fill will be placed under safety-related structures only after authorization by an LWA or issuance of the COL. The Reactor Building's base mat reinforcing module will not be an "in place" assembly. This module will be assembled during site preparation. Its setting will occur after authorization by an LWA or issuance of the COL.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 04.02-08

Question Number: 04.02-08

QUESTION:

Describe the dewatering calculation(s) and confirm that dewatering product would be discharged to the MCR. Also provide access to the supporting calculations.

Full Text (Supporting Information):

Please identify the calculation package(s) that produce the estimated initial rate of dewatering product as 6700 gpm, and the long-term rate of 1000 gpm. Briefly summarize these calculation packages (methods applied, key data and assumptions, results) and confirm that the dewatering product will be discharged as earlier planned into the MCR. Please provide the full calculation package(s) for staff audit in reading rooms in Washington, D.C., and Richland, Washington.

RESPONSE:

The Validation (Calculation) Package containing preliminary calculations for the proposed dewatering activities for STP Units 3 & 4 are discussed in Rev. 2 of the FSAR Section 2.5S.4 and Rev. 2 of ER Section 4.2. The Validation (Calculation) Package will be made available for viewing by NRC in reading rooms in the Washington, D.C. and Richland, Washington areas. The addition of a slurry wall surrounding the area to be dewatered is also discussed in the Rev. 2 of the FSAR and ER.

As discussed in ER Section 4.2 and previously submitted in response to RAI 4.2-6, the primary alternative for disposal of water from the dewatering activities is to discharge to the MCR. Other possible discharge options, as previously discussed, include discharging to existing surface water drainage features to supplement flow, if it is observed during monitoring of the dewatering activities that surface water features are being impacted. The water could also be discharged back to the upper shallow aquifer being dewatered outside of the proposed slurry wall, if needed. Some of the water could also be used in dust suppression activities during construction activities.

The lower pumping rate of 1000 gpm is an estimate of the steady state pumping rate (10-20% of initial) during dewatering. The final plan for dewatering would be developed once a dewatering contractor has been selected for the project. Should changes be made to the current plan for dewatering, STP would make changes to the appropriate document or submit notice of the affected changes and an evaluation of the potential impacts to NRC.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 04.02-11

QUESTION:

Provide a full description of the potential impacts to nearby groundwater users. Provide access to supporting calculations.

Full Text (Supporting Information):

While the response may be adequate, review of the calculation package(s) will be necessary to check the potential drawdown values included in the RAI response. Identify the calculation package(s) and make it (them) available for staff audit.

RESPONSE:

The calculation package for the deep aquifer groundwater use options during construction and operations will be provided for viewing in reading rooms located in the Washington, D.C. and Richland, Washington areas.. However, the groundwater calculation package does not include a description of the assumptions and use rationale for the development of the data. This information along with the groundwater equations used and inputs to the equations were provided in ER Sections 4.2 and 5.2. The assumption and use rationale were not repeated in the calculation package.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 04.03.01-02

Question Number: 04.03.01-02

QUESTION:

Clarify information and figures describing the proposed locations and affected areas for the temporary and permanent construction project areas and activities.

Full Text (Supporting Information):

Revision 2.0 of the ER refers to figure 3.9S-1 in describing the acreage to be affected by temporary and permanent construction activities. The acreages identified in figure 3.9S-1 sum to a greater total acreage to be disturbed by temporary and permanent construction activities than 244 acres (e.g., construction parking and laydown areas alone exceed 200 acres). Both the ENSR June 2008 report (Ecological Survey Report: Habitat Assessment) and the August 14 RAI response to Question 04.03.01-02 cite a total acreage of approximately 244 acres that will be disturbed by construction of facilities and list acreages. Section 4.1 of ER Rev. 2 provides a table that describes more than 700 acres disturbed. **(A)** Reconcile or indicate which acreages are correct in figure and tables. **(B)** Provide information to clarify and address whether the construction spoil/borrow area identified in figure 3.9S-1 and discussed in chapter 4 will be disturbed and whether habitat will be temporarily will be temporarily or permanently lost due to activities in borrow area. There are conflicting statements regarding whether this area will be affected by construction. **(C)** Identify the complete pathway for the heavy haul road and the affected acreage associated with constructing the road. **(D)** Provide a figure and table that identifies the correct acreage for each construction area, the type of habitat and associated acreage that will be disturbed, and whether the disturbance will cause temporary or permanent habitat loss.

RESPONSE:

A. Information provided in the ENSR June 2008 report (Ecological Survey Report: Habitat Assessment) and the August 14 RAI response to Question 04.03.01-02 (approximately 244 acres disturbed) refers to permanently disturbed areas. An additional 300 acres (approximately) of STP land may be temporarily disturbed during the construction process. Proposed text changes to Chapter 4.1 and Table 4.1-1of the ER are provided under RAI response 10.5S-3.

B. The construction spoil/borrow area identified in the original Figure 3.9S-1 (west of the site of proposed Units 3&4) will not be permanently disturbed and/or otherwise utilized. A new spoils area is northwest of proposed units 3&4. The text in appropriate subsections will be updated (see A above). A revised Figure 3.9S-1 will be presented in a future COLA revision.

Question 04.03.01-02

C. The path of the heavy haul road is indicated in Figure 3 of the ENSR (2008) Habitat Assessment Report. This figure also contains a table indicating that the construction of this road will disturb approximately 9 total acres, including 2 acres of maintained/disturbed areas, 2.5 acres of mixed grass communities, 4.4 acres of scrub-shrub communities and 0.3 acre of other habitat.

D. Figure 3 of the ENSR (2008) Habitat Assessment Report (previously provided) contains a table indicating acreages of the various habitat types that will be permanently disturbed by the various construction/staging areas.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 04.03.01-03

Question Number: 04.03.01-03

QUESTION:

Provide information regarding planned and potential mitigation identified as a result of 2008 wetland studies including voluntary avoidance and minimization of impact or other measures as required measures as required by local, state and federal agencies

Full Text (Supporting Information):

Provide information and details of all mitigations or actions identified as a result of wetland surveys and reviews completed in 2008. Include information on required and voluntary mitigation actions such as avoidance or minimization of impact. Describe and discuss any potential areas that have been identified for mitigation of wetlands and/or terrestrial wildlife habitats.

RESPONSE:

Results of the 2008 wetland studies indicate that no impacts to jurisdictional wetlands will occur and thus no mitigation measures will be required. STPNOC has been in regular communication with USACE regarding the status of wetlands within the project area since 2007, providing additional wetland survey information as requested. The most recent information amendment includes additional wetlands and drainage features (ditches) within or near the project area. STPNOC is awaiting USACE confirmation of their wetland assessments (latest information provided to USACE on 28 October 2008).

During the facility design process, the footprint of the facility avoided all jurisdictional wetlands. Other non-jurisdictional wetland features were avoided to the extent practical. Where potential impacts to non-jurisdictional wetland features cannot be avoided, STPNOC is committed to employ best management practices (BMPs) during all construction activities to reduce/minimize impacts on aquatic habitats (primarily man-made drainage ditches and non-jurisdictional wetlands) in the construction and staging areas. These BMPs include sediment and erosion controls (e.g., silt fences, seeded buffer strips, sediment retention ponds), and grading and re-vegetating the temporarily disturbed areas post-construction. Based on these efforts, impacts to water features are expected to be so small that mitigation efforts will not be warranted.

The construction and staging areas all occur on upland habitats that have been disturbed previously, both by agriculture (historically) and then clearing/vegetation maintenance activities associated with STP Units 1&2 construction and operation since the 1980s. The resulting habitats where the proposed construction/staging activities would occur are plant communities associated with disturbed soils (sea myrtle, blackberry, and assorted grasses/sedges) and thus typically poor quality habitats for wildlife that should not require mitigation measures for their loss. No Threatened &Endangered species have been observed in these proposed construction areas and thus no mitigation measures are required for them.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 04.04-10

QUESTION:

Discuss the impact of construction on housing demand.

Full Text (Supporting Information):

In our interviews with local officials, there was considerable informal knowledge concerning the locations of trailer courts during STP 1 & 2 construction, though none of this information was quantitative. Characterize the general locations of trailer parks and other temporary housing during the STP 1 and 2 construction period and explain why this is or is not useful guidance where housing of this type may develop again.

RESPONSE:

Quantitative data regarding the specific number and locations of mobile home or RV parks during the construction of Units 1&2 could not be located. However, an interview with a plant employee revealed that approximately 50 percent of the construction workers were bussed in from Houston. RV parks were created around the county to house many of the remaining workers. After the workers departed, many of these RV parks were phased out or abandoned, but some are still active and serve STP's outage workers and other visitors. Table 1 provides a listing of RV parks currently operating in the region.

The plant employee also noted that other construction projects are planned or projected for Matagorda County, and that this flow of construction workers may alleviate some of the peaks and valleys in the number of construction workers residing in the county at any time.

According to the Director of Environmental Services for Matagorda County, few impediments exist for the establishment of RV parks. The only location constraint is that RV parks may not be located in floodways, although location within floodplains is acceptable. Floodway definitions are those defined by FEMA. The county is the permitting agency and no additional state permits or approvals are required. The process is simple and requires no more than one month (or less) of lead time. The closure process is also uncomplicated; the septic systems can simply be abandoned in place, or the underground tanks can be filled with dirt. No other environmental requirements apply.

For RV parks, a new park would be designed for a certain number of RV units and the required size septic system (approximately 37 units per system). The county then approves the design. Good quality groundwater is readily available for drinking water at depths of 300 to 600 ft, and other depths also provide water. Water wells must be pressure cemented to a depth of 100 ft. No water rights issues apply to the drilling of water wells for drinking water.

Question 04.04-10

Table 1. RV Parks, Resorts, and State Parks with RV Facilities within a 50-mile radius of STP*	
Location	**Park Name**
Bay City	Bay Side Manor
Bay City	Bert's RV Park and Rentals
Bay City	Courtyard
Bay City	Lighthouse RV Park
Bay City	Matagorda Harbor RV
Bay City	Oak Hollow RV Park
Bay City	Riverside Park
Bay City	Traveler's RV and Mobile Home Park
Blessing	Chaparral RV Ranch
Brazoria	K's and J's RV Park
Brazoria	Way Station RV Park
Danbury	Austin Bayou RV Park and Golf Course
Edna	Lake Texana State Park
Freeport	Brazos Mobile Home Port
Freeport	San Luis Pass County Park
Ganado	Shady Oaks RV Park
Matagorda	Fisherman's Motel and RV
Matagorda	Matagorda Bay RV Park
Matagorda	Pelican Point RV Park
Needville	Brazos Bend State Park
Oyster Creek	Oyster Creek RV Ranch
Palacios	Bayside Camping Park
Palacios	Oak Grove Campground
Palacios	Serendipity Bay RV Resort and Marina
Port Lavaca	Lavaca Bay RV Park
Port Lavaca	Lighthouse Beach RV Park
Port Lavaca	Powderhorn RV Park
Quintana	Quintana Beach County Park
Sargent	Caney Creek RV Park
Surfside	Austin's Landing
Surfside Beach	Surfside Beach RV Park
*Note: This list is likely not all-inclusive. RV facilities that engage in little or no advertising and/or have few facilities may not be included.	

As an example, a 30-acre RV park would use half of the acreage for RVs and the other half for the septic system. Virtually all septic systems in that region are aerobic septic systems, with large tanks underground and the mechanical apparatus above-ground. Treated water is re-used for watering lawns and other uses.

The Executive Director of the Matagorda County Economic Development Corporation noted that a number of developers have secured land for the purpose of expanding both permanent housing and the RV park capacity in the county, and are waiting to pursue development until close to the

time workers would arrive. He noted that permanent housing efforts are aimed primarily at the operations workers.

Because of the limited permitting and other constraints required to establish and abandon RV parks, it is unlikely that the location of RV parks that existed for construction workers for Units 1&2 would influence the siting of new RV parks for incoming Units 3&4 construction workers. It is more likely that new locations would be determined by landowners or developers recognizing an economic opportunity, weighing alternative land uses, and choosing to make suitable land available to offer as RV parks, regardless of where previous parks were located. The more likely factors affecting the location of new RV parks would be access to roadways, distance from STP, the desirability of the park site, and the distance to shopping and other amenities.

CANDIDATE COLA REVISION:

Section 4.4.2.2.6, Construction:
Add the following after Paragraph 4 (the last paragraph of that subsection):

As noted above, some construction workers would elect to bring their own housing, such as RVs, mobile homes, campers, or other types of portable housing. These housing choice decisions would be influenced by workers' expected length of time at the work site, whether they are accompanied by household members, the cost, availability, and condition of local housing, and the distance from the family home. In turn, additional factors such as the capacity and quality of local schools and the cost of vehicle fuel could influence a worker family's decision regarding accompanying the worker to the construction site. Due to the multitude of factors, it is not possible to predict the proportion of workers who would choose portable housing over local housing units. However, to the extent that workers do bring mobile housing, the demand for local permanent housing units would be reduced, and there would be less upward pressure on home prices and rent that could adversely affect residents of the ROI. With a greater number of workers bringing their own housing, impacts to the local housing market, both owner-occupied homes and rentals, would be less noticeable both during and after the construction period.

There are a number of RV parks already operating in the region. New RV parks could be situated at various locations in STP's vicinity. Few permitting or environmental constraints exist regarding the placement or abandonment of such facilities. RV parks may not be placed in a floodway (as defined by FEMA) but can be placed in a floodplain, and must have a septic system. The county must approve the RV park design and septic system; the approval process generally takes less than one month and no additional state approval is needed. Good quality drinking water is readily available from wells and no water rights issues are involved. According a local source, several developers have acquired land for expanding RV parks and permanent housing, although these locations are not known at this time. The developers plan to begin development shortly before the construction workers arrive. In summary, the short response time and minimal location and permitting constraints ensure that local landowners would be able to respond quickly to demand for RV parks for construction workers.

Question 04.04-12

Question Number: 04.04-12

QUESTION:

Describe impacts of overlapping construction and operations workforces.

Full Text (Supporting Information):

The answer to the original RAI did not directly answer whether the net total socioeconomic effect of the operations workforce would be greater or less than the construction workforce. Is the net total socioeconomic effect greater than or less than that of peak construction? And why or why not?

RESPONSE:

After conferring with the NRC, it was agreed that STP would answer this question by describing, in detail, peak onsite employment numbers while considering the various types of workforces that would overlap during different periods of the project. A description of those peaks is provided below.

I. Proposed Project Impacts

For proposed project analyses, impacts include only those that are within the scope of the proposed project, the construction, operation, and refueling of STP Units 3 and 4.

A. Units 3 and 4 Workforces - Construction and Operations

According to the most current "Total Workforce Estimate Associated with Construction of STP Units 3 and 4" (the document that was included in the original response to this question), STPNOC estimates that the peak construction workforce would be 5,950 workers and would occur during months 26 through 35 of the construction project schedule. According to the same document, the operations workforce for Units 3 and 4 (the operations workforce) would also be present on site during the construction project. The operations workforce would gradually increase from 99 in month -24 to a peak of 959 in month 48 of the construction project schedule. From month 48 of the construction project schedule through the 40- to 60-year life of the new units, the operations workforce would remain at 959.

The construction and operations workforces overlap one another. During the construction period, the Units 3 and 4 workforce peak, including both construction and operations workers, would occur in month 35, when there would be 5,950 construction workers and 900 operations workers, for a total of 6,850 Units 3 and 4 workers on site at one time.

Question 04.04-12

B. Units 3 and 4 Workforces - Refueling

Units 3 and 4 would be on 18-month refueling cycles. Unit 3 and 4 refueling outages would not commence until construction would be completed. During Units 3 and 4 refueling outages, STPNOC estimates that site employment would increase above the operations workforce (for Units 3 through 4) by as many as 1,100 to 1,300 workers for a period of one to two months.

II. Cumulative Impacts

For the cumulative impacts analyses, the construction, operations, and refueling workforces for Units 3 and 4 should be combined with the operations and refueling workforces for Units 1 and 2. The document, "Total Workforce Estimate Associated with Construction of STP Units 3 and 4", provides a table and a figure that illustrate the combination of these workforces (the document was included in the original response to this question). A brief review of the table and figure is found in Sections A and B, below. Section C includes an analysis of the peak number of workers for Units 1 through 4 that would be on the STP site during the construction of Units 3 and 4.

A. Units 1 and 2 Workforces - Operations

According to "Total Workforce Estimate Associated with Construction of STP Units 3 and 4", STPNOC estimates that the number of Units 1 and 2 operations workers that would be on site during Units 3 and 4 construction and operations would be 1,350, in month -24, gradually increasing to 1,371, in months -7 and -6, and gradually decreasing to 1,062, in month 61, where it would be steady for the remaining life of Units 1 and 2.

B. Units 1 and 2 Workforces - Refueling

Units 1 and 2 are on 18-month refueling cycles. During Units 1 and 2 refueling outages, STPNOC reports that site employment increases above the Units 1 and 2 operations workforces by as many as 1,100 to 1,400 workers, for a period of one to two months.

C. Units 1 through 4 Workforces - Combined

During the construction of Units 3 and 4, members from every type of workforce (construction, operations, and refueling) for Units 1 through 4 are on site in varying degrees and at varying times. When combined and reviewed month by month, peak site employment occurs in month 26 of the construction project schedule, when there would be a total of 9,021 workers on site. This employment peak of 9,021 workers includes 1,238 Units 1 and 2 operations workers, 5,950 Units 3 and 4 construction workers, 733 Units 3 and 4 operations workers, and 1,100 Unit 2 refueling workers.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 05.03.01.02-01

Question Number: 05.03.01.02-01

QUESTION:

Describe the design feature of the RMPF that allows an "escape route" for fish to swim back to the river and precluding entrapment.

Full Text (Supporting Information):

Based on the response to RAI in ABR-AE-08000052, the fish return system is blocked off when the river flows are high. The ER states that there are restrictions on the pumping of water from the Colorado River during low flow conditions. How often is Colorado River water pumped during high flow conditions when the fish return system is blocked off? Describe and compare the low flow conditions when the pumping is reduced or ceases, and the flow conditions when the system is blocked off.

RESPONSE:

The manner in which the fish return system at the Reservoir Makeup Pumping Facility (RMPF) is operated mitigates potential impingement and entrainment impacts. Per STPNOC procedure, when salinity in the river reaches 3 parts per thousand (ppt) and pumps are operating, Environmental personnel are notified. Operations personnel immediately begin monitoring the screen wash to determine if significant numbers of fish are being impinged. If significant numbers of fish are being impinged, Environmental personnel are contacted by operations personnel for direction on whether the screen wash should be routed to the river via the fish return system or pumping operations should cease.

When the river is running high and fresh, the screen wash discharge is monitored to ascertain how much trash and debris are present. If only small amounts of debris are present, the screenwash is directed to the river by way of the fish return system. Once directed to the river, the screen wash discharge is monitored for an increase in debris/trash content. If large amounts of trash or debris are observed, the discharge is diverted, per procedure, to the sluice trench catch baskets to prevent clogging and possible damage to the fish return system. There is no threshold flow value that directs the operators to divert the screenwash discharge to the catch baskets: the decision is made based on the amount of trash and debris observed and on direction received from Environmental personnel.

STPNOC has not compiled data on the operation of the fish return system and has not correlated its operation with river flows. However, based on anecdotal information the following generalizations can be made. When river flows are high (>4,000 cfs) the fish return system is almost always "valved out," meaning the screenwash discharge is directed to the sluice trench catch baskets rather than back to the river. When flows are intermediate-to-high (2,000-4,000 cfs), the system is sometimes in service and sometimes valved out. The system is almost always in service when river flows are below 2,000 cfs and fish are being impinged. (These flow rates should not be regarded as commitments or threshold values, because the amount of debris in the

river is unpredictable, and may be relatively low when the flow is 10,000 cfs and may be high when the flow is 3,000 cfs.)

However, the fish return system may be valved out when flows are low and no fish are being impinged. The Pumping Operations procedure, rather than a particular threshold flow, is what ensures that the fish return system is in operation when fish are at risk of being impinged.

With regard to pumping during periods of high and low flow, an examination of the data in Table 2.3.2-9 of the ER is instructive. These data have been summarized in the table that follows.

	Total No. of pumping days	No. of Pumping Days with river flow > 2000 cfs*	No. of Pumping Days with river flow < 1000 cfs*	No. of Pumping Days with river flow < 500 cfs*
2001	83	54	12	1
2002	78	47	11	1
2003	0	0	0	0
2004	74	42	7	1
2005	20	2	8	1
2006	98	8	43**	13
Mean	58.8	25.5	13.5	2.8
Annual Percentage	16.1	7.0	3.7	0.8

*three months in 2006 when no USGS flow data was available.
**much higher than normal due to drought conditions

Using a very conservative threshold value (2000 cfs) as an indicator of high flow, the 2001-2006 data show that on average pumps operated 25.5 days per year when flows were in excess of 2000 cfs, thus operated on approximately 26 days when the fish return system might not have been in service. This value includes times when flows exceed 2000 cfs, debris levels are low, and the fish return system remains operational. The "real" number of times the fish return system was not operational during high-flow pumping was probably closer to 10 to 15 days per year.

Although data are quite variable, a basic relationship between flow and salinity can be established. Based on LCRA and USGS data (and ignoring several anomalous values), flows higher than 2,000 cfs (measured at Bay City) are always associated with fresh water in the lower river. Flows higher than 1,500 cfs are almost always associated with fresh water in the river. Conversely, flows below 1,000 cfs are generally associated with salt water intrusion in the lower river.

Based on these data and the requirements of the previously-discussed procedure for operation of the fish return system, the fish return system is almost never taken off line when flows in the

lower Colorado River are below 1,000 cfs and fish are being impinged. Therefore, the fish return system is rarely out of service at a time when substantial numbers of "important" marine or estuarine fishes (as defined in NUREG-1555) are present. Put another way, when substantial numbers of valuable marine and estuarine fishes are present, the fish return system is always (barring some kind of extraordinary circumstance or maintenance issue) operating.

There are other factors that tend to mitigate impacts of RMPF operations on lower Colorado River fish populations. The ENSR (2008) Colorado River study demonstrated that high flows were associated with low catches of fish (catch-per-unit-effort), whereas low flows were associated with higher catches. As the report put it, "(a) comparison of flow rates and catch rates for all four gears indicates an inverse relationship between flow rate and catch rate." Catch rates (catch-per-unit-effort) provide a measure of abundance and reflect fish density. Therefore, high flows were associated with low fish densities at all sampling stations. This stems from the fact that the fish are more widely distributed when river levels are high, thus less susceptible to capture. Given that high flows are associated with lower densities of fish, it stands to reason that high flows would be associated with lower rates of impingement.

There are also behavioral considerations that tend to mitigate impacts. Fish accumulate lactic acid in their tissues very rapidly and tire easily, so they are not inclined to fight strong currents (Hynes 1970). When river flows are very high, fish seek refuge from river currents. They seek shelter in the "dead" areas behind obstacles (rocks, stumps, even discarded automobile tires) and seek out holes in the river bottom and river bank. They move into tributary streams, nearby swamps, oxbow lakes, and sloughs, if present. It follows that increased flow in the lower Colorado River would be associated with movement of fish from the main channel (in front of the intake) of the river, where currents are strongest, to areas that offer relief from high flows. This would also serve to reduce the likelihood of impingement at the RMPF intake.

References

ENSR (ENSR Corporation). 2008. Aquatic Ecology – Colorado River Monitoring Report: Units 3 & 4 Licensing Project. ENSR Corp., Houston, TX.

Hynes, H.B.N. 1970. *The Ecology of Running Waters*. Liverpool University Press, Liverpool, UK.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 05.03.01.02-03

QUESTION:

What is the magnitude of impingement and entrainment of aquatic species at the RMPF for the species of fish currently found in the Colorado River compared to species present prior to 1993 when the diversion channel directed the river into East Matagorda Bay?

Full Text (Supporting Information):

Please clarify the RAI response in ABR-AE-08000063. The 9th paragraph states, "During the 12-month period ending in April, 2008, STPNOC conducted quarterly sampling of fish and macro invertebrates in the Main Cooling Reservoir (MCR) using gill nets, trawls, beach seines, and plankton nets (ENSR 2008, page ES-1)." The reference at the end of the response is: "ENSR Corporation. 2008. Aquatic Ecology - Colorado River Monitoring Report. Unit 3 and 4 Licensing Project. Final." This reference was provided to NRC on June 17, 2008 (ABR-AE-08000045), however, this reference does not discuss the sampling of the Main Cooling Reservoir. Provide the reference that supports the response. This information is needed in order to evaluate the magnitude of impingement and entrainment of aquatic species.

RESPONSE:

The document that discusses sampling of aquatic biota in the Main Cooling Reservoir is provided in the folder entitled RAI 05.03.01.02-03 on the enclosed CD/DVD. The report is entitled "*Aquatic Ecology – Main Cooling Reservoir and Circulating Water Intake Structure Study: Units 3 and 4 Licensing Project*".

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 05.03.03.01-01

Question Number: 05.03.03.01-01

QUESTION:

Justify the assumption in the 2nd paragraph of ER Section 5.3.3.1.2 that there will not be increased fogging.

Full Text (Supporting Information):

The initial response relies on monthly average values of temperature increase in the MCR to support the assumption. The monthly average values indicate a 37% increase in saturation vapor pressure of the MCR during the winter and about a 7% increase in radiative heat loss. Provide a technical justification using appropriate factors for MCR heat load, wind direction and speed, and temperature.

RESPONSE:

ER Subsection 5.3.3.1.2, Ground-Level Fogging and Icing, has two subsections, one for the Main Cooling Reservoir and one for the Mechanical Draft Cooling Tower. The entire Main Cooling Reservoir discussion should be replaced with the proposed text below.

CANDIDATE COLA REVISION:

The MCR is an approximately 7000 acre cooling pond that was originally designed to serve as the heat removal system for four nuclear power reactors. Only two of the four originally proposed nuclear power reactors were constructed, and these two reactors (STP 1 & 2) use the MCR for cooling. STPNOC has proposed to construct two ABWR reactors at STP. These new reactors (STP 3 & 4) would also use the MCR for heat removal. Although the MCR was designed for four reactors, the additional heat load from the new units would increase the potential for fogging from the MCR.

A fog monitoring program was initiated before the operation of STP 1 & 2 to assess the impact of operation of the MCR on local meteorology. The monitoring program was conducted in two phases. Phase I (pre-operation) began in May 1987 and continued for one year collecting data before the August 1988 commercial operation of STP Unit 1. Phase II (post-operation) began in June 1989 after commercial operation of STP Unit 2 and continued for one year until June 1990. Fog monitoring was accomplished by operation of two visibility meters. One visibility meter was located on FM 521 approximately one mile northwest of STP 1 & 2. The second visibility meter was located approximately 11 miles west-southwest of STP 1 & 2 to serve as a control site. The pre-operational monitoring results totaled 229 hours per year for the FM 521 monitoring station and 163 hours per year for the control monitoring station. The increase in actual hours of fogging was 33 hours for the FM 521 monitoring station and 56 hours per year at the control monitoring station. The control monitoring station resulted in a greater increase in fogging events, indicating an overall increase in natural fog occurrence in the area during the period of the monitoring program. The results of the fog monitoring program do not indicate

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that the presence of the MCR significantly increases the fog occurrence over the naturally occurring fog for STP 1 & 2.

To determine the increase in fogging potential once STP 3 & 4 becomes operational, the MCR was modeled using the Gaussian Plume Model to determine the downwind plume concentrations of moisture from MCR water evaporation. Inputs for the Gaussian Plume Model include the receptor height, release height, source strength, wind speed, and vertical and lateral plume dispersion parameters. The vertical and lateral plume dispersion parameters were functions of downwind distance and stability class. The MCR was approximated as a square with each side being 5322-meters long, which corresponds to the square root of the pond area. Because of the size of the MCR in relation to the receptor location, the Gaussian Plume model, which is for a point source, was generalized to describe an area source. The generalization was calculated by integrating the point source solution over the pond area. Additional details of the model are discussed in the calculation package (Tetra Tech 2008).

Daily evaporation rates in inches were provided from the MCR Thermal Calculation. The MCR Thermal Calculation predicts the water consumption from two unit (existing units) and four unit (existing units plus the proposed new units) operation. One of the outputs of this study is the daily evaporation rates. Values of daily evaporation for both the two unit operation and four unit operation at 93% and 100% load factors were provided. The daily evaporation for two and four unit operation at 100% load factor was converted to hourly evaporation rates using the hourly wind speed and relative humidity. Those hourly rates served as the source term in the model. The 100% load factor was assumed for conservatism.

The meteorological data used in the analysis was the same as the data used in other sections of the ER. The data was collected onsite from the STP 1 & 2 meteorological tower for the years 1997, 1999, and 2000. This data included the wind speed, wind direction, and stability class. Additional data was acquired from the National Climatic Data Center for the Palacios Municipal Airport. This data, also for the years 1997, 1999, and 2000, included the dew point temperature and the dry bulb temperature. The relative humidity of the ambient air was calculated from the dry bulb temperature and the dew point temperature.

There were two receptor locations identified, Receptor 1 is 500 meters north of the edge of the MCR on FM 521. Receptor 2 is 1800 meters north of the edge of the MCR along FM 521 where the road arcs around STP 1 & 2. These are expected to be the most sensitive locations to fogging events because of the proximity of these locations to the MCR and because they are in the predominant wind direction. Impacts at these receptor locations would bound any impact at other receptor locations. Because of the size of the MCR, wind blowing from multiple directions could pass over the MCR and reach the receptor locations. For this reason, any wind direction northward from East to West was assumed to pass over the MCR and reach the 500 meter receptor location, and any wind direction northward from Northeast to Northwest was assumed to pass over the MCR and reach the 1800 meter receptor location. The receptor locations were also assumed to be at the ground elevation of STP 1 & 2. The berm around the MCR is approximately 37 feet above the elevation of STP 1 & 2. Therefore, the plume would be released at a higher elevation than the receptor, and this elevation difference is accounted for in the model.

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The number of times that the wind was blowing in one of the receptor locations for the entire meteorological period is provided in Table 1. The wind direction is toward Receptor 1 for 64 percent of the year and toward Receptor 2 for 47 percent of the year. This confirms that any impacts observed at these receptor locations would bound other receptor locations. Since the meteorological data was for three years, the total was divided by three to get an average annual number of hours that the wind direction is toward one of the receptors.

Table 1. Number of hours that the wind direction is towards a receptor.

Month	Total number of hours that the wind direction is toward Receptor 1	Annual number of hours that the wind direction is toward Receptor 1	Percentage of time that the wind direction is toward Receptor 1		Total number of hours that the wind direction is toward Receptor 2	Annual number of hours that the wind direction is toward Receptor 2	Percentage of time that the wind direction is toward Receptor 2
January	1240	413	56%		915	305	41%
February	1239	413	61%		908	303	45%
March	1494	498	67%		954	318	43%
April	1430	477	66%		1022	341	47%
May	1700	567	76%		1398	466	63%
June	1820	607	84%		1560	520	72%
July	1922	641	86%		1658	553	74%
August	1730	577	78%		1428	476	64%
September	1200	400	56%		810	270	38%
October	1168	389	52%		625	208	28%
November	937	312	43%		588	196	27%
December	849	283	38%		496	165	22%
All Months	**16729**	**5576**	**64%**		**12362**	**4121**	**47%**

The model simulation then used the inputs described above to determine the number of hours that the relative humidity of the plume from the MCR would be 100 percent when only the heat load from the existing units was applied to the MCR. This value was then divided by three, the number of years in the meteorological period, to determine the average number of hours per year that the plume would have a relative humidity of 100 percent at one of the receptor locations. These would be hours where the potential for fogging would be significantly increased. Table 2 provides this information by month and annually.

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Table 2. Number of hours predicted at each receptor location where the Relative Humidity of the plume would be 100 percent for STP 1 & 2.

Month	Hours predicted with 100% Relative Humidity at Receptor 1	Percentage of the time with 100% Relative Humidity[a]		Hours predicted with 100% Relative Humidity at Receptor 2	Percentage of the time with 100% Relative Humidity[a]
January	19	3%		9	1%
February	19	3%		5	1%
March	27	4%		7	1%
April	20	3%		3	0%
May	11	1%		1	0%
June	25	3%		7	1%
July	30	4%		5	1%
August	22	3%		4	0%
September	32	4%		7	1%
October	28	4%		5	1%
November	42	6%		15	2%
December	39	5%		12	2%
Annually	**314**	**4%**		**81**	**1%**

a. Compared to the total number of hours.

The total number of discrete events associated with the above information was also determined. If two or more consecutive hourly outputs resulted in the relative humidity of 100 percent, these were counted as a single discrete event. The total number of hours presented in Table 2 could then be divided by the number of discrete events to determine the average amount of time that each event lasts. Table 3 provides this information by month and annually. It can be seen that the average time for each event is fairly constant throughout the year.

Table 3. Average time that the Plume Relative Humidity is 100 percent at each receptor location for STP 1 & 2.

Month	Number of discrete events where the Relative Humidity is 100% at Receptor 1	Average number of hours that each discrete event lasts at Receptor 1		Number of discrete events where the Relative Humidity is 100% at Receptor 2	Average number of hours that each discrete event lasts at Receptor 2
January	9	2		5	2
February	7	3		3	2
March	9	3		4	2
April	9	2		3	1
May	5	2		1	1
June	10	2		4	2
July	15	2		4	1
August	10	2		2	2
September	13	2		3	2
October	12	2		3	2
November	15	3		6	3
December	11	4		5	2
Annually	**125**	**3**		**42**	**2**

The Gaussian Plume Model described above does not predict when or if fogging may occur. The output of the model is the number of hours that the relative humidity at a receptor location is 100 percent. Fogging is dependent on a number of meteorological factors and is not easily calculated. For this determination, an approximation between the number of hours of high relative humidity and the number of hours of observed fogging was determined. Five years of additional data from the National Climatic Data Center for the Palacios Municipal Airport was acquired. The data was for the years 2002 through 2006 and contained the dry bulb temperature, the dew point temperature, the number of hours of observed fog, and observations of visibility. The number of observations where the relative humidity of this data set was equal to 100 percent (determined by the difference between the dry bulb and dew point temperatures being zero) was determined to be 3,325. Of these observations, the total number of records that also contained observations of fog was determined to be 1,379. Therefore, 41 percent of the time that the Relative Humidity at the Palacios Municipal Airport was equal to 100 percent, there was also fogging. Although this is not an ideal way to determine the relationship between fogging and relative humidity, it should give an approximation that is realistic. Further statistics with this data set were calculated, and it was determined that 87 percent of all fogging observations occurred when the difference between the dry bulb and dew point was less than or equal to 2^0F.

The number of events where visibility was impaired, where the visibility was less than 0.3 miles, was also determined from the 2002 through 2006 Palacios Municipal Airport meteorological data. Similar to the observed fogging events determination described above, the number of times that visibility was less than 0.3 miles and the relative humidity was equal to 100 percent was determined to be 214 hours. Therefore, 6 percent of the time that the relative humidity was 100 percent, the visibility was impaired.

Both the percentage of fogging and percentage of time that the visibility was impaired was applied to the number of times that the predicted relative humidity would be 100 percent from the MCR plume at the receptor locations. Table 4 presents the predicted fogging and impaired visibility for the two unit operation.

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Table 4. Predicted fogging and impaired visibility at the downwind receptor locations for STP 1 & 2.

Month	Hours of predicted fogging events at Receptor 1	Hours of predicted fogging events where the visibility is less than 0.3 miles at Receptor 1		Hours of predicted fogging events at Receptor 2	Hours of predicted fogging events where the visibility is less than 0.3 miles at Receptor 2
January	8	1		4	1
February	8	1		2	0
March	11	2		3	0
April	8	1		1	0
May	5	1		1	0
June	10	2		3	0
July	12	2		2	0
August	9	1		2	0
September	13	2		3	0
October	12	2		2	0
November	18	3		6	1
December	16	3		5	1
Annually[a]	**130**	**20**		**33**	**5**

[a] Number of annual hours may not equal sum of monthly hours due to roundoff.

Annually, 130 hours of fogging was predicted for locations northward between the East and West and within 500 meters of the edge of the MCR. This would approximate the closest approaches of FM 521. Fogging was predicted to occur for 33 hours annually for locations farther from the MCR, such as along FM 521 north of STP. The receptor location for the fog monitoring program discussed above for STP 1 & 2 is similar to the location of Receptor 2 of this analysis. The results of the fog monitoring program were that 33 additional hours of fogging were observed at that location. Coincidentally, 33 hours of fogging were also predicted at that location using the Gaussian Plume Model described and used in this analysis.

This model was then applied to the MCR with the heat load from STP 1 & 2 and STP 3 & 4. Table 5 presents the same information from Table 2 with the addition of STP 3 & 4. The number of times that the relative humidity at each receptor location is 100 percent increased by nearly a factor of two. This would be expected from an increase in heat load on the MCR by approximately a factor of two. In addition, Table 6 presents the average number of hours that the discrete relative humidity events occur. The number of discrete events increased, but the total average time that the events occur remained similar to the prediction for two unit operation, with 3 hours for Receptor 1 and 2 hours for Receptor 2.

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Table 5. Number of hours predicted at each receptor location where the Relative Humidity of the plume would be 100 percent for STP 1 & 2 and STP 3 & 4.

Month	Hours predicted with 100% Relative Humidity at Receptor 1	Percentage of the time with 100% Relative Humidity[a]		Hours predicted with 100% Relative Humidity at Receptor 2	Percentage of the time with 100% Relative Humidity[a]
January	32	4%		12	2%
February	31	5%		11	2%
March	45	6%		17	2%
April	31	4%		10	1%
May	33	4%		7	1%
June	45	6%		15	2%
July	60	8%		18	2%
August	61	8%		21	3%
September	70	10%		24	3%
October	43	6%		10	1%
November	56	8%		21	3%
December	49	7%		20	3%
Annually	**554**	**6%**		**185**	**2%**

a. Compared to the total number of hours.

Table 6. Average time that the Relative Humidity of the plume is 100 percent at each receptor location for STP 1 & 2 and STP 3 & 4.

Month	Number of discrete events with 100% Relative Humidity at Receptor 1	Average number of hours that each discrete event lasts at Receptor 1		Number of discrete events with 100% Relative Humidity at Receptor 2	Average number of hours that each discrete event lasts at Receptor 2
January	15	2		7	2
February	10	3		6	2
March	15	3		8	2
April	12	3		6	2
May	13	3		5	1
June	17	3		8	2
July	28	2		13	1
August	22	3		10	2
September	22	3		11	2
October	16	3		6	2
November	19	3		7	3
December	15	3		7	3
Annually	**202**	**3**		**94**	**2**

The same methodology described above to predict the number of hours of fogging and impaired visibility was used to determine the impacts from operation of STP 1 & 2 and STP 3 & 4 on the MCR. The ratios of 41 percent fogging and 6 percent impaired visibility were applied to the results of the modeling at each receptor location. Table 7 presents the results. The number of hours of predicted fogging and impaired visibility approximately double for the four unit operation.

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Table 7. Predicted fogging and impaired visibility at the downwind receptor locations for STP 1 & 2 and STP 3 & 4.

Month	Hours of predicted fogging events at Receptor 1	Hours of predicted fogging events where the visibility is less than 0.3 miles at Receptor 1		Hours of predicted fogging events at Receptor 2	Hours of predicted fogging events where the visibility is less than 0.3 miles at Receptor 2
January	13	2		5	1
February	13	2		4	1
March	19	3		7	1
April	13	2		4	1
May	14	2		3	0
June	19	3		6	1
July	25	4		8	1
August	25	4		9	1
September	29	4		10	2
October	18	3		4	1
November	23	4		9	1
December	20	3		8	1
Annually	**230**	**36**		**77**	**12**

As described above, the results of the fog monitoring program indicate that the presence of the MCR does not significantly increase the natural fog occurrence for STP 1 & 2 operation. Since the operation of the MCR with STP 1 & 2 does not increase the observable fogging over naturally occurring fogging, this level of fogging could be considered consistent with background levels, or levels without an observable impact. Furthermore, fogging from the MCR with STP 1 & 2 has not created an impact to any onsite or offsite areas. However, any amount of fogging over that level, such as the additional fogging from four-unit operation, could be noticeable and potentially cause an impact. The difference between the predicted fogging for four-unit operation and two-unit operation is 100 hours per year at Receptor 1 and 44 hours per year at Receptor 2. The hours where visibility would be impaired above existing levels would be 16 hours per year at Receptor 1 and 7 hours per year at Receptor 2.

Residents of the area near the MCR and commuters on FM 521 may notice the increase in localized fogging after STP 3 & 4 is operational. The fogging, especially near bodies of water, would often occur in the early morning hours. However, the total number of additional hours of fogging from the MCR would only be a fraction of the number of hours of naturally occurring fogging. The number of hours of impaired visibility from the operation of the MCR would also be small.

Impacts from fogging of the MCR would be SMALL and would not warrant mitigation. Since the climate in the region is typically too warm for frequent and persistent freezing temperatures, impacts from icing would be SMALL and would not warrant mitigation.

Question 07.01-01

Question Number: 07.01-01

QUESTION:

Provide the dose factors used in evaluation of each design basis accident and the source of the dose factors.

Full Text (Supporting Information):

The initial response references whole body dose factors from a GE report (NEDO-21143-1). The report contains propriety information and is not publically available. Therefore, provide a listing of the referenced dose factors used in the DBA analysis and the source of the dose factors. Provide a duration for the instrument line break accident dose calculation.

RESPONSE:

In STP's letter to the NRC, ABR-AE-08000052 dated July 15, 2008, Attachment 56 provided an initial response to RAI 07.01-01 regarding the source of dose factors used in evaluation of design basis accidents.

The thyroid dose conversion factors that were used in the ABWR DCD radiological consequences analyses are those from ICRP Publication 30. These values are listed below. The whole body doses reported in the ABWR DCD were calculated using the average gamma disintegration energy values (also listed below) from General Electric document NEDO-21143-1 (at pages C-3 and E-3). This document is publicly available in the NRC ADAMS document storage system (Accession No. ML051300472). As identified in NEDO-21143-1 (at page C-3), the gamma disintegration energy values were obtained from: ORNL/NUREG/TM-102, "Nuclear Decay Rate for Radionuclides Occurring in Positive Releases from Nuclear Fuel Cycle Facilities," August 1977.

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	Average Gamma Disintegration Energy (Mev/Dis)	Thyroid Dose Conversion Factor (Rem/Ci)
I-131	3.81E-01	1.07E+06
I-132	2.28E+00	6.29E+03
I-133	6.10E-01	1.81E+05
I-134	2.63E+00	1.07E+03
I-135	1.57E+00	3.14E+04
Kr-83m	2.58E-03	-
Kr-85m	1.58E-01	-
Kr-85	2.23E-03	-
Kr-87	7.93E-01	-
Kr-88	1.98E+00	-
Kr-89	1.87E+00	-
Xe-131m	2.01E-02	-
Xe-133m	4.15E-02	-
Xe-133	4.61E-02	-
Xe-135m	4.31E-01	-
Xe-135	2.48E-01	-
Xe-137	1.83E-01	-
Xe-138	1.13E+00	-

As stated in the ABWR DCD, the duration for the instrument line break dose analysis is 8 hours. This is stated in Table 15.6-1 and is reflected in Table 15.6-2 which lists the activity releases out to 8 hours. The doses reported in Table 15.6-3 for the various distances from the plant are all based on the releases occurring over the 8-hour period.

The previous RAI response also included a duration time for the instrument line break dose and a revision to COLA Table 7.1-8 of the ER.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 07.02-06

Question Number: 07.02-06

QUESTION:

Provide a list of major surface water users within 50 mi of STP Units 3 & 4, especially public water supplies.

Full Text (Supporting Information):

The initial RAI response was unresponsive. Information is needed on surface water users to permit NRC staff to interpret/evaluate MACCS2 results.

RESPONSE:

The 2007 Texas State Water Plan (found at: http://www.twdb.state.tx.us/wrpi/swp/swp.htm) was reviewed for major sources of surface water use within 50 miles of STP Units 3 & 4. 196 major reservoirs are identified (found at: http://www.twdb.state.tx.us/publications/reports/State_Water_Plan/2007/2007StateWaterPlan/APP%206.1_final%20112906.pdf) in the Plan, of which five (including the STP Main Cooling Reservoir) are within 50 miles of the new units (Texas Water Development Board Major Surface Water Features Map (found at: http://www.twdb.state.tx.us/mapping/maps/pdf/swr_34X34.pdf).
There are no known major surface water users taking water directly from the river, i.e., not using a reservoir or lake. The four offsite reservoirs are: Brazoria Reservoir (water rights held exclusively by Dow Chemical), William Harris Reservoir (water rights held exclusively by Dow Chemical), Eagle Nest Lake (Spanish Trail Land and Cattle Co., LP), and Lake Texana. Of those, only Lake Texana (located approximately 30 miles north-northwest of the site) is a public water supply which supplies the City of Point Comfort (population approximately 720) and is a secondary supplier of water to the City of Corpus Christi (population approximately 285,000). Corpus Christi, in turn, supplies water to other nearby cities and water districts, e.g., Cities of Alice and Beeville and the San Partricio Municipal Water District.

One additional major surface water feature within 50 miles of the site, Cox Lake, approximately 25 miles west of the site, was identified (from the Texas Water Development Board Major Surface Water Features Map). Cox Lake is used for industrial purposes and is owned by Alcoa World Aluminum Atlantic.

The MACCS2 surface water pathway analysis is not constrained to a single watershed, but instead considers all water within 50-miles of the STP Units 3 & 4 site. The MACCS2 surface water model is described in Volume 1 of the MACCS2 User's Guide, NUREG/CR-6613. The calculations assume that the 50-miles surrounding the site is divided between land (land fractions in MACCS2 site file) and water. Parameters are included in the Chronic module input file which describe the fraction of deposited material on land which makes its way to water via runoff; the model directly calculates the amount of material depositing directly on the water. A parameter is included which relates the fraction of material which reaches the water which is consumed by

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humans. The parameters chosen were those from MACCS Sample Problem A. The conservative assumption was made that ALL water within 50-miles of the Units 3 & 4 site is drinkable.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 07.02-07

Question Number: 07.02-07

QUESTION:

Revise the discussion of the groundwater pathway risks for STP Units 3 & 4 to support the conclusion in the last sentence of ER Section 7.2.2.3.

Full Text (Supporting Information):

The initial RAI response still lacks a complete logic chain. Provide a statement on the magnitude of potential releases to groundwater from the ABWR compared to the magnitude of potential releases from existing units.

RESPONSE:

See the Candidate COLA Revision.

CANDIDATE COLA REVISION:

The last two paragraphs of ER Subsection 7.2.2.3 will be replaced with the following text.

The ABWR DCD considered basemat penetration and concluded that it would not lead to containment failure, the debris being quenched and cooled before basemat penetration could occur. Additionally, an uncertainty analysis assessed the potential for continued core-concrete attack and concluded that there is little impact of contained core-concrete interaction on containment performance. Nevertheless, the consequence of an incredible ABWR core melt-through to the groundwater would be similar to the consequence from the same accident scenario at existing STP Units 1 or 2. This is because the source term of such a release would be roughly proportional to the power rating of the core. That is, two cores having similar power levels would have similar nuclide inventories; should those similar nuclide inventories breach the basemat and reach groundwater, they would have similar consequences. The existing STP Units 1 and 2 are rated at 3853 MWt per unit, while the proposed new ABWR Units 3 and 4 would be rated less than 2% greater, 3926 MWt per unit. Similarly, the airborne pathway consequences for STP 3 & 4 would be less than 2% greater than the airborne pathway consequences for STP 1 & 2. Although the consequences of a groundwater or airborne release from STP 1 & 2 are similar to the consequences of a groundwater or airborne release from STP 3 & 4, the severe accident frequency for the ABWR (1.5×10^{-7} per reactor year) is lower than that of STP 1 & 2 (1×10^{-5} per reactor year).

NUREG-1437 evaluated the groundwater pathway dose, based on the analysis in NUREG-0440, the Liquid Pathway Generic Study (LPGS) (Reference 7.2-8). NUREG-0440 analyzed a core meltdown that is assumed to contaminate groundwater that subsequently contaminates surface water. NUREG-1437 compares STP 1 & 2 groundwater pathway severe accident doses to the results of NUREG-0440; the STP 1 & 2 results are shown to be very much less than the LPGS

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value. NUREG-1437 concludes that the risk from groundwater releases is a small fraction of that from atmospheric releases for sites such as STP.

As discussed above, the groundwater and airborne releases from STP 3 & 4 would be similar to groundwater and airborne releases from STP 1 & 2. Therefore, since the risk from groundwater releases are much less than the risk from atmospheric releases at STP 1 & 2, the risk from groundwater releases would be much less than the risk from atmospheric releases at STP 3 & 4.

Question Number: 09.02.03-01

QUESTION:

Information on a coal-fired energy alternative is provided in section 9.2.3.1 of the ER. The staff requests additional information on whether more recent emission factors could be used to provide more accurate emission estimates for a new coal-fired power plant. If more accurate emission estimates can be prepared, then provide them.

Full Text (Supporting Information):

The most recent published information that the staff is aware of regarding the performance of fossil energy power systems is the 2007 National Energy Technology Laboratory (NETL) report Cost and Performance Baseline for Fossil Energy Plants Volume 1: Bituminous Coal and Natural Gas to Electricity, DOE/NETL-2007/1281 Rev. 1, online at: http://www.netl.doe.gov/energy-analyses/pubs/Bituminous%20Baseline_Final%20Report.pdf. The report examines four cases of subcritical and supercritical pulverized coal-fired power plants and includes emission estimates for each case. The ER uses EPA's 1998 AP-42 document to estimate emissions from a new coal-fired power plant. Emission estimates in the 2007 NETL report assume environmental regulations that would most likely apply to plants built in 2010 (see p. 18 of the report).

RESPONSE:

Background

The purpose of the 2007 NETL report is to establish baseline performance levels for fossil energy plants. To achieve this purpose, the report evaluates performance of 12 fossil-fuel-fired plant configurations. Each configuration is based on specific assumptions with regard to operational parameters, fuel parameters, and emission control technologies. Steady state plant performance for each case is then evaluated with the Aspen Plus® computer simulation program. Based on the analytic results, environmental targets are proposed for the emissions of NO_x (0.07 lb/million BTU); filterable particulate matter (0.085 lb/million BTU); SO_2 (0.013 lb/million BTU); and Hg (1.14 lb per 10 trillion BTU). The NETL report does not provide emission targets for CO or $PM_{2.5}$. Discussion of CO_2 emissions and controls is included for some cases; however, emission targets for CO_2 are not proposed, either.

Four of the 12 cases evaluated in the NETL report involve pulverized-coal (PC) plants – two which operate at subcritical conditions, and two which operate at supercritical conditions. For all of the PC cases, environmental performance is determined based on the use of Illinois #6 coal. The selection of coal has a strong influence on environmental performance of a coal-fired power plant.

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The primary composition of coal includes carbon, moisture, hydrogen, oxygen, sulfur, nitrogen, and ash. Inside the boiler, three of these constituents will oxidize to liberate energy (carbon, hydrogen, and sulfur). Although the oxygen content in coal does not contribute energy, it does contribute to the available oxygen for the combustion process. Ash, moisture, and other constituents in the coal contribute essentially nothing to the energy output, and instead, absorb and remove thermal energy from the combustion process. In addition, heat value of the coal determines the quantity of coal that must be burned to produce the desired energy output of the power plant, and the quantity of coal burned determines the uncontrolled environmental performance (i.e., uncontrolled emission levels); therefore, the heat value of the coal determines environmental performance. For these reasons, the heat value and composition of the coal has a strong influence on the environmental performance of the plant.

Discussion

The ER assumes the use of Sub-bituminous Powder River Basin (PRB) coal, which is currently used at the W.A. Parish fossil-fired plant near Houston, Texas. The Illinois #6 coal is 5 to 6 times more expensive than the PRB coal and would not be practical for use at South Texas Project. The table below illustrates the differences in heat rate and composition for Illinois #6 and Sub-bituminous PRB coals (as received).

Table 1 Coal Comparison

Constituent	Illinois #6	PRB Sub-bituminous
HEAT RATE (BTU/lb)	11,666	8,200
Carbon	63.75%	49.7%
Moisture	11.12%	29%
Hydrogen	4.50%	3.2%
Oxygen	6.88%	13.2%
Sulfur	2.51%	0.3%
Nitrogen	1.25%	0.7%
Chlorine	0.29%	0.0%
Ash	9.70%	3.9%

Note: Hg is included in the ash

It is important to note that the NETL report does not provide emission factors which facilitate direct calculation of emissions for an alternate coal choice, and therefore it is not possible to calculate the emissions from PRB coal at STP in a forward way. However, based on the environmental targets cited in the NETL report, revised emissions for PRB coal can be estimated and are provided below for comparison with the ER emissions:

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Table 2 Emissions Comparison

Pollutant	ER Emissions Based on AP-42 (tons per year)	Emissions based NETL Report Targets (tons per year)
CO	2,793	Not applicable
CO_2	26,872,597	Not applicable
Hg	0.46	1.04
NO_x	2,011	6,414
SO_2	2,933	7,788
PM_{10}	218	1,191
$PM_{2.5}$	13	Not applicable

Conclusions

The analytic assumptions of the South Texas Project ER fossil-fired alternatives were specifically chosen to yield the lowest emissions that a coal-fired plant in southern Texas would reasonably achieve based on currently proven technologies. Key assumptions included the use of sub-bituminous Powder River Basin (PRB) coal, in a supercritical pulverized coal plant, with a plant capacity factor of 0.85. The estimated emissions for the coal-fired alternative were determined based on the most current EPA-approved methods and data as published in AP-42.

The NETL report does not provide emission factors that can be directly applied to improve accuracy of the calculated emissions for the South Texas Project plant; instead, the NETL report identifies emission targets based on the collective analysis of four PC plant configurations and the use of Illinois #6 coal. The composition and heat value of this coal is very different than Sub-bituminous PRB coal, and the use of the Illinois #6 coal would not be practical at South Texas Project.

Based on the environmental target levels in the NETL report, calculated emissions for 2,700 MW_e of net power at the South Texas Project would be much higher than the emissions calculated based on the EPA AP-42 methods. Because these higher estimates are based on environmental targets instead of engineered emission factors, these estimates would likely be less accurate than the estimates presented in the ER. In addition, the NETL report does not offer environmental targets for CO, CO_2,. or $PM_{2.5}$. For these reasons, we believe the emissions presented in the ER are the most complete and accurate emissions available for the South Texas Project coal-fired alternative.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 09.02.03-02

Question Number: 09.02.03-02

QUESTION:

Information on the natural gas combined-cycle (NGCC) energy alternative is provided in section 9.2.3.2 of the ER. The staff requests additional information on whether more recent emission factors could be used to provide more accurate emission estimates for a new NGCC power plant. If more accurate emission estimates can be prepared, then provide them.

Full Text (Supporting Information):

The most recent published information that the staff is aware of regarding the performance of fossil energy power systems is the 2007 National Energy Technology Laboratory (NETL) report Cost and Performance Baseline for Fossil Energy Plants Volume 1: Bituminous Coal and Natural Gas to Electricity, DOE/NETL-2007/1281 Rev. 1, online at: http://www.netl.doe.gov/energy-analyses/pubs/Bituminous%20Baseline_Final%20Report.pdf. The report includes emission estimates for NGCC power plants. Section 9.2.3.2 of the ER uses EPA's 1998 AP-42 document to estimate emissions from a new NGCC power plant. Emission estimates in the 2007 NETL report assume environmental regulations that would most likely apply to plants built in 2010 (see p. 18 of the report). The staff also notes that EPA published a version of AP-42 applicable to natural gas combustion in 2000 (see p. 8-54 of draft NUREG-1437, Supplement 36)

RESPONSE:

The RAI poses two questions. One question [A] concerns the use of an old version of EPA AP-42, and the other question [B] asks whether the 2007 NETL report can be applied to yield a more accurate estimate of gas-fired emissions. Responses are provided below

[Part A] The gas-fired emission quantities in the latest ER submittal were calculated based on the year 2000 version of EPA AP-42. However, the text of the ER incorrectly cites the 1998 version of EPA AP-42, and should be revised to show the correct citation (year 2000).

[Part B] The purpose of the 2007 NETL report is to establish baseline performance levels for fossil energy plants based on current technologies. To achieve this purpose, the NETL report evaluates performance of 12 fossil-fuel-fired plant configurations. Each configuration is based on specific assumptions with regard to operational parameters and emission control technologies.

Two of the 12 cases evaluated in the NETL report involve natural-gas-fired plants – one case with amine capture for CO_2 separation, and one without amine capture. Steady-state plant performance for each case is evaluated with the proprietary Aspen Plus® computer simulation program. Based on those evaluations, an environmental target is proposed for the emission of NO_x (2.5 ppmv/million BTU @ 15% excess oxygen). For the purpose of environmental targets, the report assumes that emissions of SO_x, PM, and Hg are negligible for natural gas. Discussion

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of CO_2 emissions and controls is included in the NETL report; however, a CO_2 emissions target is not proposed.

The formation of NO_x from natural gas combustion is a strong function of temperature. Higher temperatures yield improved combustion efficiency, but also produce higher NO_x emissions. The NETL report applied the Aspen Plus® computer simulation program to estimate NO_x formation for their assumed gas-fired plant. The plant is assumed to include NO_x burners with overfire air, and combustion temperature is controlled via proper burner selection. The plant is also assumed to include a selective catalytic reduction (SCR) system that reduces post combustion NO_x emissions by 90 percent from 25 ppmv to 2.5 ppmv, which is the suggested environmental target.

Based on the plant configuration and operational parameters assumed in the NETL report, the annual NO_x and CO_2 emissions from a 560 MW_e (net) power plant would be 127 tons and 1,662,000 tons, respectively. It is noted that the NETL report does not provide engineered emission factors, but can be utilized to estimate emissions in an alternative way, and that is, scaling the results to an equivalent 2,700 MW_e (net) power plant to estimate emissions for the gas-fired alternative at STP. Table 1 provides a comparison of the results presented in the ER and the results scaled from the NETL report.

Table 1 Emissions Comparison

Pollutant	ER Emissions Based on AP-42 (tons per year)	Emissions based NETL Report (tons per year)
CO	141	Not provided
CO_2	6,864,747	8,008,066
NO_x	680	612
SO_2	41	Assumed Negligible
PM_{10}	119	Assumed Negligible
$PM_{2.5}$	119	Assumed Negligible

The NETL report assumed a particular plant configuration and operational parameters. Based on those assumptions, the proprietary Aspen Plus® computer software package was applied to determine performance and emissions. As shown in Table 1, NO_x emissions scaled from results in the NETL report are within 10% of those presented in the ER. This difference does not necessarily mean that the NETL results are more accurate than those presented in the ER. Instead, it is a reflection of the configuration and operational parameters assumed. It is important to note that the NETL report offers no emission factors or methods to directly calculate emissions from a natural-gas-fired plant, and in addition, offers no results which can be scaled to estimate emissions for other pollutants of concern, such as CO, PM, and SO_2. Finally, because the algorithm(s) applied by Aspen Plus® are not described in the report, the basis for those calculations is not known. The emissions presented in the ER are based on EPA-approved methods that are the current industry standard. In summary, we believe the emissions presented in the ER represent the most complete and accurate emissions for the South Texas Project gas-fired alternative.

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CANDIDATE COLA REVISION:

Page 9.2-24, Section 9.2.3.2.1, second full paragraph:

These emission totals are calculated based on the parameters and assumptions identified in Table 9.2-2 and emission factors published in AP-42 (9.2-~~53~~58).

Question 09.03-01

Question Number: 09.03-01

QUESTION:

Explain how the Limestone alternative site satisfies NRC's siting guidance for potential and/or candidate sites as set out in Regulatory Guides 4.2 and 4.7 and the July 2007 version (Draft Rev. 1) of ESRP 9.3. Provide information regarding the expected impacts (including impacts on current water users) if STPNOC were to withdraw water from Lake Limestone to provide wet cooling for two new ABWR units at the Limestone site. Provide information regarding the expected impacts (including impacts on current holders of mineral rights) if STPNOC were to acquire the mineral rights for the Limestone site.

Full Text (Supporting Information):

The staff requests further information regarding how the Limestone site is among the best candidate sites that can reasonably be found for the siting of a nuclear power plant (ESRP 9.3) given the water scarcity and mineral rights issues at the site. NRG is one of the planned co-owners of STP Units 3 and 4. In NRG's Limestone 3 Expansion Project Fact Sheet (http://www.nrgenergy.com/pdf/factsheet_limestone.pdf), NRG states that "to conserve scarce water resources in the area, Limestone 3 will use dry cooling to condense the steam back into water." Attachment 60 of STPNOC's RAI 7/15/08 response states that "it assumed that sufficient water could be purchased and developed for cooling at the site." STPNOC's 7/15/08 response also notes that "dry cooling is not necessarily an appropriate alternative cooling technology for ABWR units." The staff is having difficulty reconciling STPNOC's responses with the NRG statements in the Limestone 3 Fact Sheet. Specifically, if sufficient water could be purchased for the Limestone site (as stated in STPNOC's 7/15/08 response), the staff does not understand why NRG would propose dry cooling for Limestone 3 given the economic penalty of dry cooling in comparison to wet cooling. In addition, since dry cooling is proposed by NRG for Limestone 3, the staff does not understand how Limestone could be a candidate site for ABWR units for which dry cooling is an inappropriate cooling technology. In its 7/15/08 RAI response, STPNOC also states that it assumed that it could acquire the mineral and natural gas rights to the Limestone site. Identify the source(s) of cooling water at the site. Describe in detail the expected impacts from the use of the identified water source(s) including the impacts on the current and potential future competing water users. Describe the impacts of acquiring mineral rights at the site, including impacts on current holders of mineral rights.

RESPONSE:

For purposes of analysis, STPNOC assumed that water for the proposed nuclear generating units would come from Lake Limestone and the Carrizo-Wilcox Aquifer. Often, a project of this magnitude will utilize a combination of water sources to meet anticipated demands, including groundwater, surface water and effluent. Based on a review of publicly-available information, STPNOC assumed that water would be available from the Carrizo-Wilcox Aquifer and Lake Limestone.

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In Texas, water rights depend on whether the source of supply is groundwater or surface water. Groundwater is governed by the rule of capture, which grants landowners the right to capture the water beneath their property. Landowners have a right to pump and capture whatever water is available, regardless of the effects of that pumping on neighboring wells. The issue is not whether there is a right to capture groundwater at the proposed alternate sites, but whether the groundwater supply is physically available and in sufficient quantity to meet the STPNOC demands.

At Limestone, there is more than an ample groundwater supply readily available to meet STPNOC demands. Three onsite wells tap into the prolific Carrizo-Wilcox Aquifer, which has an annual supply of more than 251,852 acre-feet with in the Brazos G Regional Water Planning Area (BGRWPA) (where the Limestone site is located) (Reference 9.3-18). In 2000, the BGRWPA reported a total groundwater use of only 96,156 acre-feet, less than half the total annual available groundwater supply (Reference 9.3-18).

Unlike groundwater, in Texas the use of surface water requires a water right permit. Water rights are granted on a "first come - first served" basis. This is known as the "prior appropriation doctrine." Prior appropriation is not related to land ownership; instead water rights are acquired by compliance with statutory requirements of beneficial use. In the unlikely event that there is insufficient groundwater to meet STPNOC's pumping demands, unappropriated surface water rights may be acquired through permit, or surface water rights may be acquired on the open market. STPNOC may acquire surface water rights from willing sellers, including municipal service, industrial uses or agricultural water rights. Surface water rights may be acquired and transferred to new uses and new locations, subject to state permit and a hearing showing no injury to junior users on the surface water system. Permitted rights and transferred rights require public notice and hearing, and consideration of no injury to other water users on the surface stream. (Tex. Water Code Ann. Section 11.134.) "Injury" to other users could be an issue in locations where the surface water supply is over-appropriated. In such cases, the movement of water from one location to another could impact downstream users and the permitting system is designed to ensure that there is "no injury" to other water users. However, as noted below, there is sufficient unappropriated or unused surface water rights in Lake Limestone that STPNOC assumes may be obtained by contract or permit. Because the water source in Lake Limestone is not over-appropriated, the use of acquired surface water for the STPNOC project is unlikely to cause injury to other users.

The marketability of surface water rights generally results in positive socioeconomic benefits. The willing seller obtains significant monetary value for a commodity, while the buyer's use of the transferred right is subject to a "no injury" finding by the TCEQ on existing users who must be made whole by the proposed transfer. (Tex. Water Code Ann. Section 11.134.) Moreover, the marketing of surface water rights can be an environmentally positive action because the net result is fewer new demands on the water system.

Surface water is also available from Lake Limestone. Lake Limestone has an authorized storage capacity of over 200,000 acre-feet. (Reference 9.3-18). Water rights at Lake Limestone are owned by the Brazos River Authority, which has an authorized diversion of 65,000 acre-feet per year. (Reference 9.3-18). The Brazos River Authority has water supply contracts with several

industrial users (including NRG Texas Power LLC) and with one municipal user (South Limestone County). Of the 65,000 acre-feet, a total of 25,414 acre-feet are permitted through such contracts, with 25,214 acre-feet permitted for industrial use. The remaining 200 acre-feet are permitted for municipal use. (Texas Water Rights Database, available at: **http://www.tceq.state.tx.us/permitting/water_supply/water_rights/wr_databases.html**). In 2001, Lake Limestone had a reported use of 14,460 acre-feet, with almost all used for industrial purposes for industrial purposes, generally for power generation and small industry. (Reference 9.3-18). Thus, based on the reports available for existing water allocations and contracts for water diversions from Lake Limestone, STPNOC assumes that there are ample unappropriated or surplus surface water supplies that may be available.

These two water sources are more than sufficient to meet STPNOC demands, individually or in combination. The Brazos River Authority has approximately 40,000 acre-feet of water that is not currently committed through a water supply contract or other agreement. It is therefore possible that STPNOC could obtain sufficient water from surface water sources alone without displacing any other water users. If STPNOC needed to acquire water rights from existing users, such a transfer would be an exchange of a water right on the open market. STPNOC assumed that the seller would have planned appropriately for the voluntary loss of the water right and associated economic impacts, therefore minimizing long-term cumulative socioeconomic impacts. Despite the transactional nature of the transfer, it is possible that other users or interested parties could be adversely affected. There are two potential adverse effects: loss of jobs from businesses that sell their water rights, and loss of municipal water rights if sold by a municipality for STPNOC use. However, it is unlikely that municipal users would lose the right to use water set aside for a municipality, since Texas law limits the transfer of municipal water use to industrial water use. Further, the loss of jobs from possible business closure (for example small construction or other industries that have water rights), could likely be mitigated by the need for such skills during the construction of STP Units 3 & 4, if it were built at the Limestone site. Thus, STPNOC assumed that there would be a sufficient amount of groundwater and surface water available to meet the demands of two ABWR nuclear units without causing injury to other users.

NRG's proposed use of dry cooling at the proposed Limestone Generating Facility expansion is not inconsistent with this assumption. As with any water use in the western United States and particularly with a project that requires a large groundwater demand, it is common practice to use sustainable water management, conservation measures and reduction of wasteful practices to the extent feasible and consistent with the project design. Dry cooling is not a feasible option for the STPNOC nuclear units. *See* STPNOC response to July 15, 2008 RAI 9.3-1. First, it is inappropriate to compare dry cooling technology at a proposed coal facility with the feasible design criteria for the STPNOC. Dry cooling is simply not a feasible alternative to adequately cool the STPNOC facility. Second, while the proposed coal facility referenced "scarce water" resource at the proposed site, this does not necessarily mean that water supplies are unavailable to meet projected STPNOC demand. Rather, known water sources include Lake Limestone and the Carrizo-Wilcox Aquifer each of which are more than sufficient to meet STPNOC demands, either individually or in combination. It nevertheless remains prudent to manage water in the most efficient manner for the benefit of all users within the basin, and if alternative cooling

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technologies are feasible, they should be utilized as was proposed by the Limestone 3 Expansion Project.

In Texas, the mineral estate is a separate interest in the land that can be severed from the surface estate. Whether the surface and mineral estates are severed or united, the rule in Texas is the same – the mineral estate dominates. The owner of the mineral estate has the right to freely use the surface estate to the extent reasonably necessary for the exploration, development and production of minerals under the property. The best method of controlling mineral development by a surface owner is the purchase of the mineral estate.

NRG owns the surface rights at the Limestone site, but it does not own all of the mineral, or subsurface, rights. According to the staff at the Limestone Generating facility, the mineral rights at the site, are leased by private entities and are not owned by the State of Texas. If it had been selected as the preferred site, STPNOC could and would have purchased the mineral rights within the property boundary at the Limestone site from these private entities. It is STPNOC's understanding from personnel at the Limestone facility that the existing wells at the Limestone site are currently only used for exploration. Aerial views show that there are a small number of wells at the Limestone site (approximately 5-10 wells). Any transfer of mineral rights would be an arms length transaction on the open market. STPNOC would expect that the seller would plan appropriately for the voluntary loss of the mineral right, thereby minimizing socioeconomic impacts. However, STPNOC recognizes that possible impacts could be felt by the loss of gas exploration jobs in the area if it acquired the mineral rights. STPNOC considered the possibility of job loss, but considered that employees performing work at these small exploration sites could likely obtain employment during construction of the STP units or work at other gas exploration locations.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 09.03-02

Question Number: 09.03-02

QUESTION:

How would inclusion of information regarding the proposed coal–fired unit 3 at the Limestone site affect the discussion of the site in section 9.3.3.1 of the ER?

Full Text (Supporting Information):

Attachment 61 of STPNOC's 7/15/08 RAI response states that the siting of Limestone 3 would not change the analysis in section 9.3.3.1 of the ER which currently does not address any impacts from Limestone 3. The response further states that Limestone 3 would take advantage of existing infrastructure and that new ABWR units at the Limestone site would not significantly affect the construction and operation at the site. The staff does not understand how siting of both new ABWR units and Limestone 3 at the Limestone site would not change the analysis in section 9.3.3.1 of the ER. If work on the proposed ABWR units and Limestone 3 were being conducted concurrently, it seems that at a minimum there would be enhanced socioeconomic impacts from the two construction projects that would be pertinent to the discussion in section 9.3.3.1 of the ER. In addition, STPNOC's statement at p. 1 of Attachment 60 to the 7/15/08 RAI response (In assessing the environmental impacts of ABWR units at the Limestone site, STPNOC assumed that the ABWR would be sited there instead of a third coal-fired plant) does not seem consistent with the STPNOC statements in Attachment 61 of the 7/15/08 RAI response (STPNOC anticipated that the ABWR units would be built in the Freestone County portion of the site. STPNOC assumes that the Limestone 3 plant would take advantage of the infrastructure within the coal-fired plant area in Limestone County). The staff requests clarification of the preceding statements. Specifically identify whether both the coal-fired unit and the ABWR would be built at the site, and if so, what the circumstances and impacts would be from doing so. The staff also requests information on who owns the mineral rights at the Freestone County portion of the Limestone site.

RESPONSE:

The analysis in 9.3.3.1 would not change because STPNOC assumed that the Limestone 3 Plant would not be built during construction of Units 3 & 4. Several considerations support this assumption. For example, if the nuclear facility were built, the power generated by the facility would compensate for energy lost if Limestone 3 were not built. Further, STPNOC considered that the socioeconomic benefits of constructing a nuclear facility (including size of construction and operation work force, high operational capacity, and long term operational life of the plant) would likely be greater than those realized by the smaller coal-fired plant. STPNOC also assumed that environmental impacts of a nuclear facility at the site would be smaller than those from a coal-fired facility, and would therefore be a more attractive alternative to a third coal-fired plant.

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The availability of infrastructure makes Limestone a reasonable alternative for comparison to the proposed site of STP Units 3 & 4. Existing rail lines and transmission rights of way will ease the impacts of developing new transmission lines and rail corridors for transporting construction and operation supplies.

The mineral rights at the Freestone County portion of the site are owned by private entities, who actually lease the rights to extract minerals from the site's owners. As noted in RAI Response 9.3-1, mineral rights are "severed" from surface rights by the surface owner, and can be sold as a separate property right. Here, NRG Energy, Inc. owns the surface rights to the Limestone alternative site portion in Freestone County. However, it is difficult to know the exact names of the Lessees without burdensome research of records available only at the Freestone County offices in Fairfield, Texas. The Texas Railroad Commission, or the Railroad Commission of Texas (known as the RRC, available at http://www.rrc.state.tx.us/), has begun a project to digitize these records for online review, but the project has not yet developed the records for Freestone County (see "Oil and Gas Well Records," available at http://www.rrc.state.tx.us/data/online/oilgasrecords.php). STPNOC assumed that it would purchase the mineral rights. It further assumed that the leases were operated by traditional oil and gas exploration companies, and that the workforce of these companies would be transferred to well sites nearby or seek work in the nuclear plant construction workforce.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 09.03-04

Question Number: 09.03-04

QUESTION:

Explain how the Malakoff alternative site satisfies NRC's siting guidance for potential and/or candidate sites as set out in Regulatory Guides 4.2 and 4.7 and the July 2007 version (Draft Rev. 1) of ESRP 9.3. Provide information regarding the expected impacts (including impacts on current water users) if STPNOC were to withdraw water from a STPNOC-specified water body to provide wet cooling for two new ABWR units at the Malakoff site. Provide information regarding the expected impacts (including impacts on current holders of mineral rights) if STPNOC were to acquire the mineral rights for the Malakoff site.

Full Text (Supporting Information):

The staff requests additional information on practical, specific water sources that could support wet cooling for new ABWR units located at the Malakoff site. Identify a specific water source(s) so that the staff can conduct a comparative impact analysis in the EIS. The staff was not able to identify any such water sources during their visit to the Malakoff site in March 2008. To complete its EIS, the staff needs information on the expected impacts on existing and potential future competing water users if water from a STPNOC-specified water body were to be used to provide wet cooling for two new ABWR units located at the Malakoff site. Similarly, the staff needs information on the expected impacts on existing mineral rights holders if STPNOC were to acquire the mineral rights at the Malakoff site.

RESPONSE:

Although access to water at the Malakoff site may be more challenging because it will require the development of the necessary water delivery infrastructure from farther locations and involve compliance with administrative requirements, ample water supplies nevertheless are available within the greater area of the Malakoff site. Sources include both groundwater and surface water, which may be used individually or in combination to meet STPNOC's projected water demands. Often, a project of this magnitude will utilize a combination of water sources to meet anticipated demands, including groundwater, surface water and effluent.

In Texas, water rights depend on whether the water is groundwater or surface water. Groundwater is governed by the rule of capture, which grants landowners the right to capture the water beneath their property. Landowners have a right to pump and capture whatever water is available, regardless of the effects of that pumping on neighboring wells. The issue is not whether there is a right to capture groundwater at the proposed Malakoff site, but whether the groundwater supply is physically available and in sufficient quantity to meet the STPNOC demands.

Across the entire Carrizo-Wilcox Aquifer, the predicted availability of groundwater for year 2010 is about one million acre-feet per year, compared to a reported water use of 450,000 acre-feet per year (Reference 9.3-2). The amount currently available from the Carrizo-Wilcox

Aquifer to the regional water planning areas encompassing the Malakoff site is approximately 172,000 acre-feet per year (East Texas Region 2006 Regional Water Plan; Region C 2006 Regional Water Plan).

Unlike groundwater, in Texas the use of surface water requires a water right permit. Water rights are granted on a "first come - first served" basis. This is known as the "prior appropriation doctrine." Prior appropriation is not related to land ownership; instead water rights are acquired by compliance with statutory requirements of beneficial use. In the unlikely event that there is insufficient groundwater to meet STPNOC's pumping demands, unappropriated surface water rights may be acquired through permit or surface water rights may be acquired on the open market. STPNOC may acquire surface water rights from willing sellers, including municipal service, industrial uses or agricultural water rights. Surface water rights may be acquired and transferred to new uses and new locations, subject to state permit and a hearing showing no injury to junior users on the surface water system. Permitted rights and transferred rights require public notice and hearing, and consideration of no injury to other water users on the surface stream (Tex. Water Code Ann. Section 11.134). "Injury" to other users could be an issue in locations where the surface water supply is over-appropriated. In such cases, the movement of water from one location to another could impact downstream users and the permitting system is designed to ensure that there is "no injury" to other water users. However, as noted below, there appears to be sufficient unappropriated or unused surface water rights in the Richland Chambers and Cedar Creek reservoirs that STPNOC assumes may be obtained by contract or permit. Because the water resources in Richland Chambers and Cedar Creek reservoirs are not over-appropriated, the use of acquired surface water for the STPNOC project is unlikely to cause injury to other users.

Specific sites include the Richland Chambers Reservoir, which is owned and operated by Tarrant Regional Water District (TRWD), which has a firm yield of approximately 210,000 acre-feet per year. This yield is projected to decline from 188,000 acre-feet per year in 2010 to 153,000 acre-feet per year in 2060 due to sedimentation in the reservoir (Region C 2006 Regional Water Plan). The TRWD currently has water supply contracts with several municipal users, permitting the use of 15,683 acre feet per year (Texas Water Rights Database, available at **http://www.tceq.state.tx.us/permitting/water_supply/water_rights/wr_databases.html**). The TRWD also has a water supply contract with one industrial user, although the Texas Water Rights Database does not specify the amount permitted for industrial use. No other users are reported in the Texas Water Rights Database (Texas Water Rights Database). The Richland Chambers Reservoir is approximately 13 miles from the Malakoff site.

Cedar Creek Reservoir, also operated by the TRWD, has permitted conservation storage of 678,900 acre-feet and is estimated to have a firm yield of about 175,000 acre-feet per year reduced to 139,000 acre-feet per year in 2060 due to sedimentation (Region C 2006 Regional Water Plan). The uses permitted by water supply contracts with the TRWD are municipal (8,265 acre feet per year), industrial (13,164 acre feet per year) and irrigation (30 acre feet per year) and total 21,459 acre feet per year (Texas Water Rights Database). The Cedar Creek Reservoir is approximately five miles from the Malakoff site.

Additionally, other surface water supplies are available. For example, Lake Palestine, owned by the Upper Neches River Authority and the Trinity River Authority, have obtainable water and water potentially available under water supply contracts to support the STPNOC operational demands. The Lake Palestine system has a firm yield of 220,933 acre-feet per year reduced to 214,600 acre-feet per year in 2060 due to sedimentation in the reservoir (East Texas Region 2006 Regional Water Plan). The primary users of the water from Lake Palestine are the City of Tyler and the City of Palestine, which together have a permitted amount of 70,000 acre feet per year. Additionally, the City of Dallas currently holds rights to a permitted amount of over 100,000 acre feet per year, for both municipal and industrial uses (Texas Water Rights Database). The City of Dallas has not yet developed the facilities to deliver Lake Palestine water to Dallas, but intends to do so in the future (Region C 2006 Regional Water Plan). The Lake Palestine system is approximately 30 miles from the Malakoff site.

Although much of the supply in these reservoir systems has been allocated to existing users, firm unappropriated supplies remain and are available to meet STPNOC's water demands. It is possible that STPNOC could obtain sufficient water from a combination of surface water sources, or surface water and groundwater sources, without displacing any other water users. Moreover, surface water rights may be acquired from willing sellers from within the reservoir system and transferred for use at the Malakoff site. The marketability of surface water rights generally results in positive socioeconomic benefits. The willing seller obtains significant monetary value for a commodity, while the buyer's use of the transferred right is subject to a "no injury" finding by the TCEQ on existing users who must be made whole by the proposed transfer (Tex. Water Code Ann. Section 11.134). If STPNOC needed to acquire surface water rights from existing users, such a transfer would be an exchange of a water right on the open market. STPNOC assumed that the seller would have planned appropriately for the voluntary loss of the water right and associated economic impacts, therefore minimizing long-term cumulative socioeconomic impacts. Moreover, the marketing of surface water rights can be an environmentally positive action because the net result is fewer new demands on the water system.

Despite the transactional nature of the transfer, it is possible that other users or interested parties could be adversely affected. There are two potential adverse effects: loss of jobs from businesses that sell their water rights, and loss of municipal water rights if sold by a municipality for STPNOC use. However, it is unlikely that municipal users would lose the right to use water set aside for a municipality, since Texas law limits the transfer of municipal water use to industrial water use. Further, the loss of jobs from possible business closure (for example small construction or other industries that have water rights), could likely be mitigated by the need for such skills during the construction of STP Units 3 & 4, if it were built at the Malakoff site. Thus, STPNOC assumed that there would be a sufficient amount of groundwater and surface water available to meet the demands of two ABWR nuclear units without causing injury to other users.

In Texas, the mineral estate is a separate interest in the land that can be severed from the surface estate. Whether the surface and mineral estates are severed or united, the rule in Texas is the same – the mineral estate dominates. The owner of the mineral estate has the right to freely use the surface estate to the extent reasonably necessary for the exploration, development and

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production of minerals under the property. The best method of controlling mineral development by a surface owner is the purchase of the mineral estate.

STPNOC believes that the surface and mineral rights at Malakoff are owned by the same entity (Texas Genco, Inc.) and have not been leased to third parties. There is currently no oil or exploration occurring at the Malakoff site. Since there is no exploration occurring at the Malakoff site, there would be no socioeconomic impact from purchasing the mineral rights.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03-09

QUESTION:

Clarify process used to select candidate sites.

Full Text (Supporting Information):

The staff requests clarification of the process used by STPNOC to screen potential sites to candidate sites. Specifically, and in light of RAIs 9.3-1 and 9.3-4, identify how water availability and mineral rights were factored into the identification of the Limestone site and the Malakoff site as candidate sites.

RESPONSE:

Both water availability and accessibility of mineral rights were assessed in selecting the three alternatives. Initially STPNOC noted that Texas water law as well as the law of subsurface rights to minerals and other resources permitted the purchase of these rights, independent of the real property right. STPNOC concluded that these issues were economic and cost related, and assumed – for the purposes of the environmental analysis – that the cost of acquisition would be evaluated only if one of these alternatives was found to be environmentally preferable to the proposed STP Units 3 and 4 site.

STPNOC did not consider the western portion of ERCOT a reasonable candidate area because of the region's water constraints. Southern portions of the South ERCOT region were also eliminated from evaluation because water availability was limited. Mineral rights will likewise limit access to a property, but STPNOC assumed that these rights could be acquired with minimal economic or environmental impact.

Water and mineral rights, therefore, play an important role in the selection of the three alternative sites. The lack of water features onsite is not an exclusionary criterion for deselecting a site. Rather, in Texas, the water right must be developed and sometimes acquired by permit or on the open market. The existence of mineral exploration does not exclude a site, either. The acquisition of a subsurface mineral right is similar to access to the site itself, and availability of access to the site and existing subsurface rights is an important avoidance and suitability criteria. The availability of these rights on the open market weighed heavily in the analysis to determine the suitability of the site. At Malakoff and Limestone, existing access to the surface rights and some control over the mineral rights made them among the best reasonable sites in the Candidate Area. Thus, access to the site and the likelihood that any mineral leases could be bought back by the surface owner weighed heavily in the consideration.

The ER Table 9.3-4 shows the potential sites, narrowed down from the wide array of possible sites for a plant in Texas (*see* Tables 9.3-1 and 9.3-2). In the early part of the selection process, STPNOC focused on the exclusionary criteria of proximity to hazardous activities, such as co-generation associated with a natural gas-fired generation facility, or a stand-alone natural gas-

fired generation facility. STPNOC continued its narrowing process by reviewing avoidance and suitability criteria on sites that survived the second cut. These "potential" sites are reviewed in Table 9.3-4. STPNOC, while not specifically referring to the EPRI site selection guidance, was influenced by its three layers of categories:

Exclusionary Criteria: Exclusionary criteria included nearby hazardous land uses such as natural gas-fired generation and other uses that created an unacceptable health and safety hazard. In addition, sites near high population areas were excluded from further review. Sites in areas that are preserved as state or national parks were also excluded from consideration.

Avoidance Criteria: Avoidance criteria allowed STPNOC to identify sites with more favorable than unfavorable conditions, such as sites away from densely populated areas with sufficient land and water for the location and operation of a nuclear plant. These criteria included availability of cooling water, access to transmission corridors, availability of suitable land for Units 3 and 4, and preemption of established recreational uses.

Suitability Criteria: Sites that met requirements affecting the relative environmental suitability of a site were carried forward to a more detailed review, as described in Section 9.3.5. Suitability criteria included access considerations (including surface and subsurface access), availability of sufficient water resources, occurrence of important habitat or species, and other environmental issues included in the candidate site criteria found in NUREG 1555.

Sites that failed the exclusionary criteria were not carried forward. Sites that were assessed for avoidance criteria were weighted more heavily than those sites meeting the suitability criteria. A number of the potential sites were carried forward as candidate sites because they met the avoidance and suitability criteria noted above. Table 9.3-4 will be revised to clarify the site selection criteria that weighed for and against the selection of the candidate sites from the list of potential sites.

STPNOC concluded that the environmental impacts of acquiring water at the two sites would be minimized. Water is available at both sites:

- At Limestone, Lake Limestone and groundwater sources are about 5 miles away from the proposed site, minimizing the environmental impacts of a long pipeline corridor to carry surface water. Lake Limestone has sufficient firm supplies to support operation of Units 3 and 4, with any additional water to be made up from groundwater resources as noted in STPNOC'S response to RAI 9.3-1. Lake Limestone is approximately 5 miles from the Limestone alternative site.

- At Malakoff, Cedar Creek Reservoir could support operation of Units 3 and 4. Cedar Creek Reservoir is owned by the Tarrant Regional Water District (TRWD), and is approximately five miles from the Malakoff site. Richland Chambers Reservoir, also owned and operated by TRWD. If necessary, surface water is also available at Lake Palestine in the eastern portion of Henderson County (STPNOC did not heavily weight the option of obtaining water from that source, since the environmental impacts of the 30-mile pipeline outweighed the benefits of the pipeline). As noted in STPNOC'S response

to RAI 9.3-4, the surface and ground water supply immediately adjacent to the Malakoff site provided sufficient water for operation of the units if they were built at that site.

STPNOC considered water availability at the other candidate sites (*see* Table 9.3-5, Consumptive Use of Water), and assumed that surface water supplies there would be more difficult to obtain, given that the existing facilities there were fully utilizing the available sources of surface and ground water. Other suitability and avoidance criteria not associated with water or mineral rights also weighed more heavily in relation to the other candidate sites. In particular, accessibility to the Limestone and Malakoff sites outweighed the water availability issues, as did their proximity to larger population centers. Further, avoidance criteria such as adequacy of transmission, proximity to recreation and agricultural uses and natural areas also weighed heavily against using the other candidate sites.

CANDIDATE COLA REVISION:

An updated ER Table 9.3-4 is attached.

Question 09.03-09

Table 9.3-4 EXISTING GENERATION SITES IN CANDIDATE AREA - Potential Site Analysis

UTILITY ID	UTILITY NAME	PLANT NAME	COUNTY LOCATION	FUEL	TRANSPORT	SITE SELECTION CRITERIA	COMMENTS
33106	Pasadena Paper Co LP	Pasadena Paper	Harris	BLQ		E	Near population centers - within Houston metropolitan area
252	Alcoa Inc	Sandow Station	Milam	LIG	CV	A, S	Meets size, transmission, and suitability criteria
54891	Altura Power	Twin Oaks Power One	Robertson	LIG	TK	A, S	Meets size, transmission, and suitability criteria
54888	NRG Texas LLC	Limestone	Limestone	LIG	CV	A, S	Meets size, transmission, and suitability criteria
16624	San Miguel Electric Coop Inc	San Miguel	Atascosa	LIG	TK	A, S	Meets size, transmission, and suitability criteria
19323	TXU Generation Co LP	Big Brown	Freestone	LIG	TK	A, S	Meets size, transmission, and suitability criteria
19323	TXU Generation Co LP	Sandow No. 4	Milam	LIG	TK	A, S	Meets size, transmission, and suitability criteria
19323	TXU Generation Co LP	Comanche Peak	Somervell	NUC	TK	E	No additional land or cooling water available. TXU has announced plans to build two new units; site at capacity
6831	Ft Worth City of	Village Creek Wastewater Treatment	Tarrant	OBG	PL	E	Near population centers - within Dallas/Fort Worth metropolitan area
2172	Brazos Electric Power Coop Inc	Johnson County	Johnson	OG		E	Near population centers - within Dallas/Fort Worth metropolitan area
15927	Rhodia Inc	Rhodia Houston Plant	Harris	OTH	WA	E	Near population centers - within Houston metropolitan area
17139	Shell Oil Co-Deer Park	Shell Deer Park	Harris	PUR	UN	E	Near population centers - within Houston metropolitan area

Table 9.3-4 EXISTING GENERATION SITES IN CANDIDATE AREA - Potential Site Analysis

UTILITY ID	UTILITY NAME	PLANT NAME	COUNTY LOCATION	FUEL	TRANSPORT	SITE SELECTION CRITERIA	COMMENTS
54865	ANP-Coleto Creek	Coleto Creek	Goliad	SUB	RR	A, S	Meets size, transmission, and suitability criteria
11289	Lower Colorado River Authority	Fayette Power Project	Fayette	SUB	RR	A, S	Meets size, transmission, and suitability criteria
16604	San Antonia Public Service Bd	J T Deely	Bexar	SUB	RR	E, A	Near population centers - within San Antonio metropolitan area
16604	San Antonio Public Service Bd	J K Spruce	Bexar	SUB	RR	E, A	Near population centers - within San Antonio metropolitan area
18715	Texas Municipal Power Agency	Gibbons Creek	Grimes	SUB	RR	A, S	Meets size, transmission, and suitability criteria
19323	TXU Generation Co LP	Monticello	Titus	SUB	RR	A, S	Meets size, transmission, and suitability criteria
7751	Guadalupe Blanco River Authority	Abbott TP 3	Guadalupe	SUN		E, A	Near population centers - within 5 miles of Seguin (pop 22,000) and 35 miles of San Antonio
2176	Brazos River Authority	Morris Sheppard	Palo Pinto	WAT		E, A	Far from appropriate transmission infrastructure (e.g., substations); lake adjacent to State Park; plant could adversely affect aesthetic and recreational resources
5063	Denton City of	Ray Roberts	Denton	WAT		E	50 miles from Dallas; pop density in county = 487/mi sq
6958	Garland City of	Lewisville	Denton	WAT		E, A	Near population centers - within Dallas/Fort Worth metropolitan area
7370	Gonzales City of	Gonzales Hydro Plant	Gonzales	WAT		E	Far from appropriate transmission infrastructure (e.g.,

Table 9.3-4 EXISTING GENERATION SITES IN CANDIDATE AREA - Potential Site Analysis

UTILITY ID	UTILITY NAME	PLANT NAME	COUNTY LOCATION	FUEL	TRANSPORT	SITE SELECTION CRITERIA	COMMENTS
							substations)
7751	Guadalupe Blanco River Authority	Canyon	Comal	WAT		E, A	Near population centers - San Antonio (40 miles); less than 20 miles from New Braunfels (pop > 35,000) and San Marcos (pop>40,000). Major regional recreational destination -high transient population.
7751	Guadalupe Blanco River Authority	Dunlap TP 1	Guadalupe	WAT		E	Near population centers - less than 10 miles from New Braunfels (pop > 35,000); 40 miles from San Antonio
7751	Guadalupe Blanco River Authority	H 4	Gonzales	WAT		E	Far from appropriate transmission infrastructure (e.g., substations)
7751	Guadalupe Blanco River Authority	H 5	Gonzales	WAT		E	Far from appropriate transmission infrastructure (e.g., substations)
7751	Guadalupe Blanco River Authority	Nolte	Guadalupe	WAT		E, A	Near population centers - within 5 miles of Seguin (pop 22,000); 40 miles from San Antonio
7751	Guadalupe Blanco River Authority	TP 4	Guadalupe	WAT		E, A	Near population centers - less than 25 miles from San Marcos (pop> 40,000); 40 miles from San Antonio
11269	Lower Colorado River Authority	Austin	Travis	WAT		E	Near population centers - within Austin metropolitan area

Question 09.03-09

Table 9.3-4 EXISTING GENERATION SITES IN CANDIDATE AREA - Potential Site Analysis

UTILITY ID	UTILITY NAME	PLANT NAME	COUNTY LOCATION	FUEL	TRANSPORT	SITE SELECTION CRITERIA	COMMENTS
11269	Lower Colorado River Authority	Buchanan	Burnet	WAT		A, S	Meets size, transmission, and suitability criteria
11269	Lower Colorado River Authority	Granite Shoals	Burnet	WAT		E, A	Plant could adversely affect developed residential, commercial and recreational land uses at Lake LBJ (Granite Shoals, TX on banks of lake); vicinity of Marble Falls, TX and Lake Marble Falls; population density in immediate area > 800/mi sq
11269	Lower Colorado River Authority	Inks	Burnet	WAT		E, A	Plant could adversely affect aesthetic and recreational resources in vicinity; State Park on banks of lake; Inks Dam National Fish Hatchery located at lake
11269	Lower Colorado River Authority	Marble Falls	Burnet	WAT		E, A	Plant could adversely affect developed residential, commercial and recreational land uses at Lake Marble Falls (Marble Falls, TX on banks of lake); vicinity of Granite Shoals, TX and Lake LBJ; population density in immediate area > 800/mi sq
11629	Lower Colorado River Authority	Marshall Ford	Travis	WAT		E	Near population centers - within Austin metropolitan area
54682	Maverick Cnty Wtr Control & Imp. Dst No 1	Eagle Pass	Maverick	WAT		E	Far from appropriate transmission infrastructure (e.g., substations)

Table 9.3-4 EXISTING GENERATION SITES IN CANDIDATE AREA - Potential Site Analysis

UTILITY ID	UTILITY NAME	PLANT NAME	COUNTY LOCATION	FUEL	TRANSPORT	SITE SELECTION CRITERIA	COMMENTS
17345	Small Hydro of Texas Inc	Small Hydro of Texas	De Witt	WAT		E	Far from appropriate transmission infrastructure (e.g., substations)
19449	USCE-Forth Worth District	Whitney	Bosque	WAT		E	45 miles from outskirts of Dallas/Ft. Worth Metropolitan area; plant could adversely affect aesthetic and recreational resources at site; State Park on banks of lake
27470	USCE-Tulsa District	Denison	Grayson	WAT		E	Far from appropriate transmission infrastructure (e.g., substations)
54759	Mesquite Wind Power LLC	Lone Star Wind Farm	Shackelford	WIND		A, S	Meets size, transmission, and suitability criteria

E: Exclusionary criteria included nearby hazardous land uses such as natural gas-fired generation and other uses that created an unacceptable health and safety hazard. In addition, sites near high population areas were excluded from further review. Sites in areas that are preserved as state or national parks were also excluded from consideration.

A: Avoidance criteria allows STPNOC to identify sites with more favorable than unfavorable conditions, such as sites away from densely populated areas with sufficient land and water for the location and operation of a nuclear plant. These criteria included availability of cooling water, access to transmission corridors, availability of suitable land for Units 3 and 4, and preemption of established recreational uses. Additionally, sites that exhibited more unfavorable avoidance criteria (where the existence of the criteria could not be mitigated) were excluded from further consideration.

S: Sites that met requirements affecting the relative environmental suitability of a site were carried forward to a more detailed review, as described in Section 9.3.5. Suitability criteria included access considerations (including surface and subsurface access), availability of sufficient water resources, occurrence of important habitat or species, and other environmental issues included in the candidate site criteria found in NUREG 1555

Question 10.05S-02

Question Number: 10.05S-02

QUESTION:

Describe the analytical process used to determine cumulative impacts to downstream surface water users.

Full Text (Supporting Information):

Operation of Units 3 and 4 will result in greater water withdrawal from the Colorado River than that currently used for Units 1 and 2 alone. Provide an estimate of the additional water required for the operation of Units 3 and 4 over and above that needed for the operation of Units 1 and 2. Also provide an estimate of the frequency of a discharge 300 cfs or smaller in the Colorado River downstream of the RMPF with all four units in operation.

RESPONSE:

STP Units 3 & 4 would require an average pumping rate of 22,692 gpm (50.603 cfs) under normal operating condition from the Colorado River to the MCR. Maximum operating conditions would require an average pumping rate of 24,867 gpm (55.453 cfs) from the river to the MCR.

Based on the NRC clarification of this RAI during the October 30, 2008 hydrology teleconference, it is STPNOC's understanding that NRC's question concerns the number of times (days) flow of the Colorado river has been 300 cfs or less and how many times the Operation of STP Units 1 & 2 contributed to that flow condition. NRC also wants to know how often the operations of four units would create flow in the river of 300 cfs or less.

Historic USGS data from May 1948 through 2005 (21,064 days) (USGS 2008) indicate there have been 2702 days when flow of the Colorado River as measured at the USGS station at Bay City has been 300 cfs or less. This represents approximately 13% of the daily flow data over the period of interest. Assuming similar weather patterns in the future, a similar percentage of daily flows 300 cfs or less could be expected to occur. The period from 1948 through 2005 includes the 10-year Texas historical drought of record (ER Subsection 2.3.1.1.1).

STPNOC's contract with the Lower Colorado River Authority (LCRA) and the water rights Certificate of Adjudication No. 14-5437 limits the amount of water STPNOC can pump from Segment 1401 (Tidal segment) of the Colorado River to 55% of the flow in excess of the 300 cfs, up to a maximum of 1200 cfs. ER Table 2.3.2-9 shows daily river flow data and STP daily surface water pumping rates from 2000 through 2006.

Based upon STPNOC's surface water contract with the LCRA and the water rights Certificate of Adjudication, STPNOC cannot reduce the flow in the river to 300 cfs or less. Therefore, operation of Units 1 & 2 has not caused the daily flow of the Colorado River to be 300 cfs or less and 4-unit operations will not reduce the flow to 300 cfs or less.

Question 10.05S-02

More information associated with the operation of the MCR and the flow of the Colorado River is included in the response to RAI 2.3-6.

REFERENCE:

USGS (U.S. Geological Survey) 2008, Colorado River Discharge Data for May 1, 1948 through 2005, for USGS Station 08162500 near Bay City, Texas, USGS Surface-Water Daily Data for the Nation, Available at http://waterdata.usgs.gov/nwis/div?, accessed October 24, 2008.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 10.05S-03

Question Number: 10.05S-03

QUESTION:

How much land would be disturbed at the STP site in conjunction with construction of the proposed units?

Full Text (Supporting Information):

There are several figures in the ER and RAI responses for the amount of land that would be disturbed in conjunction with construction of Units 3 and 4 at the STP site. Attachment 21 of STPNOC's 8/14/08 RAI response indicates 540 acres. Table 4.1-1 of Rev. 2 of the ER indicates 768 acres. Section 4.3.1.1 of Rev. 2 of the ER indicates 244 acres. Section 10.2.1.1 of Rev. 2 of the ER indicates 770 acres. The staff requests that STPNOC reconcile these numbers.

RESPONSE:

The 540 acres estimate provided in Attachment 21 of STPNOC's 8/14/08 RAI response is bounding based on current construction planning. The 768 acres estimate was calculated earlier in the planning effort, using the estimated acres impacted from each of nine areas (Power Block, Concrete Batch Plant, Switchyard, Laydown Areas, Construction Parking Areas, Cooling Tower Area, Connector Transmission Lines (on site), Heavy Haul Road, Borrow and Spoil Areas). The 244 acre estimate came from the *"Ecological Survey Report-Habitat Assessment,"* Unit 3 and 4 Licensing Project, ENSR Corporation, June 2008, which used the best available information at the time. The 770 acre estimate discussed in Rev. 2 of the ER is basically a "round-up" of 768 acres.

As the project is performing more detailed design work and getting closer to the actual construction work, the initial estimates are being refined. Impacted area estimates will continue to be refined prior to construction.

CANDIDATE COLA REVISION:

The following sections of the ER will be updated in COLA Revision 3, to be consistent with the 540 acres bounding estimate:

- 3.9S.3.7
- 4.1.1.1
- 4.1.1.3
- Table 4.1-1
- 4.4.2.2.5
- 9.2.2.6.1
- 9.2.4.2
- 9.3.3.3.1
- 10.2.1.1
- 10.2.1.3
- 10.5S.1.1
- Table 10.4-4

Question 10.05S-03

Section 3.9S.3.7

The sentence in Subsection 3.9S.3.7 that states "Temporary spoils, borrow, and topsoil areas will be established on the southwest parts of the STP site property (Figure 3.9S-1)" will be changed to "Temporary spoils, borrow, and topsoil areas will be established on the northwest parts of the STP site property (Figure 3.9S-1)."

Page 4.1-3, third full paragraph, first sentence:

Of the approximately ~~12,200~~ 12,220 acres located within the site boundary (fenceline), approximately ~~770~~ 540 acres would be disturbed for long-term or short-term construction activities associated with construction of STP 3 & 4 and their supporting facilities.

Page 4.1-3, last paragraph, first sentence:

Approximately ~~90~~ 300 acres of the approximately ~~770~~ 540 acres disturbed during site preparation and construction would be dedicated permanently to the new units and their supporting facilities (power block, cooling tower, switchyard) (see Figure 3.9S1).

Page 4.1-3, first full paragraph, last sentence:

To mitigate impacts, STPNOC would maintain communication with local and regional governmental and nongovernmental organizations (e.g., LCRA, ~~FEMA~~, etc.) to verify that construction activities comply with ~~the CMP~~ applicable laws and regulations.

Page 4.1-3, last paragraph, last sentence:

Since the expected impact at STP encompasses only ~~770~~ 540 acres of land the impact is expected to be minor.

Section 4.1.1.3, second paragraph, second sentence:

A total of approximately ~~770~~ 540 acres would be required for construction facilities including permanent facility structures and laydown.

Question 10.05S-03

Table 4.1-1

Table 4.1-1 in the ER will be replaced with the following table.

Table 4.1-1 South Texas Project Construction Area Acreage		
	Construction Area	**Acreage**
Permanently Impacted Areas	STP 3 & 4 Power Block	
	Switchyard	
	Cooling Tower Area	
	Cooling Water Intake System	
		300 acres
Temporarily Impacted Areas	Concrete Batch Plant, Material Storage	
	Construction Laydown/Facilities Area	
	Construction Parking Area	
	Heavy Haul Road	
	Borrow and Spoil Areas	
		240 acres
Totals Acreage		540 acres

Section 4.4.2.5, first paragraph, first sentence:

As part of construction, a total of ~~770~~ 540 acres would be cleared for the construction of STP 3 & 4 (Figure 3.9S-1).

Page 9.2-19, first paragraph, fourth sentence:

As discussed in Subsection 4.1.1, construction of the proposed project would disturb about ~~770~~ 540 acres of which about ~~90~~ 300 acres of these lost permanently due to construction of new facilities and a new heavy haul road.

Page 9.3-8, first sentence:

... approximately ~~770~~ 540 acres, with ~~90~~ 300 acres permanently dedicated to new units and their supporting facilities).

Section 9.3.3.3.1, second paragraph, first sentence:

Construction of the 2,700 MWe two-unit nuclear facilities would require approximately ~~770~~ 540 acres of land for permanent structures and plant operations (Reference 9.3-9).

Question 10.05S-03

Section 10.2.1.1, first paragraph, first two sentences:

STP 3 & 4 will be constructed within the existing STP site on ~~770~~ 540 acres previously cleared during the construction of STP 1 & 2 and designated for industrial use. Approximately ~~90~~ 300 acres of the ~~770~~ 540 acres disturbed during site preparation and construction would be dedicated to STP 3 & 4 and its supporting facilities.

Section 10.2.1.3, second paragraph, first sentence:

Approximately ~~680~~ 240 acres of the ~~770~~ 540 acres of vegetation impacted will be restored to preconstruction conditions and will be available as habitat upon completion of construction.

Table 10.4-4, first row, middle column:

Adverse Impact – Based on STP 3& 4, approximately ~~770~~ 540 acres of land out of the 11,000 acre site would be disturbed during construction, with the potential for erosion.

Section 10.5S.1.1, first paragraph, second sentence:

Approximately ~~770~~ 540 acres of the existing STP property will be required for construction of STP 3 & 4.

Attachment 2

- Print versions of previously submitted materials supporting of RAI 02.04.01-03

Dimensions of Selected Stream and Wetland Features at the STP Site

	S001	S002	S017	S018	S020	S022
Measured water widths (ft.)	28.19	22.94	None	None	21.84	54.82
	17.75	20.75			12.26	69.37
	22.6	18.01			37.09	
	20.9	21.58			25.16	
	15.12	17.62			19.71	
	12.47	21.8			25.07	
	14.63	29.47			12.03	
	13.87	25.73			11.72	
	19.27	24.03			54.82	
	41.77	34.9			69.37	
	25.48	33.34				
	30.98	22.78				
		29.73				
		26.24				
Average water width (ft.)	21.92	24.92	None	None	28.91	62.10

	S001	S002	S017	S018	S020	S022
Measured length (ft.)	5,168	4,562	6,712	1,612	4,974	1,388

	S001	S002	S017	S018	S020	S022
Water area estimate (sq. ft.)	113,278	113,698			143,783	86,188
Water area estimate (acres)	2.6	2.61			3.3	1.98

Wetland Feature ID	Type	Latitude	Longitude	Acreage
W021	PEM	28.80570265	-96.05318466	0.88
W022	PEM/PSS	28.80595468	-96.05077686	0.11
W023	PEM/PSS	28.80480732	-96.04753644	1.36
W024	PEM	28.79790118	-96.04020811	5.21
W025	PEM	28.79932612	-96.03832647	0.09
W026	PEM/PSS	28.8049385	-96.04921984	1.47

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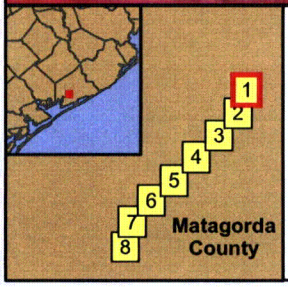

Stream S001
South Texas Project Units 3 & 4
Matagorda County, TX

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Water Flag
Top of Bank
Waterlines

0 25 50 100
Feet

Projection: Texas State Plane Central, NAD 1983, US Feet
Background: 2004 NAIP 1 M CIR Imagery

STPNOC

ENSR | AECOM

Date: September 10, 2008
Project No.: 10720-008
By: CJ Bowes

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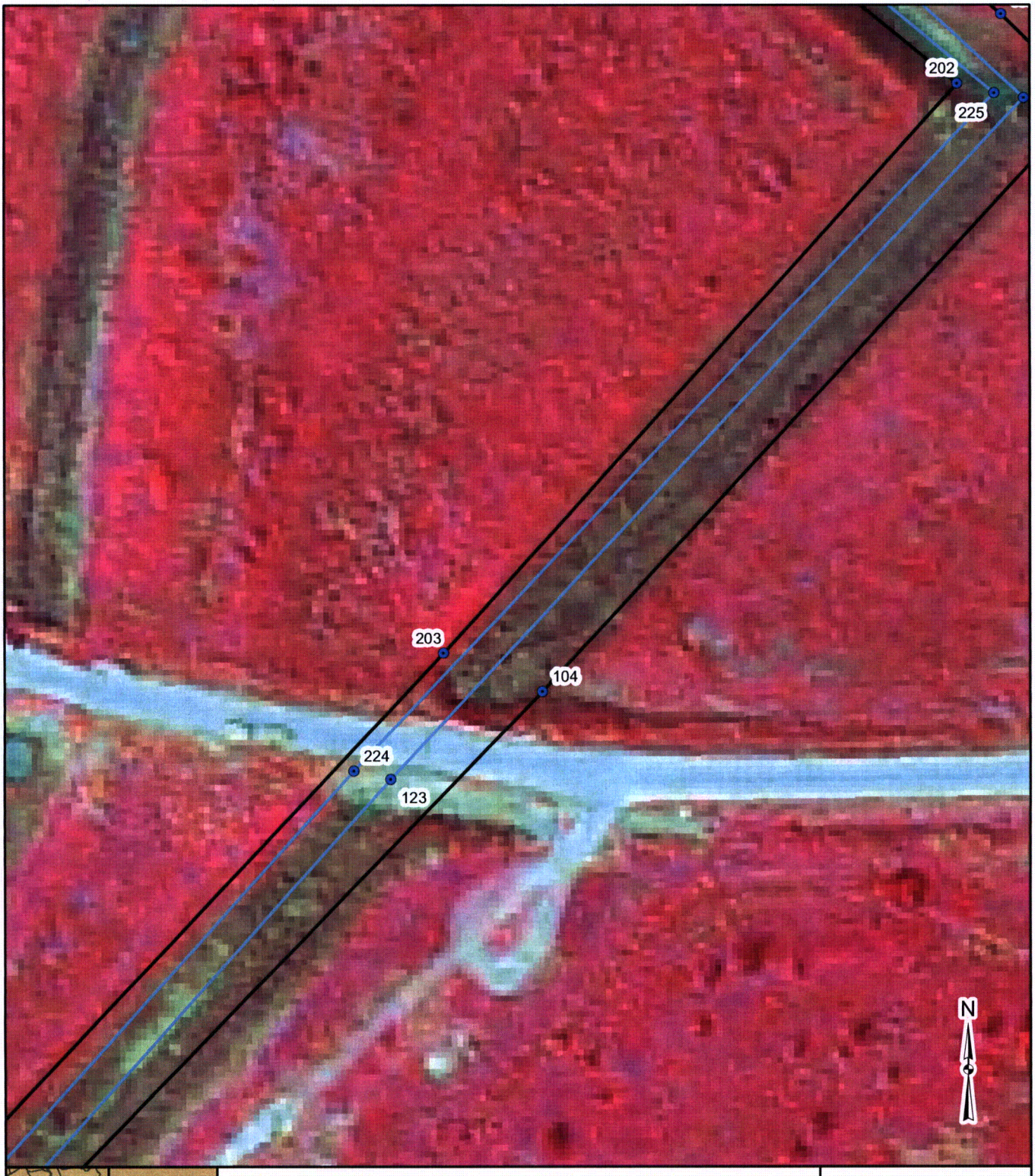

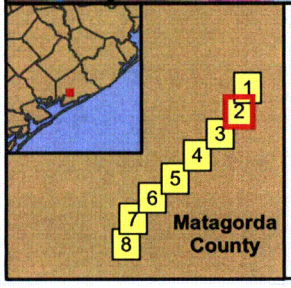

Stream S001
South Texas Project Units 3 & 4
Matagorda County, TX

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Water Flag
Top of Bank
Waterlines

0 25 50 100
Feet

Projection: Texas State Plane Central, NAD 1983, US Feet
Background: 2004 NAIP 1 M CIR Imagery

STPNOC

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Date: September 10, 2008
Project No.: 10720-008
By: CJ Bowes

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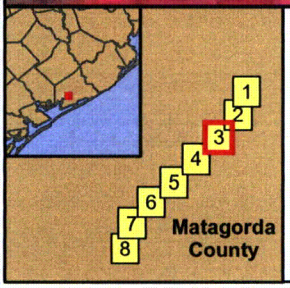

Stream S001
South Texas Project Units 3 & 4
Matagorda County, TX

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Water Flag
Top of Bank
Waterlines

0 25 50 100
Feet

Projection: Texas State Plane Central, NAD 1983, US Feet
Background: 2004 NAIP 1 M CIR Imagery

STPNOC

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Date: September 10, 2008
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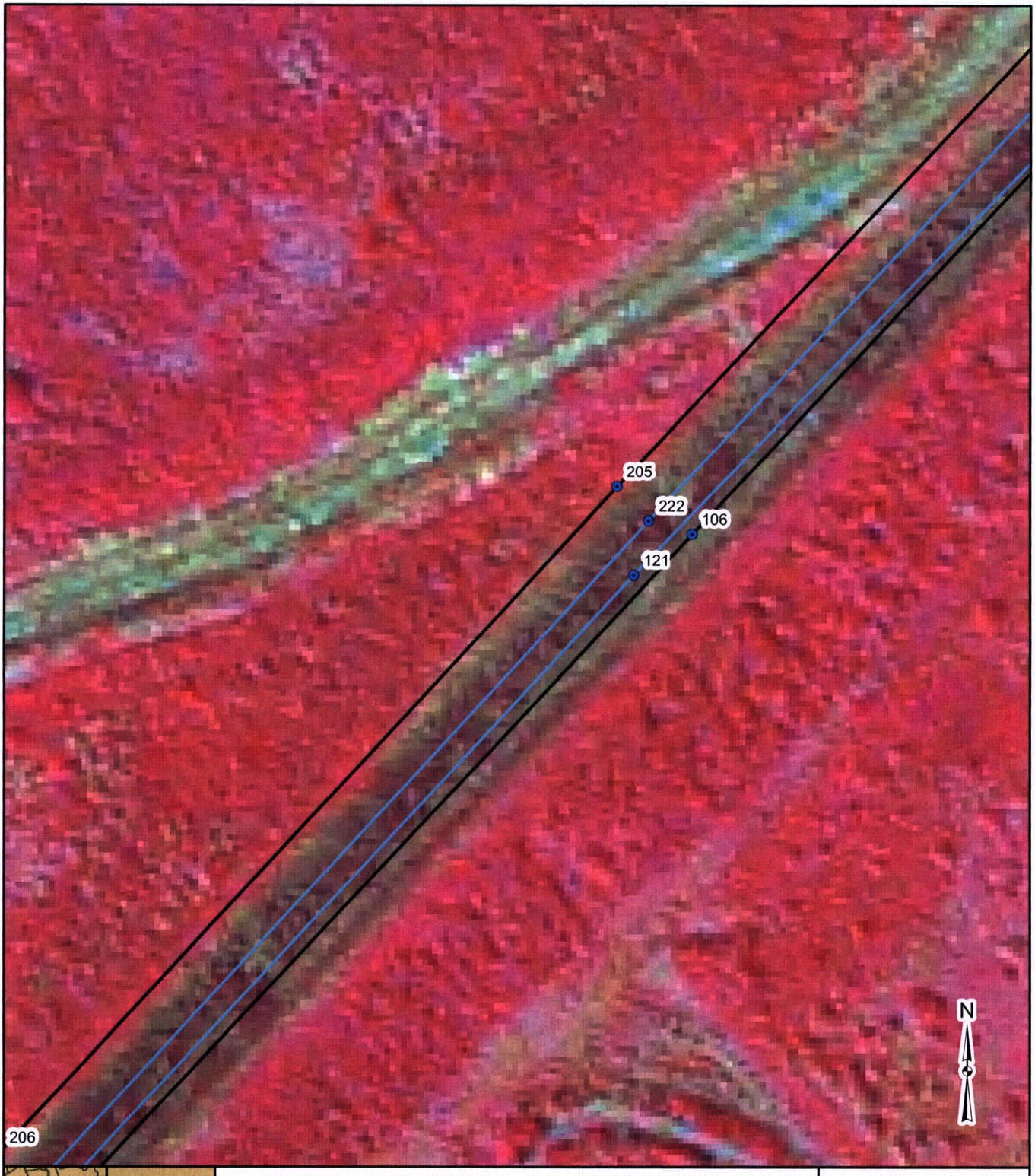

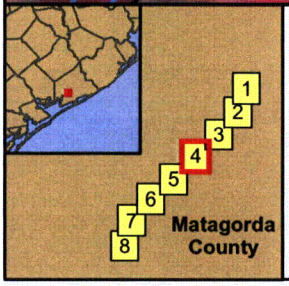

Stream S001
South Texas Project Units 3 & 4
Matagorda County, TX

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Water Flag
Top of Bank
Waterlines

0 25 50 100
Feet

Projection: Texas State Plane Central, NAD 1983, US Feet
Background: 2004 NAIP 1 M CIR Imagery

STPNOC

ENSR | AECOM

Date: September 10, 2008
Project No.: 10720-008
By: CJ Bowes

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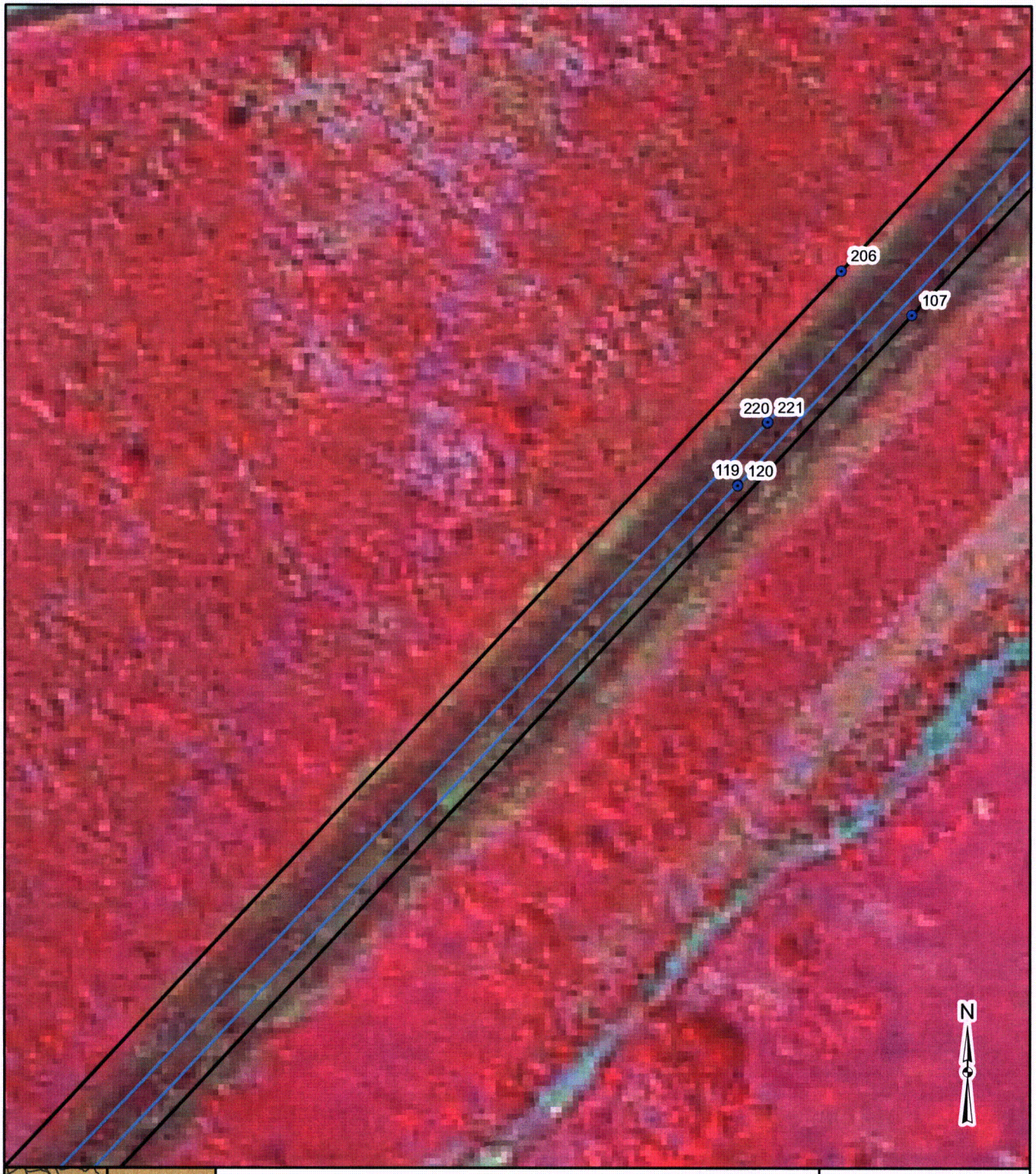

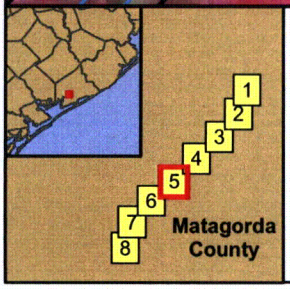

Stream S001
South Texas Project Units 3 & 4
Matagorda County, TX

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Water Flag
Top of Bank
Waterlines

0 25 50 100
Feet

Projection: Texas State Plane Central, NAD 1983, US Feet
Background: 2004 NAIP 1 M CIR Imagery

STPNOC

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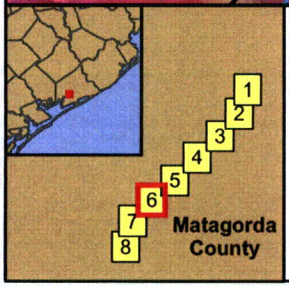

Stream S001
South Texas Project Units 3 & 4
Matagorda County, TX

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Water Flag
Top of Bank
Waterlines

0 25 50 100
Feet

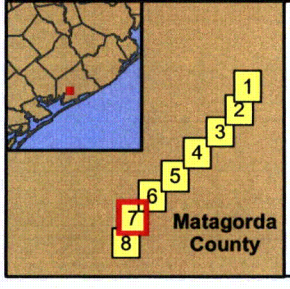
Projection: Texas State Plane Central, NAD 1983, US Feet
Background: 2004 NAIP 1 M CIR Imagery

STPNOC

ENSR | AECOM

Date: September 10, 2008
Project No.: 10720-008
By: CJ Bowes

Location: G:\Projects\NRG\10720_011_STPRiverAquaticStudies\Mapbooks\Streams\S001.mxd



Stream S001
South Texas Project Units 3 & 4
Matagorda County, TX

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Water Flag
Top of Bank
Waterlines

0 25 50 100
Feet

Projection: Texas State Plane Central, NAD 1983, US Feet
Background: 2004 NAIP 1 M CIR Imagery

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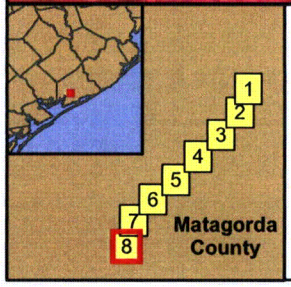
Location: G:\Projects\NRG\10720_011_STPRiverAquaticStudies\Mapbooks\Streams\S001.mxd



Stream S001
South Texas Project Units 3 & 4
Matagorda County, TX

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Water Flag
Top of Bank
Waterlines

0 25 50 100
Feet

Projection: Texas State Plane Central, NAD 1983, US Feet
Background: 2004 NAIP 1 M CIR Imagery

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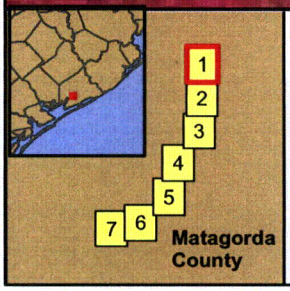
Date: September 10, 2008
Project No.: 10720-008
By: CJ Bowes

Location: G:\Projects\NRG\10720_011_STPRiverAquaticStudies\Mapbooks\Streams\S002.mxd



Stream S002
South Texas Project Units 3 & 4
Matagorda County, TX

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Water Flag
Top of Bank
Waterlines

0 25 50 100
Feet

Projection: Texas State Plane Central, NAD 1983, US Feet

Background: 2004 NAIP 1 M CIR Imagery

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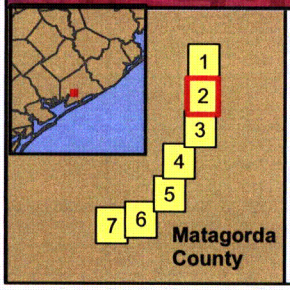
Date: September 10, 2008

Project No.: 10720-008

By: CJ Bowes

Location: G:\Projects\NRG\10720_011_STPRiverAquaticStudies\Mapbooks\Streams\S002.mxd



Stream S002
South Texas Project Units 3 & 4
Matagorda County, TX

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Water Flag
Top of Bank
Waterlines

0 25 50 100
Feet

Projection: Texas State Plane Central, NAD 1983, US Feet

Background: 2004 NAIP 1 M CIR Imagery

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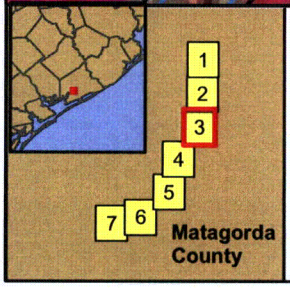

Stream S002
South Texas Project Units 3 & 4
Matagorda County, TX

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Water Flag
Top of Bank
Waterlines

0 25 50 100
Feet

Projection: Texas State Plane Central, NAD 1983, US Feet

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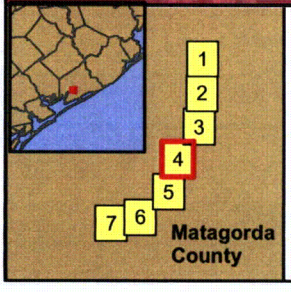

Stream S002
South Texas Project Units 3 & 4
Matagorda County, TX

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Water Flag
Top of Bank
Waterlines

0 25 50 100
Feet

Projection: Texas State Plane Central, NAD 1983, US Feet

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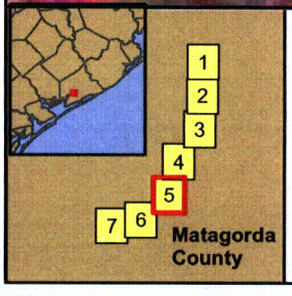

Stream S002
South Texas Project Units 3 & 4
Matagorda County, TX

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Water Flag
Top of Bank
Waterlines

0 25 50 100
Feet

Projection: Texas State Plane Central, NAD 1983, US Feet

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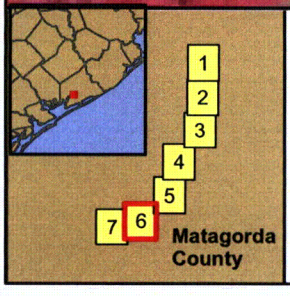

Stream S002
South Texas Project Units 3 & 4
Matagorda County, TX

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Water Flag
Top of Bank
Waterlines

0 25 50 100
Feet

Projection: Texas State Plane Central, NAD 1983, US Feet

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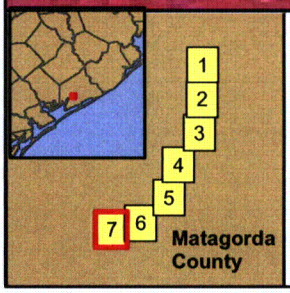

Stream S002
South Texas Project Units 3 & 4
Matagorda County, TX

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Water Flag
Top of Bank
Waterlines

0 25 50 100
Feet

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