



South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

November 20, 2008
U7-C-STP-NRC-080065

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 and Response Date Extensions

Attached are responses to NRC staff questions included in Request for Additional Information (RAI) letter numbers 59, 63, 64, and 66 related to Combined License Application (COLA) Part 2, Tier 2, Sections 2.2S.3, 2.3S.4, 2.3S.5, and 2.3S.3, respectively. Attachments 1 through 7 include responses to the following RAI questions:

02.02.03-4	02.03.03-5	02.03.04-4	02.03.05-6
02.02.03-6			02.03.05-7
02.02.03-7			

Attachment 8 to this letter identifies questions, included in RAI letter numbers 33-Revised and 41 related to COLA Part 2, Tier 2, Sections 2.4S.4 and 2.4S.14, which require extensions. This attachment includes the reasons for extensions and the date by which each response is expected to be submitted.

When a change to the COLA is indicated, the change will be incorporated into the next routine revision of the COLA following NRC acceptance of the RAI response.

There are no commitments in this letter.

If you have any questions regarding these responses or date extensions, please contact me at (361) 972-7136, or Bill Mookhoek at (361) 972-7274.

DOA
MRO

STI 32397103

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

Executed on 11/20/08



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

Attachments:

1. Response to Question 02.02.03-4
2. Response to Question 02.02.03-6
3. Response to Question 02.02.03-7
4. Response to Question 02.03.03-5
5. Response to Question 02.03.04-4
6. Response to Question 02.03.05-6
7. Response to Question 02.03.05-7
8. Response Date Extensions for RAI Questions

cc: w/o attachment except*
(paper copy)

Director, Office of New Reactors
U. S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

Regional Administrator, Region IV
U. S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 400
Arlington, Texas 76011-8064

Richard A. Ratliff
Bureau of Radiation Control
Texas Department of State Health Services
1100 West 49th Street
Austin, TX 78756-3189

C. M. Canady
City of Austin
Electric Utility Department
721 Barton Springs Road
Austin, TX 78704

*Steven P. Frantz, Esquire
A. H. Gutterman, Esquire
Morgan, Lewis & Bockius LLP
1111 Pennsylvania Ave. NW
Washington D.C. 20004

*George F. Wunder
*Tekia Govan
Two White Flint North
11545 Rockville Pike
Rockville, MD 20852

(electronic copy)

*George Wunder
*Tekia Govan
Loren R. Plisco
U. S. Nuclear Regulatory Commission

Steve Winn
Eddy Daniels
Joseph Kiwak
Jim von Suskil
NRG South Texas 3/4 LLC

Jon C. Wood, Esquire
Cox Smith Matthews

J. J. Nesrsta
R. K. Temple
Kevin Pollo
L. D. Blaylock
CPS Energy

RAI 02.02.03-4:**QUESTION:**

Provide information for which chemicals and parameters were used in the ALOHA model and the DEGADIS model. Please also provide inputs, assumptions, methodology and details used in the TOXDISP (Toxic Dispersion model, Revision 3) modeling.

RESPONSE:

The ALOHA and DEGADIS model parameters were provided in the response to RAI Question 02.02.03-2 submitted to NRC in STP letter ABR-AE-08000039, dated May 29, 2008. The inputs, assumptions, methodology and details regarding TOXDISP are discussed below.

TOXDISP was used in two different calculations. They are as follows:

- The spill of gasoline from a barge on the Colorado River.
- The spill of crude oil from a nearby Crude Oil Storage Tank.

Gasoline Barge Spill

The first scenario involves the release of the entire contents of a gasoline barge into the Colorado River whereby the formed pool begins to evaporate, travel and disperse as a vapor cloud. The vapor cloud concentrations are evaluated downwind up to the location of the control room intake to ensure that concentrations do not exceed 300 ppm. Similar to the DEGADIS evaluation of the gasoline barge, a virtual point source is assumed.

Parameter	Input	Basis
Atmospheric Stability Class	F	F stability represents the worst 5% of meteorological conditions observed at majority of nuclear plant sites (Reference 1).
Wind Speed	1.5 m/s	1.5 m/s was chosen using guidance provided in the parameter selection requirements for the US EPA's Risk Management Program "40 CFR 68.22 Offsite consequence analysis parameters. (b)...For the worst case release analysis, the owner or operator shall use a wind speed of 1.5 meters per second..." (Reference 2) Additionally, the minimum surface wind speed at 10 m for Pasquill Stability Class F is 2 m/s. (Reference 3)
Spill Elevation	0 ft	Spill is conservatively assumed to be at the plant elevation. For comparison, RMP guidance suggests using a ground-level release for worst-case-- "40 CFR 68.22 Offsite consequence analysis parameters (d) Height of release. The worst-case release of a regulated toxic substance shall be analyzed assuming a ground-level (0 feet) release." (Reference 2)

Parameter	Input	Basis
Spill area	55,741.8 m ² (600,000 ft ²)	Spill is initially at its specified maximum area. Given the immense volume of gasoline and the relatively small spill depth, the maximum spill area would require the gasoline to flow miles down the river away from the site. Therefore, the length of the spill area influencing the site is assumed as 1,500 ft (457.2 m) up and down the river from the spill site (the closest point from the river to the proposed site) for a total of 3,000 ft (914.4m) in river length. The "Length of the river" or "Length of the spill area" is defined as the length perpendicular to the shortest distance between the Colorado River and the closest proposed unit. This creates a rectangular spill area with the long side perpendicular to the wind direction. The Colorado River in the vicinity of the Port of Bay City is roughly 200 ft wide (Reference 4). Therefore, the spill area is 600,000 ft ² (55,741.8 m ²). The assumed length of the river (3000 ft) is verified to be conservative based on the Gaussian distribution (That point at the outer edge of the rectangular spill does not laterally disperse enough to affect the Control Room concentrations).
Downwind Distance	39,241.8 ft (11,960.92 m)	$\sigma_{y0} = s/4.3 = (3000/4.3) = 697.674$ ft This correlates to a downwind distance of 7,000 m. Therefore, L = (4,960.92m) + (7,000m) = 11,960.92m (see Note 1 and Figure 1)
Control Room Intake Height	6.0 m	(Reference 18)
Quantity Spilled	4,604,272.081 kg	The barge transports in quantities of up to 40,000 BBLs or 1,680,000 gallons (6,359.5m ³). (Reference 5). Based upon the liquid density defined below (0.724 g/cm ³), the quantity spilled is calculated.
Air and Water Temperature	84.1°F = 28.9°C = 302.1 K	To maximize evaporation rate, the July mean temperature is used. (Reference 6) Assuming the water temperature to be the same as the air temperature is conservative as the temperature of the Colorado River is consistently cooler than the air or ground temperature. (Reference 7)
Water Vapor Pressure	27.7 mmHg @ 28.9°C = 36.93 mb @ 28.9°C	(Reference 9)
Atmospheric Radiation	$I_{atm} = \sigma_{SB} * (C_1 + 0.0263 * P^{1/2}) * (T_a + 273)^4 = 18.04 \text{ cal/m}^2\text{s}$ $C_1 = 0.735$ if $T_a > 34^\circ\text{C}$ or $C_1 = 0$ if $T_a \leq 34^\circ\text{C}$ $\sigma_{SB} = 1.355 * 10^{-8} \text{ cal/m}^2\text{sK}^4$ $P =$ water vapor pressure (mbar) $T_a =$ ambient temperature (°C)	(Reference 10)

Parameter	Input	Basis
Solar Radiation	$I_{\text{solar}} = 69.44 \text{ cal/m}^2\text{s}$	(Reference 11) This is based on the location of the plant relative to the Sun during that time of the year with the greatest incident solar heat flux (June). Although the air temperature is based on the July mean temperature, this is worst case and the use of June's data is recommended by Reference 10.
Properties of Gasoline	<p>Boiling Point (average): 333 K to 472 K = 402.5 K = 129.35°C</p> <p>Liquid Heat Capacity: 0.496 Btu/lb °F @ 80°F & 0.499 Btu/lb °F @ 85 °F (CHRIS) = 0.497 Btu/lb °F @ 81.4 °F = 0.497 cal/g °C @ 28.9 °C</p> <p>Saturated Liquid Density: 45.24 lb/ft³ @ 80°F & 45.08 lb/ft³ @ 85°F = 45.2 lb/ft³ @ 81.4°F = 6.04 lb/gal @ 81.4°F = 0.724 g/cm³ @ 28.9 °C</p> <p>Latent Heat of Vaporization (Average): 71-81 cal/g = 76 cal/g</p> <p>Molecular Weight: 95 g/mol</p> <p>Diffusion Coefficient in Air: 0.008 in²/s = 0.052 cm²/s</p> <p>Saturated Vapor Pressure: 11.5 in Hg @ 81.4 °F = 292 mm Hg @ 81.4 °F</p> <p>TLV-TWA: 300 ppm</p> <p>Gas Density: 4386 g/m³ @ 0°C</p>	<p>(Reference 12)</p> <p>(Reference 12)</p> <p>(Reference 12)</p> <p>(Reference 12)</p> <p>Range is 92 to 95 g/mol – 95 g/mol is the most conservative (Reference 13)</p> <p>(Reference 14)</p> <p>(Reference 15)</p> <p>(Reference 12)</p> <p>$\rho_{\text{gas}@0^\circ\text{C}} = SG_{\text{vapor}} * \rho_{\text{air}@0^\circ\text{C}} = 3.4 * 1.29 \text{ kg/m}^3 = 4.386 \text{ kg/m}^3 = 4386 \text{ g/m}^3$ (References 12 & 8, respectively)</p>
Output Time Increment	15 sec	Presents outputs in the specified time increment. No effect on the outcome of the calculation.
Terrain	Flat	Maintains the integrity of the plume while allowing it to travel as close to the proposed site as possible.
River Velocity	None	Spill area is maintained and not washed downstream farther from the plant. Downwash (cooling) of the gasoline is prevented.
Heat Transfer	Calculated by TOXDISP– Inputs are solar and atmospheric radiation; TOXDISP uses these parameters as well its own calculations of forced air convection and ground conduction.	Reference 10

Note 1:**Virtual Distance:**

1. The puddle area that would form from the spilled gasoline would take the form of the river. However, many models such as TOXDISP assume the mass from a single point source. Since the spill area is a long rectangle that is perpendicular to the proposed Units, a point source model would not be accurate. In order to account for the large spill and consequently the resulting large vapor cloud at the spill site, a virtual point source is assumed upwind of the real spill. The virtual point source forms a virtual vapor cloud that would be equivalent to the actual vapor cloud after it travels and reaches the spill site. This equivalent virtual source is assumed using the Gaussian distribution. The virtual distance is the distance between the virtual upwind "point source" and the rectangular spill.

The initial standard deviation for a 3000 ft square area source is approximated as follows (Reference 17):

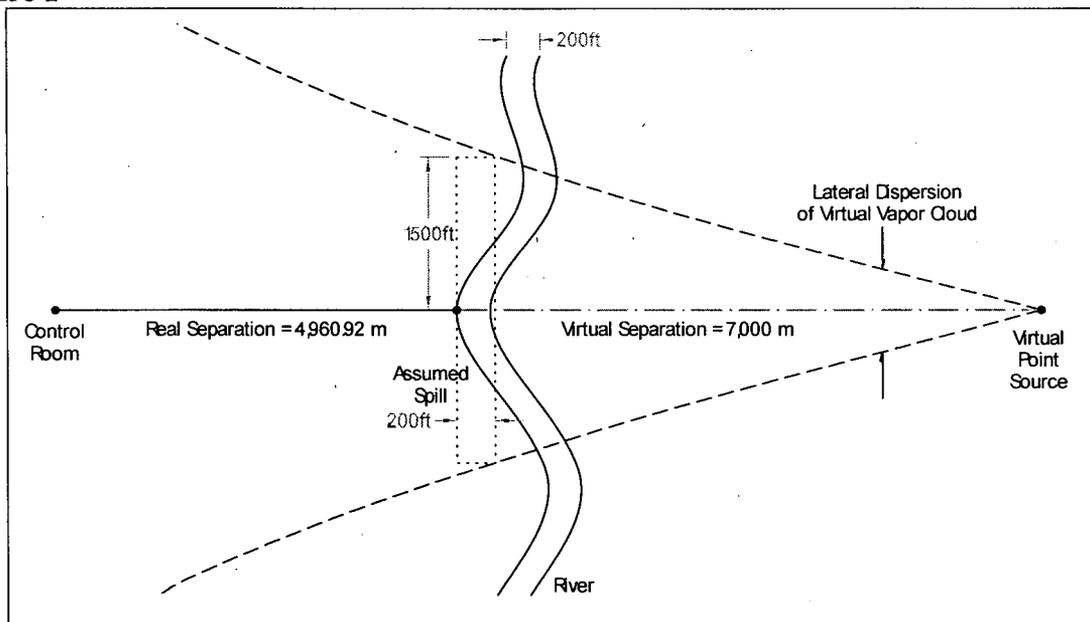
$$\sigma_{y0} = s/4.3$$

where,

σ_{y0} = horizontal dispersion parameter (ft)

s = length of the river side of the rectangular spill area (ft)

This virtual distance represents the generation of a vapor cloud from a point origin that would be of an equivalent cloud size when it reaches the "real" distance at the river. (See Figure 1 below.)

Figure 1

Crude Oil Tank Spill

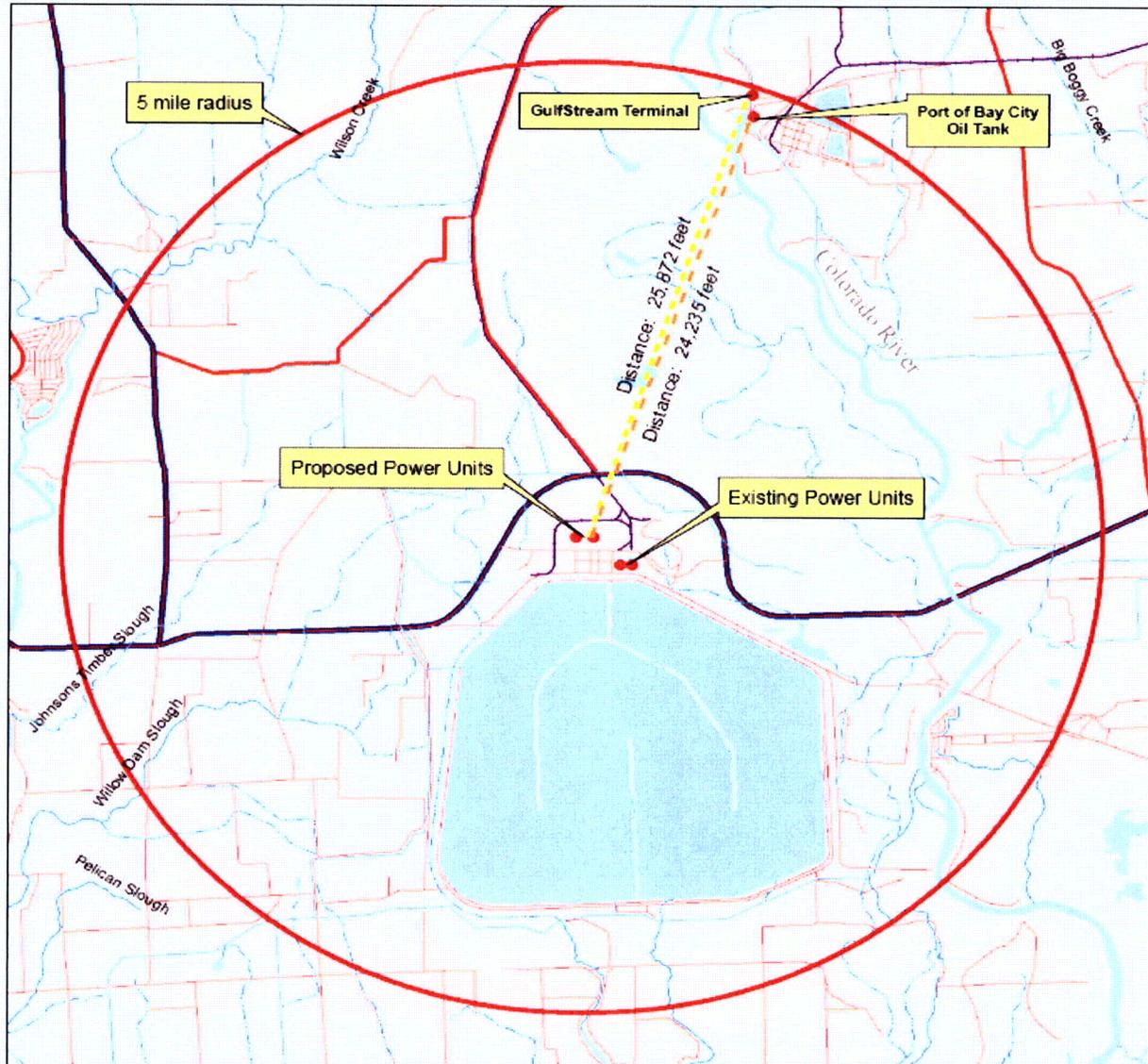
The second scenario involves the release of the entire contents of a crude oil tank into its dike whereby the formed pool begins to evaporate, travel and disperse as a vapor cloud. The vapor cloud concentrations are evaluated downwind up to the location of the control room intake to ensure that concentrations do not exceed 100 ppm.

Parameter	Input	Basis
Atmospheric Stability Class	F	F stability represents the worst 5% of meteorological conditions observed at majority of nuclear plant sites (Reference 1).
Wind Speed	1.5 m/s	1.5 m/s was chosen using guidance provided in the parameter selection requirements for the US EPA's Risk Management Program "40 CFR 68.22 Offsite consequence analysis parameters. (b)For the worst case release analysis, the owner or operator shall use a wind speed of 1.5 meters per second..." (Reference 2) Additionally, the minimum surface wind speed at 10 m for Pasquill Stability Class F is 2 m/s. (Reference 3)
Spill Elevation	0 ft	Spill is conservatively assumed to be at the plant elevation. For comparison, RMP guidance suggests using a ground-level release for worst-case-- "40 CFR 68.22 Offsite consequence analysis parameters (d) Height of release. The worst-case release of a regulated toxic substance shall be analyzed assuming a ground-level (0 feet) release." (Reference 2)
Spill area	3,140.2 m ² (33,800 ft ²)	Spill is initially at its specified maximum area (Reference 19).
Downwind Distance	24,230 ft (7, 385.3 m)	Figure 2
Control Room Intake Height	6.0 m	(Reference 18)
Quantity Spilled	2,782,277.673 kg	The tank contains up to 1,050,000 gallons (3,974.68 m ³) (Reference 20) with a liquid density of 700 kg/m ³ (See Below).
Air and Water Temperature	93.8°F = 34.33°C = 307.5 K	To maximize evaporation rate, the July mean maximum daily temperature of 307.5 K is used. (Reference 6) Note: For the gasoline barge spill input data as shown above, a July mean temperature of 302.1 K was used. Either the mean temperature or the maximum mean temperature can be selected for use in this calculation. The difference in the calculated evaporation rates will be negligible. These calculations were performed at different times, and different temperature criteria were selected for each calculation.
Water Vapor Pressure	40.65 mmHg @ 34.33°C = 54.2 mb @ 34.33°C	(Reference 9)

Parameter	Input	Basis
Atmospheric Radiation	$I_{\text{atm}} = \sigma_{\text{SB}} * (C_1 + 0.0263 * P^{1/2}) * (T_a + 273)^4$ $= 112.5 \text{ cal/m}^2\text{s}$ $C_1 = 0.735$ if $T_a > 34^\circ\text{C}$ or $C_1 = 0$ if $T_a \leq 34^\circ\text{C}$ $\sigma_{\text{SB}} = 1.355 * 10^{-8} \text{ cal/m}^2\text{sK}^4$ $P =$ water vapor pressure (mb) $T_a =$ ambient temperature ($^\circ\text{C}$)	(Reference 10)
Solar Radiation	$I_{\text{solar}} = 69.44 \text{ cal/m}^2\text{s}$	(Reference 11) This is based on the location of the plant relative to the Sun during that time of the year with the greatest incident solar heat flux (June). Although the air temperature is based on the July mean temperature, this is worst case and the use of June's data is recommended by Reference 10.
Properties of Crude Oil	<p>Boiling Point (average): 305 K to 673 K = 489 K = 215.85$^\circ\text{C}$</p> <p>Liquid Heat Capacity: 0.479 Btu/lb$^\circ\text{F}$ @ 88$^\circ\text{F}$ & 0.480 Btu/lb$^\circ\text{F}$ @ 90$^\circ\text{F}$ (CHRIS) = 0.4819 Btu/lb$^\circ\text{F}$ @ 93.8$^\circ\text{F}$ = 0.4819 cal/g$^\circ\text{C}$ @ 34.33$^\circ\text{C}$</p> <p>Saturated Liquid Density: 43.7 lb/ft3 @ 50-84$^\circ\text{F}$ = 5.84 lb/gal @ 93.8$^\circ\text{F}$ = 0.7 g/cm3 @ 34.33$^\circ\text{C}$</p> <p>Latent Heat of Vaporization (Average): 76-86 cal/g = 81 cal/g</p> <p>Molecular Weight: $M_f \approx M_a * SG_{\text{vapor}} =$ $(28.97 \text{ g/mol}) * (8) = 231.76 \text{ g/mol}$ $\approx 240 \text{ g/mol}$</p> <p>Diffusion Coefficient in Air: $M_f = (M_a + M_b) / (M_a * M_b)$ Where: $M_f =$ mixture molecular weight (g/mol) $M_a =$ air molecular weight (g/mol) $M_b =$ fuel molecular weight (g/mol) $= (28.97 + 240) / (28.97 * 240)$ $= 0.0387 \text{ mol/g}$</p> <p>$V_b = (N_C * M_C) + (N_H * M_H)$ Where: $V_b =$ molar volume of fuel (cm3/mol) $N_C =$ number of carbon atoms in fuel molecule $M_C =$ molar volume of carbon atom (cm3/mol) $N_H =$ number of hydrogen atoms in fuel molecule $M_H =$ molar volume of hydrogen atom (cm3/mol) $= (17 * 16.5) + (36 * 1.98)$ $= 351.78 \text{ cm}^3/\text{mol}$</p>	<p>(Reference 12)</p> <p>(Reference 12)</p> <p>(Reference 12)</p> <p>(Reference 12)</p> <p>Equation: Reference 21.</p> <p>SG_{vapor} of No. 2 diesel fuel oil assumed: Reference 16. M_f assumed high for conservatism.</p> <p>Molecular weight of Air-Fuel mixture: Reference 22</p> <p>Molecular Weight of Air: Reference 8</p> <p>Molar volume of fuel: Reference 22</p> <p>Approximated as a paraffin ($\text{C}_n\text{H}_{2n+2}$) with a molecular weight of 240 g/mol 16.5 cm3/mol (Reference 23)</p> <p>Approximated as a paraffin ($\text{C}_n\text{H}_{2n+2}$) with a molecular weight of 240 g/mol 1.98 cm3/mol (Reference 23)</p>

Parameter	Input	Basis
	$D_{air} = 0.001 * (T^{1.75} * M_r^{1/2}) / [P * (V_a^{1/3} * V_b^{1/3})^2]$ Where: P = atmospheric pressure (1 atm) V _a = molar volume of air (cm ³ /mol) $= 0.001 * (307.5^{1.75} * 0.0387^{1/2}) / [1 * (20.1^{1/3} * 351.78^{1/3})^2]$ $= 0.0465 \text{ cm}^2/\text{s}$ Saturated Vapor Pressure: 0.076 psi @ 90°F & 0.087 psi @ 95°F = 0.08436 psi @ 93.8°F = 4.363 mm Hg @ 93.8°F TLV-TWA: 100 ppm Gas Density: 4386 g/m ³ @ 0°C	Diffusion coefficient of fuel in air; Reference 22 V _a = 20.1 cm ³ /mol (Reference 22) (Reference 15) (Reference 12) (Reference 16) $\rho_{gas@0^\circ C} = SG_{vapor} * \rho_{air@0^\circ C} = 8 * 1.29 \text{ kg/m}^3 = 10.32 \text{ kg/m}^3 = 10320 \text{ g/m}^3$ (References 16 & 8, respectively)
Output Time Increment	15 sec	Presents outputs in the specified time increment. No effect on the outcome of the calculation.
Terrain	Flat	Maintains the integrity of the plume while allowing it to travel as close to the proposed site as possible.
Heat Transfer	Calculated by TOXDISP– Inputs are solar and atmospheric radiation; TOXDISP uses these parameters as well its own calculations of forced air convection and ground conduction.	Reference 10

Figure 2



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

References

1. U.S. Nuclear Regulatory Commission Regulatory Guide 1.78, "Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release," Revision 1, December 2001.

2. Title 40 Code of Federal Regulations Part 68.22 "Offsite consequence analysis parameters," Revised July 1999.
3. Seinfeld, J.H., "Air Pollution," John Wiley & Sons, Inc. 1986.
4. Port of Bay City Authority. <http://www.portofbaycity.com/facilities.html>.
5. Letter From Evans, Terry of Gulfstream Terminals & Marketing, LLC to Wagner, David of Bechtel Power Corporation, Entitled "Information you requested on the Port of Bay City," on 10 January 2007.
6. National Oceanic and Atmospheric Administration, Local Climatological Data, Houston, Texas. Extremes Data Annual Summaries for 2000-2006.
http://www.srh.noaa.gov/hgx/climate/iah/normals/iah_summary.htm.
7. Lower Colorado River Authority (LCRA), Colorado River Watch Network Water Quality Data. <http://crwn.lcra.org/>.
8. "Flow of Fluids through Valves, Fittings and Pipes." Crane Valves North America, 1988.
9. Hyperphysics. <http://hyperphysics.phy-astr.gsu.edu/Hbase/kinetic/watvap.html>.
10. TOXDISP (MAP 126), Rev. 3, User/Theoretical Manual, Bechtel Power Corporation, 1994.
11. Beckman, William A. and John A. Duffie. "Solar Energy Thermal Processes." Figure 3.3.2. Page 35. John Wiley and Sons Publication, 1974. ISBN# 0-471-22371-9.
12. Chemical Hazardous Response Information System (CHRIS), U.S. Coast Guard, June 1999.
13. "Motor Gasolines Technical Review", Chevron, page 27.
http://www.chevron.com/products/ourfuels/prodserv/fuels/documents/Motor_Fuels_Tch_Rvw_complete.pdf
14. U.S. Department of Energy, Hydrogen, Fuel Cells and Infrastructure Technologies Program (HFCIT) Safety, Code and Standards.
<http://www1.eere.energy.gov/hydrogenandfuelcells/codes/basics.html>
15. "Vapor Pressure Graphs of Motor Gasolines," Vacuum Limitations on Blackmer Pumps.
<http://www.blackmer.com/myapp/pdf/bul50.pdf>
16. Fuel Oil #2. Canadian Centre for Occupational Health and Safety. MSDS for SARA Reports. Issued November 2004. MSDS record Number: 2374085.

17. Turner, Bruce D., "Workbook of Atmospheric Dispersion Estimates: An Introduction to Dispersion Modeling," 2nd Edition, Lewis Publishers, 1994.
18. ABWR DCD/Tier 2, Figures 1.2-21 and 1.2-15, Rev. 003, "Control and Service Building, Arrangement and Elevation, Section B-B" and "Control and Service Building, Arrangement Plan at Elevation at 17150 mm."
19. Email from Chauvin, Joseph of Gulfmark Energy to Nieman, David of Bechtel Power Corporation, Entitled "Re: Port of Bay City Crude Oil Tank". Sent Friday, 2 Feb. 2007 at 9:11 AM.
20. Email from Broussard, Ronnie to Wagner, David of Bechtel Power Corporation, Entitled "Response to Port of Bay City Information", Sent Tuesday 9 Jan 2007.
21. Chemical Hazardous Response Information System (CHRIS), U.S. Coast Guard, June 1999, Section 9.10.
22. Diffusion Coefficient Estimation. Environmental Protection Agency (EPA). <http://www.epa.gov/athens/learn2model/part-two/onsite/estdiffusion.htm>.
23. Diffusion Coefficients in Air and Water. Handbook of Chemical Property Estimation Methods, 1982. Chapter 17: Selected Methods of Estimating Gaseous Diffusion Coefficients of Organics in Air. Table 17-4, page 17-11.

RAI 02.02.03-6:**QUESTION:**

For the identified quantity of 1-Hexene, the distance to have concentrations still at the IDLH value of 30 ppm is >31680ft, and the concentration at distance 22841ft (distance to outside Control Room) is about 600 ppm while inside Control Room is calculated to be about 60 ppm still exceeding the IDLH value of 30 ppm. Please check and clarify.

RESPONSE:

A reanalysis was performed to assess the possible release of 1-Hexene from the OXEA industrial site in a control room toxicity scenario. After contacting OXEA Corporation, it was determined that a berm exists around the 1-Hexene storage tank at the site. Based on this information the analysis was re-performed assuming that the berm would contain the full quantity of 1-Hexene.

At the OXEA site, 1-Hexene (1,265,000 lbs) is stored in a tank located 22,841 ft from the control room. A berm exists around the tank with dimensions 120 ft x 90 ft x 40 inches. This results in a volume of 36,000 ft³ with surface area 10,800 ft². The maximum spill volume is 30,119 ft³ for the given quantity, less than the total volume of the berm, thus it is able to contain the full quantity of 1-Hexene limiting the spill surface area to the surface area of the berm.

Given these assumptions and utilizing the ALOHA Model (ALOHA), the Temporary Emergency Exposure Limit (TEEL) concentration of 30 ppm for 1-Hexene is never reached at the control room intake. The concentration of 1-Hexene is greater than 30 ppm only up to a maximum distance of 6,864 ft downwind from the source, well short of the 22,841 ft to the control room.

As clarification, the limit reported in the COLA is the TEEL-3 (reported as TEEL) as opposed to the IDLH, which is not currently defined for 1-Hexene. This is discussed further in the response to RAI 02.02.03-7.

References:

(ALOHA) Areal Locations of Hazardous Atmospheres (ALOHA) User's Manual, EPA and NOAA, February 2006.

The first paragraph of FSAR Subsection 2.2S.3.1.2.5 will be revised as follows:

The OXEA Corporation located approximately 22,841 feet, and the Port of Bay City, Gulfstream Terminal and Marketing LLC and GulfMark Energy facilities, located approximately 24,244 feet, from the nearest safety-related structure - the STP 3 Control Room - operate within the vicinity of the STP site. The hazardous material stored at GulfMark Energy that was identified for further analysis with regard to the potential for delayed ignition of a flammable vapor cloud formed following the accidental release of the hazardous material was crude petroleum--the gasoline storage at the Port of Bay City,

Gulfstream Terminal and Marketing LLC and GulfMark Energy is bounded by the gasoline transport on the Colorado River. The hazardous materials stored at OXEA Corporation that were identified for further analysis with regard to the potential for delayed ignition of flammable vapor clouds are: 1-hexene, 1-octene, 2-hexene, acetaldehyde, acetic acid, acetone, cyclohexylamine, hydrazine, carbon monoxide, dimethyl sulfide, ethyl acetate, ethylene, hydrogen, isobutanol, isobutyl acetate, isobutyraldehyde, methane, n-butanol, n-butyl acetate, n-butyraldehyde, n-heptanal, n-propyl acetate, n-propyl alcohol, propionaldehyde, propylene, and vinyl acetate. For 1-hexene, 1-octene, 2-hexene, acetaldehyde, acetic acid, isobutanol, isobutyl acetate, isobutyraldehyde, n-butanol, n-butyl acetate, n-butyraldehyde, n-propyl acetate, npropyl alcohol, propionaldehyde, and vinyl acetate, the maximum allowable surface area of the spill that ALOHA would allow - 31,400 m² - was used due to the large storage quantity of these chemicals. The 1-hexene storage tank at OXEA Corporation is surrounded by an installed berm; therefore, it was assumed that the berm confined the spill, limiting the surface area of the spill to 10,800 ft². For the remaining chemicals, it was conservatively assumed that the entire contents of the vessels leaked and formed a one-centimeter thick puddle, or in the case of the chemicals in the gas state, the entire contents of the tank or pipeline were released over a 10-minute period as a continuous direct source. The results using the methodology described in Subsection 2.2S.3.1.2 indicate that any plausible vapor cloud that could form and mix sufficiently under stable atmospheric conditions would be below the LFL boundary before reaching STP 3 & 4 (Table 2.2S-10). The greatest distance to the LFL boundary -12,672 feet- was for hydrogen and ethylene.

A related COLA revision to FSAR Subsection 2.2S.3.1.3.5 is provided in the response to RAI 02.02.03-7.

The line item entry for 1-Hexene in Tables 2.2S-10 and 2.2S-11 also will be revised as follows:

Table 2.2S-10 Design-Basis Events, Flammable Vapor Clouds (Delayed Ignition) and Vapor Cloud Explosions

Source	Pollutant Evaluated & Quantity	Distance to Nearest Safety-Related Structure	Distance to UFL	Distance to LFL	Safe Distance for Vapor Cloud Explosions	Peak Overpressure at Nearest Safety-Related Structure (psi)
Offsite (OXEA Corp.)	1-Hexene (1,265,000 lbs)	22,841 ft	1,209 240 ft	2,805 423 ft	5,280 948 ft	0.129 psi No significant overpressure

Table 2.2S-11 Design-Basis Events, Toxic Vapor Clouds

Source	Chemical	Quantity	IDLH	Distance to STP 3 & 4 Control Room	Distance to IDLH	Maximum Control Room Concentration
Offsite (OXEA Corp.)	1-Hexene	1,265,000 lbs	30 ppm [1]	22,841 ft	> 31,680 6,864 ft [6]	> 1 hr [3]

[1] Temporary Emergency Exposure Limits (TEEL)

[2] Emergency Response Planning Guideline (ERPG)

[3] ALOHA does not report values after 1 hour because it assumes that the weather conditions or other release circumstances are likely to change after an hour.

[4] Not applicable - The TOXDISP model was used to determine concentrations outside the control room intake. Because, the toxic concentrations had dissipated below the toxicity limit prior to reaching the control room intake, calculating the concentration inside the control room was not required.

[5] Not applicable - the material is an asphyxiant with no associated toxicity limit

[6] The control room is greater than 1 hour downwind from the release, the model assumes, with the conservative meteorological conditions applied, that the weather conditions or other circumstances are likely to change such that the vapor cloud would not pose a threat inside the control room.

RAI 02.02.03-7:**QUESTION:**

The IDLH concentration for 1-Hexene and CO in Table 2.2S-11 extend > 31680 ft (beyond Control Room distance of 22841 ft). Rather than calculating the concentration outside and inside the Control Room for these chemicals, the footnote stating that ALOHA does not calculate beyond 1 hr is provided. Justify how the model is a technical basis for not determining the concentrations?

RESPONSE:**1-Hexene**

For clarification, no IDLH is currently defined for 1-hexene, so, as described in FSAR Subsection 2.2S.3.1.3, the limit reported is the Temporary Emergency Exposure Limit (TEEL) of 30 ppm (ALOHA), which is equal to the TLV-TWA as reported by the CHRIS database (CHRIS). TEELs were developed by the DOE Subcommittee on Consequence Assessment and Protective Actions for chemicals for which no other toxic limits exist as a temporary limit until more accurate exposure limits are developed. The TEEL-3 limit is defined as the maximum concentration in air below which it is believed nearly all individuals could be exposed without experiencing or developing life-threatening health effects (DOE). It is recommended that the concentration at the receptor point of interest be calculated as the peak 15-minute time-weighted average concentration (DOE). This is as opposed to the IDLH, which is an instantaneous concentration to which a person should not be exposed for greater than 30 minutes. For the STP COLA, the reported TEEL limits are TEEL-3 limits and are referred to as TEEL. In order to eliminate confusion, the tables in the COLA will be amended to clarify the 1-hexene limits as the TEEL limit.

The original analysis for the Control Room habitability resulting from a spill of 1-hexene was based upon the assumption that the maximum spill area of 31,400 m² had occurred at the storage tank containing 1-hexene. A reassessment of the layout of the chemical storage tanks at the OXEA industrial site revealed that the 1-hexene is stored in a tank that is contained within a bermed area. Any spill from this storage tank would be contained within the bermed area. The ALOHA analysis was redone based upon this new information as discussed in the response to RAI 02.02.03-6. The maximum spill size was determined to be the area contained within the berm surrounding the storage tank. It was determined that a TEEL concentration of 30 ppm 1-hexene will travel a maximum of 6,864 ft downwind of the spill source. The control room is located 22,841 ft from the spill. Therefore, the TEEL concentration of 30 ppm or more will never reach the control room.

Carbon Monoxide

To assess the effects of a carbon monoxide release from the OXEA industrial site, an analysis using the computer program, Flame Acceleration Simulator (FLACS), was performed in order to get a more accurate depiction of the behavior of the cloud as well as determine concentrations at the control room. The conditions of the FLACS analysis were assumed to be the same as those for the ALOHA analysis.

The FLACS analysis shows that there is no significant concentration at the control room. The reason for the difference between the ALOHA results and the FLACS results is that carbon monoxide is a lighter than air gas. ALOHA does not account for movement in the vertical direction, whereas FLACS does (ALOHA) (FLACS). The plume rise is clearly seen in FLACS and this causes the plume to go well above the control room, thus resulting in safe conditions. Within the first 30 minutes of the release, the cloud is about 500 meters (1,640 ft) off the ground and at a distance of about 2,000 meters (6,560 ft) from the release point. In addition, FLACS shows that the cloud disperses to concentrations below the IDLH concentration before it travels the horizontal distance to the control room. This is also due to plume rise which allows for greater dispersion. Wind speeds are generally faster at higher altitudes. The IDLH concentration is seen up to 3,250 meters (10,660 ft) downwind from the release point at a height of about 1,250 meters (4,100 ft). These conditions occur about 39 minutes after the release has started. This horizontal distance is much less than the 22,481 ft to the control room. Therefore, there will be no adverse impact to plant operations.

References:

(DOE) DOE Handbook, "Temporary Emergency Exposure Limits For Chemicals: Methods and Practice," DOE-HDBK-1046-2008, August 2008.

(ALOHA) Areal Locations of Hazardous Atmospheres (ALOHA) User's Manual, EPA and NOAA, February 2006.

(FLACS) Flame Acceleration Simulator (FLACS) User's Guide, Gexcon, 2003.

(CHRIS) Chemical Hazardous Response Information System (CHRIS), United States Coast Guard, June 1999.

A COLA revision to reflect the reanalysis of the 1-hexene storage tanks at the OXEA industrial site is provided in the response to RAI 02.02.03-6. Additional COLA revisions due to the 1-hexene and carbon monoxide reanalyses are provided below.

The second paragraph of FSAR Subsection 2.2S.3.1.3, Toxic Chemicals, will be revised as follows:

The potential onsite chemicals (Table 2.2S-6), offsite chemical storage (Table 2.2S-7), hazardous materials transported on navigable waterways (Table 2.2S-8), and hazardous materials potentially transported on FM 521 were evaluated to ascertain which hazardous materials should be analyzed with respect to their potential to form a toxic vapor cloud following an accidental release. The ALOHA air dispersion model was used to predict the concentrations of toxic chemical clouds as they disperse downwind for all facilities and sources except for the gasoline barge, which was analyzed using the Toxic Dispersion Model (TOXDISP), Revision 3-, and for carbon monoxide at the OXEA Corporation, which was analyzed using the Flame Acceleration Simulator (FLACS) computer model (Reference 2.2S-XX). The maximum distance a cloud can travel before it disperses enough to fall below the Immediately Dangerous to Life and Health (IDLH) concentration in the vapor cloud was determined using ALOHA or TOXDISP or FLACS. The ALOHA model was also used to predict the concentration of the chemical in the Control Room following a chemical release to ensure that, under worst-case scenarios, Control Room operators will have sufficient time to take appropriate action.

Subsection 2.2S.3.1.3.5 will be revised as follows:

The OXEA Corporation, located approximately 22,841 feet, and the Port of Bay City, Gulfstream Terminal and Marketing LLC and GulfMark Energy facilities, located approximately 24,244 feet, from STP 3 & 4 operate within the vicinity of the STP site. The hazardous material stored at GulfMark Energy that was identified for further analysis with regard to the potential for forming a toxic vapor cloud following an accidental release and traveling to the Control Room was crude petroleum. (The gasoline storage at the Port of Bay City, Gulfstream Terminal and Marketing LLC, and GulfMark Energy is bounded by gasoline transport on the Colorado River.) The hazardous materials stored at OXEA Corporation that were identified for further analysis with regard to the potential for forming a toxic vapor cloud following an accidental release and traveling toward the Control Room were 1-hexene, 1-octene, 2-hexene, acetaldehyde, acetic acid, acetone, cyclohexylamine, dimethyl sulfide, hydrazine, sodium hypochlorite, carbon dioxide (asphyxiant), carbon monoxide (asphyxiant), ethyl acetate, ethylene (asphyxiant), hydrogen (asphyxiant), isobutanol, isobutyl acetate, isobutyraldehyde, methane (asphyxiant), n-butanol, n-butyl acetate, n-butyraldehyde, n-propyl acetate, n-propyl alcohol, propionaldehyde, nitrogen (asphyxiant), propylene (asphyxiant), and vinyl acetate. Carbon dioxide, carbon monoxide, ethylene, hydrogen, methane, nitrogen and propylene concentrations were determined outside the Control Room following a 10-minute release from the largest storage vessel. In each case, the concentration of the asphyxiants at the Control Room would not displace enough oxygen for the Control Room to become an oxygen deficient environment, nor

would it be otherwise toxic at these concentrations (Table 2.2S-11). The remaining chemical analyses indicate that, ~~except for 1-Hexene and carbon monoxide,~~ the distance the vapor cloud could travel prior to falling below the selected toxicity limit was less than the distance to the Control Room. ~~Additionally, in each case, including 1-Hexene and carbon monoxide, the analyses indicate that one hour after an accidental release, the toxic chemical had not reached the Control Room (Table 2.2S-11). After 1 hour, the model assumes that weather conditions or other release circumstances are likely to change such that the vapor cloud would not pose a threat inside the control room.~~ Therefore, the formation of a toxic vapor cloud following an accidental release of the analyzed hazardous materials stored offsite would not adversely affect the safe operation or shutdown of STP 3 & 4.

The following new reference will be added to Subsection 2.2S.4:

~~2.2S-XX Flame Acceleration Simulator (FLACS) User's Guide, Gexcon, 2003.~~

The line item entry for 1-Hexene on Table 2.2S-3, 2.2S-7 and 2.2S-11 will be revised as follows:

Table 2.2S-3 Offsite Chemical Storage – OXEA Corporation, Gulfstream Terminal and Marketing LLC, and GulfMark Energy

Material	Toxicity Limit (IDLH) [2]	Maximum Quantity [1] in Largest Container (lbs)
OXEA Corporation		
1-Hexene	30 ppm TLV TWA [3] TEEL [4]	1,265,000

The line item entry for 1-Hexene on Table 2.2S-7 will be revised as follows:

Table 2.2S-7 Offsite Chemicals, Disposition - OXEA Corporation, Gulfstream Terminal and Marketing LLC, and GulfMark Energy

Material	Toxicity Limit (IDLH)	Flammability	Explosion Hazard?	Vapor Pressure	Disposition
OXEA Corporation					
1-Hexene	30 ppm TLV-TWA [6] TEEL [3]	1.2% LEL	Vapor may explode	5.990 psi @ 100°F	Toxicity Analysis
					Flammability Analysis
					Explosion Analysis

The line item entries for 1-Hexene and Carbon Monoxide and Note [6] on Table 2.2S-11 will be revised as follows. (Notes [1-5] are provided for clarity.)

Table 2.2S-11 Design-Basis Events, Toxic Vapor Clouds

Source	Chemical	Quantity	IDLH	Distance to STP 3 & 4 Control Room	Distance to IDLH	Maximum Control Room Concentration
Offsite (OXEA Corp.)	1-Hexene	1,265,000 lbs	30 ppm [1]	22,841 ft	> 31,680 6,864 ft [6]	>1 hr [3]
	1-Octene	2,010,000 lb	250 mg/m ³		8,976 ft	>1 hr [3]
	2-Hexene	3,861 lb	30 ppm		3,645 ft	>1 hr [3]
	Acetaldehyde	866,300 lbs	2,000 ppm		13,200 ft	>1 hr [3]
	Acetic Acid	9,999,999 lbs	50 ppm		9,504 ft	>1 hr [3]
	Acetone	4,400 lbs	2,500 ppm		399 ft	> 1 hr [3]
	Cyclohexylamine	4,000 lbs	30 ppm [1]		921 ft	>1 hr [3]
	Dimethyl Sulfide	10,000 lbs	2,000 ppm		1,083 ft	> 1 hr [3]
	Hydrazine	4,000 lbs	50 ppm		1,500 ft	>1 hr [3]
	Sodium Hypochlorite	30,000 lbs	10 ppm		114 ft	>1 hr [3]
	Carbon Dioxide	868,000 lbs	40,000 ppm		7,920 ft	>1 hr [3]
	Carbon Monoxide	868,000 lbs	1,200 ppm		> 31,680 10,660 ft [6]	>1 hr [3] [6]
	Ethyl Acetate	21,800 lbs	2,000 ppm		672 ft	>1 hr [3]
	Ethylene	470,000 lbs	15,000 ppm		11,616 ft	> 1 hr [3]
	Hydrogen	58,512 lbs	Asphyxiant		Not applicable [5]	> 1 hr [3]
	Isobutanol	3,455,333 lbs	1,600 ppm		1,377 ft	>1 hr [3]
	Isobutyl Acetate	9,999,999 lbs	1,300 ppm		1,956 ft	> 1 hr [3]
	Isobutyraldehyde	1,000,000 lbs	1,500 ppm [1]		6,336 ft	>1 hr [3]
	Methane	47,000 lbs	25,000 ppm [1]		4,392 ft	>1 hr [3]
	n-Butanol	16,921,268 lbs	1,400 ppm		777 ft	>1 hr [3]
n-Butyl Acetate	9,999,999 lbs	1,700 ppm	1,380 ft	>1 hr [3]		
n-Butyraldehyde	3,300,000 lbs	2,000 ppm [1]	4,563 ft	>1 hr [3]		

- [1] Temporary Emergency Exposure Limits (TEEL).
- [2] Emergency Response Planning Guideline (ERPG).
- [3] ALOHA does not report values after 1 hour because it assumes that the weather conditions or other release circumstances are likely to change after an hour.
- [4] Not applicable - The TOXDISP model was used to determine concentrations outside the control room intake. Because, the toxic concentrations had dissipated below the toxicity limit prior to reaching the control room intake, calculating the concentration inside the control room was not required.
- [5] Not applicable - the material is an asphyxiant with no associated toxicity limit.
- [6] ~~The control room is greater than 1 hour downwind from the release, the model assumes, with the conservative meteorological conditions applied, that the weather conditions or other circumstances are likely to change such that the vapor cloud would not pose a threat inside the control room.~~ The FLACS model was used to determine that the carbon monoxide plume travels to a maximum horizontal distance of 10,660 ft and rises vertically to 4,100 ft before concentrations are lowered to less than IDLH values.

RAI 02.03.03-5:

QUESTION:

This question is related to the applicant's response to RAI 02.03.03-3.

The response to RAI 02.03.03-3 states that the 6% increase in measured onsite stability class A (extremely unstable) conditions between the pre-operational period (1973-1977) and the post-operational period (1997, 1999, and 2000) is mainly attributed to thermal instability contributed by the main cooling reservoir (MCR). This assertion is in apparent conflict with the statement in FSAR Section 2.3S.3.2.1.3 that the influence of the MCR on ambient temperature instrumentation is expected to be minimal due to the large separation in distance between the meteorological tower and the MCR. Revise the FSAR as necessary to rectify this apparent conflict.

RESPONSE:

The statement in FSAR Section 2.3S.3.2.1.3 will be revised to address the impact on the meteorological tower by the MCR. The COLA text revisions are provided in the response to RAI 02.03.04-4.

RAI 02.03.04-4:**QUESTION:**

This question is related to the applicant's response to RAI 02.03.04-2. The staff finds the response to RAI 02.03.04-2 incomplete.

(a) The response to RAI 02.03.04-2 states, in part, that it is expected that the main cooling reservoir would have an influence on the observed meteorological (e.g., dew point and delta-temperature) data, especially when the meteorological tower is downwind from the MCR. This assertion is in apparent conflict with the statement in FSAR Section 2.3S.3.2.1.3 that the influence of the MCR on ambient temperature and dew point instrumentation is expected to be minimal due to the large separation in distance between the meteorological tower and the MCR. Revise the FSAR as necessary to rectify this apparent conflict.

(b) Portions of the exclusion area boundary (EAB) and the outer boundary of the low population zone (LPZ) extend over the MCR. Revise the FSAR as necessary to describe the impact of reduced surface roughness resulting from over-water trajectories on the resulting offsite short-term atmospheric dispersion estimates.

RESPONSE:

(a) The statement in FSAR Subsection 2.3S.3.2.1.3 will be revised to address the impact on the meteorological tower by the MCR.

(b) Portions of the EAB and the outer boundary of the LPZ extend over the MCR. Smaller surface roughness induced by the MCR would result in less turbulence, and consequently generates slightly higher χ/Qs at portions of the EAB and the LPZ that extend over the MCR. However, reduced surface roughness would also increase ambient wind speed slightly and reduce the χ/Qs due to better dispersion. The above effects counter each other and subsequently minimize the net effect of reduced surface roughness on the offsite short-term atmospheric dispersion estimates.

For Item (a), Subsection 2.3S.3.2.1.3 will be revised under the subheading Heat and Moisture Sensors as shown below:

Heat and Moisture Sensors

Based on the structure layout as shown in Figures 2.3S-19 through and 2.3S-22, the ambient temperature and dew point measurement instrumentation on the existing towers were assessed to determine whether they would be affected by any heat or moisture sources (e.g., ventilation sources, cooling towers, water bodies, large parking lots, etc.) and the findings are presented below:

- Both the primary and backup towers are located on open fields with grassy surfaces underlying the tower. As shown in Figure 2.3S-18, there are no large concrete or asphalt parking lots or temporary land disturbances such as plowed fields or storage areas nearby. The closest large concrete or asphalt parking lots and ventilation sources are located at STP 1 & 2, which is more than one mile from the meteorological towers.
- The proposed plant cooling system for STP 3 & 4 includes the existing Main Cooling Reservoir (MCR) and two banks of mechanical draft cooling towers. As shown on Figure 2.3S-18, the MCR is approximately one mile southwest of the primary meteorological tower at its closest point, while the cooling towers are located directly west, at a distance greater than ~~1.5~~ 1.3 miles from the meteorological towers. The STP 1 & 2 essential cooling pond is approximately 3500 feet and 2600 feet from the primary and backup towers, respectively. ~~Therefore, the meteorological towers are not directly downwind from the cooling towers, MCR or cooling pond under the prevailing wind direction (i.e., south-southeast).~~

With the large separation distance between the meteorological towers and ~~these nearby heat and moisture sources~~ the cooling towers and Essential Cooling Pond, their influence on the ambient temperature, dew point and relative humidity instrumentation is expected to be minimal.

However, due to the relatively large size of the MCR (>7000 acres), it is expected that the MCR would have an influence on the observed meteorological data when the meteorological tower is downwind (south to southwest winds) from the MCR. For example, the dew point measurement is expected to be somewhat higher when the tower is downwind of the MCR and warmer temperatures from the MCR would tend to increase the lower level temperature and increase thermal instability. This effect would enhance the dispersion of releases occurring near the plant site under the south to southwest winds.

In addition, temperature sensors are mounted in fan-aspirated radiation shields, which are pointing downward to minimize the impact of thermal radiation and precipitation.

In addition, Tables 2.3S-13 and 2.3S-14 will be clarified as follows:

Table 2.3S-13 Meteorological Tower Siting Conformance Status

RG 1.23 Criteria	Conformance Status	Remarks
Tower Siting		
The meteorological tower sites and the proposed STP 3 & 4 location have similar meteorological exposure.	Yes	The site area is generally flat land
The base of the tower is at approximately the same elevation as the finished plant grade of the proposed units.	Yes	Tower elevation: 28' MSL Finished plant grade: 34' MSL
Location of the tower is not directly downwind of the existing and proposed plant cooling systems (i.e., MCR and the mechanical cooling towers) under the prevailing downwind wind direction.	Yes	Prevailing wind: SSE MCR – one mile S to SW of the meteorological towers [Note: It is expected that winds from the south to southwest would have an influence on observed meteorological data; however, the data collected from sensors will be representative of the plant site due to the size and location of the MCR.] Two banks of mechanical draft cooling towers – 1.3 miles west of the meteorological towers
Tower is not located on or near permanent man-made surface.	Yes	There are no large concrete or asphalt parking lot or temporary land disturbance, such as plowed fields or storage areas nearby. Both the primary and backup towers are located on open fields with grassy surface underlying the towers.

Table 2.3S-14 Meteorological Instrument Siting Conformance Status

RG 1.23 Criteria	Conformance Status	Remarks
Sensor Siting		
Wind sensors are located at 10 obstruction heights away from such obstructions (including the existing and proposed unit complex, trees, and nearby terrain) to minimize any airflow modification (i.e., turbulent wake effects).	Yes	Both the primary and backup meteorological towers are located in open fields. The nearby trees and brushes are ranging from 15 feet to 30 feet tall and mostly at 300 feet or more from the towers. During routine maintenance, these trees are to be trimmed periodically to ensure that the 10-obstruction-height requirement is met.
Wind sensors are located at heights that avoid airflow modifications by nearby obstructions with heights exceeding one-half of the wind measurement.	Yes	Existing and STP 3 & 4 structures are less than 250' in height and over a mile from the meteorological towers. Instrument shelter heights are less than 11 ft, which is less than half of the lower level sensor height at 10m (33').
Wind sensors are located to reduce airflow modification and turbulence induced by the supporting structure itself.	Yes	Tower booms (8 feet long) are oriented into the prevailing winds to reduce tower effects on the measurements.
Air temperature and dew point sensors are located in such a way to avoid modification by the existing and proposed heat and moisture sources, such as ventilation systems, water bodies, or the influence of large parking lots or other paved surfaces.	Yes	No large water body , ventilation systems, and or large parking lots within 1000' of the tower. The ground surface at the base of the towers has been kept natural (i.e., grasses). It is expected that winds from the south to southwest would have an influence on observed meteorological data; however, the data collected from sensors will be representative of the plant site due to the size and location of the MCR.

		Temperature sensors are mounted in downward pointing fan-aspirated radiation shields to minimize the adverse influences of thermal radiation and precipitation.
Precipitation measured at ground level near the base of the tower.	Yes	Precipitation gauge is equipped with wind shields to minimize the wind-caused loss of precipitation.

For Item (b), text as shown below is to be added as a new paragraph at the end of FSAR Subsection 2.3S.4.1:

Portions of the EAB and the outer boundary of the LPZ extend over the MCR. Smaller surface roughness induced by the MCR would result in less turbulence, and consequently generates slightly higher χ/Q_s at portions of the EAB and the LPZ that extend over the MCR. However, reduced surface roughness would also increase ambient wind speed slightly and reduce the χ/Q_s due to better dispersion. The above effects counter each other and subsequently minimize the net effect of reduced surface roughness on the offsite short-term atmospheric dispersion estimates.

RAI 02.03.05-6:**QUESTION:**

This question is related to the applicant's response to RAI 02.03.05-1. The staff finds the response to RAI 02.03.05-1 incomplete.

Expand the proposed FSAR discussion on the impact of the main cooling reservoir on routine release atmospheric dispersion estimates to include the impact of reduced surface roughness resulting from over-water trajectories.

RESPONSE:

Portions of the EAB and the outer boundary of the LPZ extend over the MCR. Smaller surface roughness over the MCR would result in less turbulence, and consequently generates slightly higher χ/Q_s . However, reduced surface roughness over the MCR would increase wind speed and reduce the χ/Q_s due to increased along wind transport. The net effect of reduced surface roughness on the offsite short-term atmospheric dispersion estimates is expected to be minimal.

To address the influence of the MCR on routine atmospheric dispersion estimates, the new paragraph proposed for insertion between paragraphs six and seven of FSAR Subsection 2.3S.5.1 in response to RAI 02.03.05-1 will be expanded and the seventh paragraph will be revised as follows:

Distances from the STP 1 & 2 reactors to various receptors of interest (i.e., nearest residence, meat animal, EAB boundaries, and vegetable garden) for each directional sector are provided in the STP 1 & 2 Offsite Dose Calculation Manual (Reference 2.3S-54). The shortest distances from the STP 3 & 4 Reactor Buildings to these same receptors of interest are recalculated for each directional sector. The results are presented in Table 2.3S-26.

Smaller surface roughness leads to minimal changes in χ/Q values. Lower surface roughness over the MCR would increase wind speeds resulting in lower χ/Q values. This is balanced by decreasing production of mechanical turbulence, leading to decreased dispersion and higher χ/Q . The decrease in turbulence is also offset by the increased destabilization over the MCR due to the heating from below of the overwater trajectories. Warm water in the MCR heating ambient air from below will destabilize the atmosphere passing over the MCR. Increased instability will, in turn, enhance local dispersion, lowering overall routine release χ/Q values. In addition, Sea Breezes from the Gulf of Mexico will tend to increase routine release χ/Q values due to local air recirculation. The cool air moving from the Gulf of Mexico will tend to stabilize the atmosphere, in addition to the recirculation of polluted air.

To account for possible effects from Matagorda Bay and the Gulf of Mexico on local meteorological conditions, default correction factors were implemented in the

XOQDOQ (and PAVAN) model(s). These factors were implemented to satisfy section C2.c of RG 1.111 (Reference 2.3S-45) and properly account for possible recirculation due to land-water boundaries, which could raise χ/Q values in an open terrain area such as the STP plant site.

RAI 02.03.05-7

QUESTION:

This question is related to the applicant's response to RAI 02.03.05-5.

Revise the FSAR to state that the no decay and 2.26 day decay χ/Q values presented in Table 2.3S-27 assume no dry deposition and the 8 day decay χ/Q values presented in the same table assume dry deposition.

RESPONSE:

The FSAR will be revised (Subsection 2.3S.5.2, 1st paragraph) as shown below:

Table 2.3S-27 summarizes the maximum relative concentration and relative deposition (i.e., χ/Q and D/Q) values predicted by the XOQDOQ model for identified sensitive receptors of interest in the STP site area due to routine releases of gaseous effluents. The listed maximum χ/Q values reflect several plume depletion scenarios that account for radioactive decay: no decay and the default half-life decay periods of 2.26 and 8 days. The no decay and 2.26 day decay χ/Q values assume no dry deposition and the 8 day decay χ/Q values assume dry deposition.

Response Date Extensions for RAI Questions

RAI Question	Reason for Extension	Extended Response Date
02.04.04-9	The response to this question about the flooding due to the postulated breach of the main cooling reservoir (MCR) will be provided based on the new analysis being performed. Multiple methods had to be evaluated in order to effectively model this analysis because of its size and complexity, and reasonable results have been obtained. Additional time is required to complete the calculation, formalize the results, and prepare the proposed changes to the COLA.	January 30, 2009
02.04.04-10	This RAI requires a determination of the composition of the flood wave with respect to the sediment carried with the flow, including dynamic and impact forces during the postulated breach of the MCR, which is dependent upon the response to RAI 02.04.04-9 as discussed above.	January 30, 2009
02.04.14-1	Evaluation of severe hydrology-related events (levee breach, heavy rain, hurricane, tsunami, etc.) needed for preparation of the MCR emergency operating procedures is required for this response, which is also dependent upon the response to RAI 02.04.04-9 as discussed above.	January 30, 2009