

PMComanchePeakPEm Resource

From: Monarque, Stephen
Sent: Friday, February 26, 2010 2:08 PM
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Cc: ComanchePeakCOL Resource; Magee, Michael
Subject: Comanche Peak RCOL Chapter 2.4.12 - RAI Number 147
Attachments: RAI 4314 (RAI 147).doc

The NRC staff has identified that additional information is needed to continue its review of the combined license application. The NRC staff's request for additional information (RAI) is contained in the attachment. Luminant is requested to inform the NRC staff if a conference call or public meeting is needed.

The response to this RAI is due within 35 calendar days of February 26, 2010.

Note: If changes are needed to the safety analysis report, the NRC staff requests that the RAI response include the proposed changes.

thanks,

Stephen Monarque
U. S. Nuclear Regulatory Commission
NRO/DNRL/NMIP
301-415-1544

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Request for Additional Information (RAI) No. 4314 COL Revision 1

RAI Number 147

2/26/2010

Comanche Peak Units 3 and 4
Luminant Generation Company, LLC.
Docket No. 52-034 and 52-035
SRP Section: 02.04.12 - Groundwater
Application Section: FSAR Section 2.4.12

QUESTIONS for Hydrologic Engineering Branch (RHEB)

02.04.12-8

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.12, 'Groundwater,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

By letter dated October 2, 2009, the NRC staff issued RAI ID 3672 (RAI No. 114) Question Number 14266 (02.04.12-1), in which the NRC staff asked, "Provide a description of the process followed to determine the conceptual models subsequently used to establish subsurface site characteristics related to groundwater to ensure that the most conservative of plausible conceptual models have been identified."

The applicant responded in document CP-200901564-Log No TXNB-09067-(ML093230704) executed on November 13, 2009. The NRC staff has reviewed the response and has determined that additional information is needed in order to complete its review.

The staff determined that an adequate description of the processes used to develop conservative conceptual models used subsequently in the accidental release evaluations was not sufficiently provided in the RAI response. The information provided in the response has numerous assumptions and lacked adequate conceptual description, data, and analyses to characterize the site alterations and how these alterations affect the hydrologic processes at the site. For example, it is assumed that there will not be any shallow groundwater at the site after construction is completed because the A and B zones will be entirely removed and the surface water drainage system will be designed to prevent subsurface infiltration.

Also, the NRC staff disagrees with a statement, which was made intermittently throughout the RAI responses and the combined license application, Revision 1 Part 2 FSAR, that groundwater within the Glen Rose Formation is "not real groundwater". This statement is unsupported since on the basis of data presented, the NRC staff asserts that the Glen Rose Formation is indeed a groundwater bearing perched aquifer.

In order to make its safety determination based on adequate characterization of the site, the NRC staff requests that the applicant provide the information below. The responses should follow guidance related to the analysis of groundwater related hazards through compliance with this and the accompanying RAIs.

1. Provide adequate conceptual and site specific information on how the surface water and groundwater flow system is expected to change after Comanche Peak Nuclear Power Plant, Units 3 and 4 are constructed.
2. Provide an adequate site conceptual model supported by data, analyses and construction design information to support the conclusions presented.

This is supplemental RAI 2.4.12-00-S.

02.04.12-9

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.12, 'Groundwater,' establishes criteria that staff intends to use to evaluate whether an applicant meets the NRC's regulations.

By letter dated October 2, 2009, the NRC staff issued RAI ID 3672 (RAI No. 114) Question Number 14267 (02.04.12-2), in which the NRC staff asked "The CPNPP Units 1 and 2 FSAR states that alterations related to construction increased groundwater levels onsite. In order to understand the effect of construction of Units 3 and 4 on the hydrologic characteristics of the subsurface, plausible groundwater pathways, and site groundwater levels, Luminant is requested to provide a detailed description of the location and extent of planned construction activities including: excavation of regolith/undifferentiated fill and bedrock, the placement of engineered fill and the addition of engineered features (such as drainage ditches, parking lots, roads, etc.). Additionally, please evaluate and discuss the impact of these changes on site hydrologic processes such as infiltration, surface runoff, groundwater levels, hydraulic gradients and flow paths."

The applicant responded in document CP-200901564-Log No TXNB-09067-(ML093230704) executed on November 13, 2009. The NRC staff has reviewed the response and has determined that additional information is needed in order to complete its review.

The staff acknowledges that the additional information provided in the response partially satisfies the information need with regard to the post-construction site conditions. However, the information provided did not incorporate adequate description of the location and extent of planned construction activities including: excavation of regolith, undifferentiated fill and bedrock, the placement of engineered fill and the addition of engineered features (such as drainage ditches, subsurface drains, parking lots, roads, etc.)

The NRC staff provides the following examples that demonstrate some of the inadequacies in the description and level of details provided within the response.

- 1) The applicant stated that there will not be any shallow groundwater at the site after construction is completed because the A and B zones will be removed and the surface water drainage system will be designed to prevent subsurface infiltration and preclude buildup near plant foundations. However, these statements are not sufficient to illustrate that the system will function as designed and to establish a maximum operational groundwater level and ensure compliance with the US-APWR design parameter groundwater level. In fact, Section 2.4.13 of the FSAR for Units 1 and 2 states that

construction activities actually created areas where water levels were elevated due the placement of permeable fill materials. The data and evaluations presented are not adequate and of sufficient detail to show that this will not occur at the Units 3 and 4 site. For example, Figures 2.4.12-213 and 2.4.12-214 show new fill around many of the new structures but it is not clear how and if this new fill will be drained and what post-construction groundwater and surface water conditions (flow and levels) will be like.

2) The water level hydrographs from B-zone monitoring wells MW1201b (middle of Unit 4) and MW1207b (just north of Unit 3) have water level elevations of over 830 ft. The screened interval for these wells extends to elevations of 808 ft and 803 ft, respectively, which is well below the 822 ft site grade. This suggests that at least some portion of the water bearing B-zone could remain after the site grading is completed. The applicant has stated that it will all be removed.

In order to make its safety determination based on adequate characterization of the site that depicts the post-construction scenario adequately, the NRC staff requests that the applicant provide the following information.

- 1) A qualitative description of the construction related impacts that could affect site hydrology including maps at a legible scale, sufficiently detailed engineering design information on drainage systems and a description of conservative measurements or estimates of hydrologic parameters. This information should be of sufficient detail to support an analysis of the impact of site modifications on site hydrologic processes such as infiltration, surface runoff, groundwater levels, hydraulic gradients and flow paths.
- 2) A conservative quantitative analysis that demonstrates that the estimated maximum operational groundwater level complies with the US-APWR Design Certification Document.

This is supplemental RAI 2.4.12-01-S.

02.04.12-10

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.12, 'Groundwater,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

By letter dated October 2, 2009, the NRC staff issued RAI ID 3672 (RAI No. 114), Question Number 14268 (02.04.12-3), in which the NRC staff asked "In accordance with 10 CFR 52.79(a) provide illustrations of cross-sections through the centerline of each proposed reactor area which present the post-construction site configuration, hydrogeological units beneath the site (including the Twin Mountains Formation and bedrock transition zone found in the Glen Rose), monitoring wells and borings used as control points and probable directions of groundwater movement. Also provide maps displaying post-construction site features and conceptualize post-construction groundwater conditions."

The applicant responded in document CP-200901564-Log No TXNB-09067-(ML093230704) executed on November 13, 2009. The NRC staff has reviewed the

response and has determined that additional information is needed in order to complete its review.

The staff acknowledges that cross-sections were included in the applicant's response as Figures 2.4.12-213 and 2.4.12-214 and Figures 2.5.4-209 through 211. While these cross-sections contain useful and related information they do not satisfy the intent of the original RAI, which was to illustrate the post-construction conceptual site configuration by incorporating description of conceptual hydrologic conditions (such as groundwater levels, flow directions, etc.) and site hydrogeology with associated well or boring control points through the Twin Mountains Formation on one set of cross-sections.

Information provided in the cross-sections does not clearly show the anticipated surface and groundwater conditions. The flowpaths presented in these cross-sections are simple straight lines with little documentation or maps to support the selection of these specific pathways as the most probable result of post-construction conditions. The interaction between surface water and groundwater is important and there are insufficient details on expected interactions post-construction.

In order to make its safety determination based on adequate characterization of the site, the NRC staff requests that the applicant provide cross-sections through the centerline of each proposed reactor area which present on the same figure the post-construction site configuration, hydrogeological units beneath the site (including the Twin Mountains Formation and bedrock transition zone found in the Glen Rose), monitoring wells and borings used as control points and probable directions of groundwater movement. Also provide maps displaying post-construction site features and conceptualize post-construction groundwater conditions.

This is supplemental RAI 2.4.12-02-S.

02.04.12-11

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.12, 'Groundwater,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

By letter dated October 2, 2009, the NRC staff issued RAI ID 3672 (RAI No. 114), Question Number 14269 (02.04.12-4), in which the NRC staff asked "In order to understand impacts of seasonality and climatic fluctuations on aquifers beneath and in the vicinity of the site, the Applicant is requested to provide the following information: (a) Explain or discuss any trends or fluctuations in data from onsite monitoring wells, which will be displayed on the revised hydrographs submitted as part of the Applicant's response to Environmental RAI HYD-06; (b) Correlate data from onsite monitoring wells to monitoring data from area wells with longer records, and provide a discussion of any apparent seasonal and climatic trends and aquifer response to historic precipitation conditions; and (c) Identify current precipitation conditions at the site (i.e., wet, normal or drought conditions) and evaluate and discuss the effect that long-term wet and dry periods will have on the post-construction groundwater conditions and compliance with the design criteria maximum groundwater level."

The applicant responded in document CP-200901564-Log No TXNB-09067-(ML093230704) executed on November 13, 2009. The NRC staff has reviewed the

response and has determined that additional information is needed in order to complete its review.

The staff determined that the applicant's response does not adequately address parts (b) and (c) of the RAI. As presented in the RAI response to part (b), it was determined during the site audit that due to the location of Squaw Creek Reservoir to the north, east and south-east of the site, data from offsite wells within the Glen Rose Formation would not likely be helpful in confirming flow directions in the vicinity of the site. However, an evaluation of groundwater level trends in any nearby offsite wells which may exist is still needed to better understand the response of the aquifer to long-term hydro-climatic stresses such as changes in precipitation and evapotranspiration.

In response to part (c) the applicant asserted that long term climatic changes would have minimal effect due to the limited number of wells exhibiting seasonal and long-term fluctuations and the planned removal of a large portion of the Glen Rose Formation. The staff agrees that aquifer response to precipitation may not be seen in all wells in the Glen Rose Formation. However, fluctuations of several feet are observed in several wells. The staff also understands that a large portion of the Glen Rose Formation near the site will be removed. However, the extent of this removal is not clear to the staff and it appears that after removal, water-bearing portions of the Glen Rose Formation may be left intact in the vicinity of the site.

In order to make its safety determination based on adequate characterization of the site and description of the hydrologic causal mechanisms that govern groundwater flow processes at the site, the NRC staff requests that the applicant provide the following information.

- 1) Discussion on long-term groundwater trends based on data from nearby wells with longer periods of monitoring
- 2) Description of how current precipitation conditions relate to normal or extreme precipitation conditions (wet, normal, and dry).
- 3) Description of impacts of groundwater level fluctuations due to changes in precipitation conditions on the maximum operational groundwater level determined in response to RAI 2.4.12-01-S.

This is supplemental RAI 2.4.12-03-S-a.

02.04.12-12

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.12, 'Groundwater,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

By letter dated October 2, 2009, the NRC staff issued RAI ID 3672 (RAI No. 114), Question Number 14269 (02.04.12-4), in which the NRC staff asked "In order to understand impacts of seasonality and climatic fluctuations on aquifers beneath and in the vicinity of the site, Luminant is requested to provide the following information: (a) Explain or discuss any trends or fluctuations in data from onsite monitoring wells, which will be displayed on the revised hydrographs submitted as part of Luminant's response to Environmental RAI HYD-06; (b) Correlate data from onsite monitoring wells to

monitoring data from area wells with longer records, and provide a discussion of any apparent seasonal and climatic trends and aquifer response to historic precipitation conditions; and (c) Identify current precipitation conditions at the site (i.e., wet, normal or drought conditions) and evaluate and discuss the effect that long-term wet and dry periods will have on the post-construction groundwater conditions and compliance with the design criteria maximum groundwater level.”

The applicant responded in document CP-200901564-Log No TXNB-09067-(ML093230704) executed on November 13, 2009. The NRC staff has reviewed the response and has determined that additional information is needed in order to complete its review.

The NRC staff determined that the hydrographs with rainfall data provided by the applicant’s response do not provide adequate information to determine whether the data demonstrates equilibrium conditions since water levels in some wells are still increasing.

In order to make its safety determinations based on the most current and reliable information, the staff requests that the applicant provide updated hydrographs with more recent data.

This is supplemental RAI 2.4.12-03-S-b.

02.04.12-13

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.12, 'Groundwater,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC’s regulations.

By letter dated October 2, 2009, the NRC staff issued RAI ID 3672 (RAI No. 114), Question Number 14270 (02.04.12-5), in which the NRC staff asked “The four groundwater flow paths and related travel time scenarios presented in FSAR Section 2.4.12.3 are based on current site conditions. To demonstrate compliance with 10 CFR 100.20(c), which requires consideration of site characteristics which may affect flow and transport, please evaluate the applicability of these flowpaths in a post-construction setting and provide a revised description of the most conservative, plausible post-construction flowpaths, if needed.”

The applicant responded in document CP-200901564-Log No TXNB-09067-(ML093230704) executed on November 13, 2009. The NRC staff has reviewed the response and has determined that additional information is needed in order to complete its review.

The staff noted that groundwater levels in wells MW-1200b and MW-1202B are labeled as anomalous on Figures 2.4.12-210 sheets 6 through 8. However, Table 2.4.12-209 shows that the water levels measured in the wells were relatively consistent throughout the period of monitoring. The information lacks adequate description of why the values from these wells are considered anomalous and not included as part of the potentiometric contouring on Figures 2.4.12-210. If included, the data could indicate that water levels within B-zone are lower to the west of the Unit 4 reactor site and that groundwater may flow from Unit 4 to the west.

The NRC staff also noted that the four flowpaths currently presented in the FSAR represent the shortest straight line from the proposed Units to SCR. As a result, the resultant flowpaths may not be realistically representative of the post-construction environment.

In order to make its safety determination based on information that adequately demonstrates conservatism and consideration of the post-construction conditions at the site, the staff requests that flowpaths be based upon post-construction site conditions, as determined in the analyses performed in response to RAI 2.4.12-01. In addition, if the anomalous nature of the water level measurements from wells MW-1200b and MW-1202b cannot be adequately explained, the staff requests that the applicant evaluate the potential of flowpaths to the west away from Unit 4.

This is supplemental RAI 2.4.12-04-S.

02.04.12-14

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.12, 'Groundwater,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

By letter dated October 2, 2009, the NRC staff issued RAI ID 3672 (RAI No. 114), Question Number 14271 (02.04.12-6), in which the NRC staff asked "To satisfy 10 CFR 100.20(c) as it relates to evaluating site characteristics important to hydrology, explain how the parameters selected for travel time calculations conservatively represent parameters which may be expected along post-construction flowpaths. Specifically: (a) Present the range of effective porosities in hydrologic units along potential flowpaths including engineered fill, and describe why lower measured values presented in Chapter 2.5 of the FSAR were not used; (b) Discuss how averaging of literature values for the effective porosity of the regolith and bedrock (from Reference 2.4-261 of the FSAR), and the use of total porosity in the undifferentiated fill demonstrate conservatism; and (c) Explain the rationale behind the use of hydraulic conductivity values which are less than the highest values determined through onsite aquifer testing."

The applicant responded in document CP-200901564-Log No TXNB-09067-(ML093230704) executed on November 13, 2009. The NRC staff has reviewed the response and has determined that additional information is needed in order to complete its review.

The NRC staff acknowledges that in response to parts (a) and (b) of the RAI question, the applicant has revised the calculations and used a porosity of 11.9% for the C-zone limestone. However, in Section 2.5 of the FSAR it is estimated that the limestone beds at the site have an average "total" porosity of 11.9%. Effective porosity would be substantially lower than 11.9% especially since average moisture content of the limestone reported in Section 2.5 was only 5%. Therefore, Staff finds that the Applicant's assumption of an effective porosity of 11.9% to be not conservative for the C-zone limestone.

In order to make its safety determination based on consideration of conservative estimates for parameters that govern the hydrologic processes at the site, the staff requests that the applicant use more conservative assumptions for effective porosity for

the lateral and vertical migration scenarios or provide additional justification for the conservatism of existing assumptions.

This is supplemental RAI 2.4.12-05-S-a.

02.04.12-15

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.12, 'Groundwater,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

By letter dated October 2, 2009, the NRC staff issued RAI ID 3672 (RAI No. 114), Question Number 14271 (02.04.12-6), in which the NRC staff asked "To satisfy 10 CFR 100.20(c) as it relates to evaluating site characteristics important to hydrology, explain how the parameters selected for travel time calculations conservatively represent parameters which may be expected along post-construction flowpaths. Specifically: (a) Present the range of effective porosities in hydrologic units along potential flowpaths including engineered fill, and describe why lower measured values presented in Chapter 2.5 of the FSAR were not used; (b) Discuss how averaging of literature values for the effective porosity of the regolith and bedrock (from Reference 2.4-261 of the FSAR), and the use of total porosity in the undifferentiated fill demonstrate conservatism; and (c) Explain the rationale behind the use of hydraulic conductivity values which are less than the highest values determined through onsite aquifer testing."

The applicant responded in document CP-200901564-Log No TXNB-09067-(ML093230704) executed on November 13, 2009. The NRC staff has reviewed the response and has determined that additional information is needed in order to complete its review.

The NRC staff noted that the applicant's response to part (c) of the RAI reports that the hydraulic conductivity used for the horizontal flowpath was 1.37×10^{-5} cm/sec which is representative for the C-zone. If there is B-zone remaining after excavation is completed, a more conservative hydraulic conductivity value is warranted to be used for the remaining zone.

In order to make its safety determination based on consideration of current and correct information, the staff requests that the applicant confirm the existence of any remaining B-zone after excavation and discuss the selection of conservative post-construction porosities and hydraulic conductivities for the C-zone and B-zone.

This is supplemental RAI 2.4.12-05-S-b.

02.04.12-16

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.12, 'Groundwater,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

By letter dated October 2, 2009, the NRC staff issued RAI ID 3672 (RAI No. 114), Question Number 14271 which asked "To satisfy 10 CFR 100.20(c) as it relates to evaluating site characteristics important to hydrology, explain how the parameters

selected for travel time calculations conservatively represent parameters which may be expected along post-construction flowpaths. Specifically: (a) Present the range of effective porosities in hydrologic units along potential flowpaths including engineered fill, and describe why lower measured values presented in Chapter 2.5 of the FSAR were not used; (b) Discuss how averaging of literature values for the effective porosity of the regolith and bedrock (from Reference 2.4-261 of the FSAR), and the use of total porosity in the undifferentiated fill demonstrate conservatism; and (c) Explain the rationale behind the use of hydraulic conductivity values which are less than the highest values determined through onsite aquifer testing.”

The applicant responded in document CP-200901564-Log No TXNB-09067-ML093230704 executed on November 13, 2009. The NRC staff has reviewed the response and has determined that additional information is needed in order to complete its review.

During the review of groundwater velocity and travel time calculations presented in Table 2.4.211, the staff found several items that made it impossible to reproduce the velocities and travel times results for each pathway using the parameters and assumptions presented in the FSAR. The items identified are explained as follows:

a) Using the Applicant's assumptions provided in Table 2.4.12-211, the staff performed a confirmatory analyses for travel time and velocity. The staff was not able to recreate velocities and travel times reported by the Applicant in Table 2.4.12-211.

b) In Table 2.4.12-211, the water levels reported from wells MW-1217a (Scenario 1, Pathway 3a) and MW-1215a (Scenario 2, Pathway 4a) are incorrect. The values are actually the same as the values reported for wells MW-1217b and MW-1215b, respectively.

c) Table 2.4.12-211 and Section 2.4.12.3.1 (page 2.4-57) report that a hydraulic conductivity value of 1.37×10^{-5} cm/sec was used in the travel time calculations. However, in Section 2.4.12.3 (page 2.4-56) the upper value for hydraulic conductivity within the shallow bedrock is reported as 1.037×10^{-5} cm/sec.

In order to make its safety determination based on current, correct, and conservative estimates of parameters that govern the hydrologic processes at the site, the staff requests the following information.

- 1) Pursuant to issue (a), document all parameter values used in the calculations (including the path length for each scenario), and, if necessary revise the FSAR to include corrected results.
- 2) Pursuant to issue (b), correct either the well names or the starting head values for the calculation and revise the calculation as appropriate.
- 3) Pursuant to issue (c) determine which of these values is correct and revise the calculation as appropriate.

This is supplemental RAI 2.4.12-05-S-c.

02.04.12-17

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.12, 'Groundwater,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

By letter dated October 2, 2009, the NRC staff issued RAI ID 3672 (RAI No. 114), Question Number 14272 (02.04.12-7), in which the NRC staff asked "Section 2.4.12.2.5 of the Update Tracking Report, Rev. 0, dated April 2, 2009, 'Technical Correction Version' of the FSAR dated March 31, 2009 states that the undifferentiated fill, regolith and the shallow Glen Rose Formation which generally coincide with monitoring well zones "a" and "b", will be removed during construction in the power block area. Despite this excavation, it appears that groundwater bearing portions of these formations with water levels, inferred to be above the design maximum groundwater level (on Figures 2.4.12-210 of the FSAR), will be left in place after construction. In accordance with 10 CFR 100.21(d) demonstrate that the maximum operational groundwater level will comply with the design maximum groundwater level."

The applicant responded in document CP-200901564-Log No TXNB-09067-ML093230704 executed on November 13, 2009. The NRC staff has reviewed the response and has determined that additional information is needed in order to complete its review.

The staff disagrees with the applicant's assertion that there will be no groundwater at the site during the post-construction phase. Data from Units 1 and 2 show that construction activities can create areas where water levels are elevated due the placement of permeable fill materials. Figures 2.4.12-213 and 2.4.12-214 show new fill around many of the new structures, but it is not clear how and if this new fill will be drained and what the details will be for post-construction groundwater and surface water conditions (flow and levels). Seasonal trends in groundwater elevation related to seasonal rainfall recharge are obvious with as much as 10 ft of variation between wet and dry seasons in the A-zone and 5 ft in the B-zone (which will not be entirely excavated during construction).

In order to make its safety determination based on site configuration that reflects the engineered fill materials and changes to the onsite hydrologic processes, the NRC staff requests that the applicant provide a conservative analysis of maximum operational groundwater level that takes into account the removal of portions of Zone-B and takes into account the fact that the area surrounding the excavated and backfilled area of the site still has the potential for lateral inflow. The analyses should include an evaluation of any surface and subsurface drainage systems that will be implemented to maintain groundwater levels below the Design Control Document design criteria.

This is supplemental RAI 2.4.12-06-S.