

PMBelCOL NPEmails

From: Christopher Cook
Sent: Tuesday, July 29, 2008 8:55 AM
To: Henry Jones; Lance Vail; Philip.Meyer@pnl.gov; Stephen A. Breithaupt
Subject: final BLN RAIs
Attachments: eRAI_AllQuestions.pdf

All,
The BLN RAIs have all gone out to TVA. Here's a copy of the final versions for your records.

Regards,
Chris

Christopher B. Cook, Ph.D.
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Hearing Identifier: Bellefonte_COL_NonPublic_EX
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From: Christopher Cook

Created By: Christopher.Cook@nrc.gov

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This Site: RAI

RAI > [Questions](#) > Bellefonte Units 3 and 4 - 02.04.02 - Floods - Question 1349

Questions : Bellefonte Units 3 and 4 - 02.04.02 - Floods - Question 1349

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Title	Bellefonte Units 3 and 4 - 02.04.02 - Floods - Question 1349
RAI ID	422
Status	Reviewed (Final)
Acceptance Criteria	10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c)
Question Type	Application Specific
Description	<p>TVA should justify use of the Christofano methodology to model dam embankment breaching and document their justification for use of this method. TVA needs to also provide a copy of the Christofano reference. This issue is associated with Attachment 5, item 47, of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).</p> <p>Note: Subsequent to the hydrology-related safety site trip the staff received a May 23, 2008, letter from the U.S. Department of the Interior Bureau of Reclamation regarding the use of the Cirstofano method (see ADAMS ML081570447). The letter states in part that "the method developed in 1965, by Eugene A. Cristofano of the Bureau of Reclamation for computing the erosion rate for failure of an earthfill dam is no longer being actively used by our agency."</p>
Relates to Question	
Question Number	02.04.02-1
Answer	
Official Response Date	
Response Accession #	
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Questions : Bellefonte Units 3 and 4 - 02.04.02 - Floods - Question 1357

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Title	Bellefonte Units 3 and 4 - 02.04.02 - Floods - Question 1357
RAI ID	422
Status	Reviewed (Final)
Acceptance Criteria	10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c)
Question Type	Application Specific
Description	TVA should provide the NRC staff with Geographic Information System shape files of the new cross sections used in the updated simulated open channel hydraulics (SOCH) for Chickamauga, Nickajack and Guntersville reservoirs. This issue is associated with Attachment 5, item 49, of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).
Relates to Question	
Question Number	02.04.02-2
Answer	
Official Response Date	
Response Accession #	
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Questions : Bellefonte Units 3 and 4 - 02.04.02 - Floods - Question 1358

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Title	Bellefonte Units 3 and 4 - 02.04.02 - Floods - Question 1358
RAI ID	422
Status	Reviewed (Final)
Acceptance Criteria	10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c)
Question Type	Application Specific
Description	TVA should provide diagrams of dam cross sections for: 1) the tributary dams found to be controlling during seismic events, and 2) all main stem dams. The diagrams should clearly show flood levels and assumed sections of the dam that fail and how they are postulated to fail for the given event. TVA should also include a diagram of the Dallas Bay area above Chickamauga Dam such that the diagram shows how at high reservoir levels this area will provide a flow path for bypassing the Chickamauga Dam. TVA needs to perform sensitivity runs to evaluate the impacts of modifying the Chicamauga lock. TVA should also consider how potential impacts from future modifications of the Chicamauga lock should be captured in the Bellefonte 3 and 4 licensing basis. This issue is associated with Attachment 5, item 50, of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).
Relates to Question	
Question Number	02.04.02-3
Answer	
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Questions : Bellefonte Units 3 and 4 - 02.04.02 - Floods - Question 1359

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Title	Bellefonte Units 3 and 4 - 02.04.02 - Floods - Question 1359
RAI ID	422
Status	Reviewed (Final)
Acceptance Criteria	10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c)
Question Type	Application Specific
Description	The applicant should clarify in the final safety analysis report the wind wave runup calculation from the U.S. Army Corps of Engineers reference (Coastal Engineering Manual). This issue is associated with Attachment 5, item 51, of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).
Relates to Question	
Question Number	02.04.02-4
Answer	
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Questions : Bellefonte Units 3 and 4 - 02.04.02 - Floods - Question 1360

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Title	Bellefonte Units 3 and 4 - 02.04.02 - Floods - Question 1360
RAI ID	422
Status	Reviewed (Final)
Acceptance Criteria	10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c)
Question Type	Application Specific
Description	TVA should check consistency between winds speeds reported in Section 2.3 and wind speed used in Subsection 2.4.3.6 of the final safety analysis report (FSAR) and make appropriate changes to the FSAR. This issue is associated with Attachment 5, item 52, of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).
Relates to Question	
Question Number	02.04.02-5
Answer	
Official Response Date	
Response Accession #	
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Questions : Bellefonte Units 3 and 4 - 02.04.02 - Floods - Question 1624

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Title	Bellefonte Units 3 and 4 - 02.04.02 - Floods - Question 1624
RAI ID	422
Status	Reviewed (Final)
Acceptance Criteria	10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c)
Question Type	Application Specific
Description	TVA should provide a sensitivity run to investigate the effects of peaking each sub-basin unit hydrograph to account for non-linear behavior of the watershed during the probable maximum flood (PMF). This sensitivity run is discussed in the summary of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).
Relates to Question	
Question Number	02.04.02-6
Answer	
Official Response Date	
Response Accession #	
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RAI > Questions > Bellefonte Units 3 and 4 - 02.04.02 - Floods - Question 1703

Questions : Bellefonte Units 3 and 4 - 02.04.02 - Floods - Question 1703

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Title	Bellefonte Units 3 and 4 - 02.04.02 - Floods - Question 1703
RAI ID	422
Status	Reviewed (Final)
Acceptance Criteria	10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c)
Question Type	N/A
Description	<p>During the May 13 -16, 2008, hydrology-related safety site trip the staff identified eleven items that should be clarified/corrected in the April 17, 2008 draft white paper (ADAMS accession number ML081120497) before the white paper is finalized. This issue is associated with Attachment 5, item 54, of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).</p> <ol style="list-style-type: none"> 1) Appendix A figures present observed elevations that fall outside the guide curves. TVA will expand their discussion of these figures in the next version of the white paper to explain these variations. 2) Section 4.1, last paragraph (Page 11) refers to “studies done by others and unpublished work by TVA.” TVA is to provide clarification of these studies in the white paper and provide copies of the studies for staff review during the June 23, 2008 Knoxville trip. 3) Using figure 7 and 8 as an example, curves are identified as being “reproduced by composite unit graph.” TVA is to provide an explanation in the text where further information on how these figures were developed can be found. 4) On figure 10, TVA is to resolve whether or not the “Blue dots” represent real data. 5) On figure 12, TVA is to explain the note on the graph that states “Hoch’s estimated inflow.” 6) Using figure 13 as an example, TVA is to develop text to describe the method used to develop the curve.

- 7) Page 27 section 4.2.1 TVA is to clarify overall text on what is meant by stable model and stability criteria and tie this discussion to page 32.
- 8) Page 32, last paragraph TVA is to change the word "disadvantage" to "advantage."
- 9) Page 36 Section 4.2.5 first paragraph last sentence TVA is to clarify the the relationship between HEC-2 and the SOCH code.
- 10) Figure 30 through figure 39, TVA will clarify the run sequence associated with these figures in the white paper.
- 11) In Section 5.3 TVA is to expand the white paper discussion regarding work crew access for reservoir operations during and after the antecedent storm and will include a discussion of the Memorandum of Understanding with the US Army Corps of Engineers.

Relates to Question

Question Number 02.04.02-7

Answer

Official Response Date

Response Accession #

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RAI > Questions > Bellefonte Units 3 and 4 - 02.04.02 - Floods - Question 1704

Questions : Bellefonte Units 3 and 4 - 02.04.02 - Floods - Question 1704

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Title	Bellefonte Units 3 and 4 - 02.04.02 - Floods - Question 1704
RAI ID	422
Status	Reviewed (Final)
Acceptance Criteria	10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c)
Question Type	N/A

Description
 During the May 13 -16, 2008, hydrology-related safety site trip the staff and TVA identified nine commitments in the applicant's draft white paper dated April 17, 2008 (ADAMS accession number ML081120497) regarding the simulated open channel hydraulics (SOCH) code used in the probable maximum flood and dam breach analysis. These commitments relate to future actions by TVA. The purpose of this question is to track these commitments to resolution. This issue is associated with Attachment 5, item 53, of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).

A location for the commitments in the white paper is as follows:

- 1) Bottom of page 34 last sentence includes a commitment for a comparative analysis.
- 2) Cover letter for the white paper indicates that an update will be provided the week of May 26, 2008.
- 3) Page 52, section 5.3.1, first paragraph last sentence includes a commitment regarding the verification process.
- 4) Page 60 last paragraph contains a commitment regarding the verification process.
- 5) Page 62 first and second bullets contain commitments regarding bathymetry data.
- 6) Page 62 contains commitments regarding the analysis of the 2003 flood.
- 7) Page 62 contains commitments regarding updating and verifying hydrographs.
- 8) Page 62 contains commitments that updated models will be used.
- 9) Page 62 contains commitments regarding reservoir operating guides and spillway rating curves being reviewed.

Relates to Question

Question Number 02.04.02-8

Answer

Official Response Date

Response Accession #

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RAI > Questions > Bellefonte Units 3 and 4 - 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers - Question 1282

Questions : Bellefonte Units 3 and 4 - 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers - Question 1282

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Title	Bellefonte Units 3 and 4 - 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers - Question 1282
RAI ID	398
Status	Reviewed (Final)
Acceptance Criteria	10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c)
Question Type	Application Specific
Description	Provide a description of the method used to estimate precipitation losses and perform a sensitivity analysis to investigate the effect of increasing the precipitation excess (decreasing the infiltration) in each sub-basin. Also please provide a copy of reference 3 of the white paper, Kohler, M.A., and R.K. Linsley, Research Paper No. 34, " Predicting the Runoff from Storm Rainfall", U.S. Department of Commerce, Weather Bureau, Washington, September 1951. This issue is associated with Attachment 5, item 41, of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).
Relates to Question	
Question Number	02.04.03-1
Answer	
Official Response Date	
Response Accession #	
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RAI > [Questions](#) > Bellefonte Units 3 and 4 - 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers - Question 1283

Questions : Bellefonte Units 3 and 4 - 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers - Question 1283

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Title	Bellefonte Units 3 and 4 - 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers - Question 1283
RAI ID	398
Status	Reviewed (Final)
Acceptance Criteria	10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c)
Question Type	Application Specific
Description	TVA should provide further explanation and justification for the use of the Goodrich semi-graphical method for tributary routings. This issue is associated with Attachment 5, item 43, of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).
Relates to Question	
Question Number	02.04.03-2
Answer	
Official Response Date	
Response Accession #	
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RAI > Questions > Bellefonte Units 3 and 4 - 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers - Question 1284

Questions : Bellefonte Units 3 and 4 - 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers - Question 1284

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Title	Bellefonte Units 3 and 4 - 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers - Question 1284
RAI ID	398
Status	Reviewed (Final)
Acceptance Criteria	10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c)
Question Type	Application Specific
Description	TVA needs to clarify FSAR text regarding dam-safety modifications (existing, anticipated, or not) for the Chickamauga Dam. This issue is associated with Attachment 5, item 44, of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).
Relates to Question	
Question Number	02.04.03-3
Answer	
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Response Accession #	
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RAI > Questions > Bellefonte Units 3 and 4 - 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers - Question 1289

Questions : Bellefonte Units 3 and 4 - 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers - Question 1289

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Title	Bellefonte Units 3 and 4 - 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers - Question 1289
RAI ID	398
Status	Reviewed (Final)
Acceptance Criteria	10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c)
Question Type	Application Specific
Description	<p>Description: Attachment 5, item 45, of the May 13-16, 2008 trip report stated that TVA should provide a subject matter expert to discuss the assumptions about the status of spillway gates and other adjustable structures during the PMF. During the trip (including staff's visit to Chickamauga Dam), TVA staff stated that six spillway bays will be out of service during construction of the new navigation lock at Chickamauga Dam. Once construction has been completed, only five spillway bays will be permanently out of service due to the new navigation lock.</p> <p>Commitment: TVA will perform and document sensitivity runs that compute the water surface elevation at the Bellefonte Site with Chickamauga Dam spillway gates out of service due to the new navigation lock. This includes both the construction (6 bays out-of-service) and operation (5 bays out-of-service) configurations.</p>
Relates to Question	
Question Number	02.04.03-4
Answer	
Official Response Date	
Response Accession #	
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RAI > Questions > Bellefonte Units 3 and 4 - 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers - Question 1290

Questions : Bellefonte Units 3 and 4 - 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers - Question 1290

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Title	Bellefonte Units 3 and 4 - 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers - Question 1290
RAI ID	398
Status	Reviewed (Final)
Acceptance Criteria	10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c)
Question Type	Application Specific
Description	TVA should provide a description of the method used to estimate the initial state of the reservoir, the reservoir state at the end of the antecedent storm and how these assumptions comply with Standard Review Plan 2.4.4 and GDC 2, Appendix A of 10 CFR 50. This issue is associated with Attachment 5, item 46, of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).
Relates to Question	
Question Number	02.04.03-5
Answer	
Official Response Date	
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RAI > Questions > Bellefonte Units 3 and 4 - 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers - Question 1291

Questions : Bellefonte Units 3 and 4 - 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers - Question 1291

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Title	Bellefonte Units 3 and 4 - 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers - Question 1291
RAI ID	398
Status	Reviewed (Final)
Acceptance Criteria	10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c)
Question Type	Application Specific
Description	TVA should provide a description of impacts on the probable maximum flood brought about by a change in the reservoir operation policy discussed in the Reservoir Operations Study conducted by TVA in 2004. This issue is associated with Attachment 5, item 48, of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).
Relates to Question	
Question Number	02.04.03-6
Answer	
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RAI > Questions > Bellefonte Units 3 and 4 - 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers - Question 1292

Questions : Bellefonte Units 3 and 4 - 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers - Question 1292

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Title	Bellefonte Units 3 and 4 - 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers - Question 1292
RAI ID	398
Status	Reviewed (Final)
Acceptance Criteria	10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c)
Question Type	Application Specific
Description	In order for staff to make a determination of reasonable assurance of adequate protection from flooding, the staff must ensure that the conceptual model(s) considered in the design basis evaluation represent the most conservative plausible model. The staff relies on the available data to determine which conceptual models are plausible and which conceptual models are implausible. The uncertainty resulting from a paucity of data is compensated for with more conservative conditions being considered. Provide a description of the process used to ensure that the conceptual models employed for a) site flooding b) Town Creek drainage flooding and c) regional flooding of the Tennessee River calculations are the most conservative plausible conceptual models.
Relates to Question	
Question Number	02.04.03-7
Answer	
Official Response Date	
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RAI > [Questions](#) > Bellefonte Units 3 and 4 - 02.04.06 - Probable Maximum Tsunami Flooding - Question 1425

Questions : Bellefonte Units 3 and 4 - 02.04.06 - Probable Maximum Tsunami Flooding - Question 1425

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Title	Bellefonte Units 3 and 4 - 02.04.06 - Probable Maximum Tsunami Flooding - Question 1425
RAI ID	440
Status	Reviewed (Final)
Acceptance Criteria	10 CFR 100.20(c), 10 CFR 100.23(d), and 10 CFR 52.79(a)(1)(iii)
Question Type	Application Specific
Description	TVA should check for consistency in sections throughout the FSAR related to hillslope failure-generated tsunami-like waves and correct any inconsistencies that are found. This issue is associated with Attachment 5, item 36, of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).
Relates to Question	
Question Number	02.04.06-1
Answer	
Official Response Date	
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RAI > Questions > Bellefonte Units 3 and 4 - 02.04.12 - Groundwater - Question 1280

Questions : Bellefonte Units 3 and 4 - 02.04.12 - Groundwater - Question 1280

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Title	Bellefonte Units 3 and 4 - 02.04.12 - Groundwater - Question 1280
RAI ID	396
Status	Reviewed (Final)
Acceptance Criteria	To meet the requirements of 10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c)
Question Type	Application Specific
Description	<p>Information provided in the FSAR on private residential water wells across Town Creek is from the 1980's. Specifically, the FSAR states that</p> <p style="padding-left: 40px;"><i>Private water wells listed in Table 2.4.12-201 were identified during construction of Bellefonte Units 1 and 2, and may have changed since these wells were surveyed. The State of Alabama does not require registration of private water wells; therefore, no records of existing or new private water wells were available. (FSAR 2.4.12.2.1, p. 2.4-49)</i></p> <p>The private residences across Town Creek are the groundwater users closest to the site with the greatest potential to be impacted by any site activities. Provide a description of the efforts undertaken to obtain updated information on these wells. Such information may include, but is not limited to, locations of private homes and other facilities likely to use water, areas served by public water supplies, locations of new wells, well depth, and water use. This issue is associated with Attachment 5, items 2 and 4, of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).</p>
Relates to Question	
Question Number	02.04.12-1
Answer	
Official Response Date	
Response Accession #	
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This Site: RAI

RAI > Questions > Bellefonte Units 3 and 4 - 02.04.12 - Groundwater - Question 1285

Questions : Bellefonte Units 3 and 4 - 02.04.12 - Groundwater - Question 1285

[New Item](#) | [Edit Item](#) | [Delete Item](#) | [Alert Me](#) | [Version History](#)

Title	Bellefonte Units 3 and 4 - 02.04.12 - Groundwater - Question 1285
RAI ID	397
Status	Reviewed (Final)
Acceptance Criteria	To meet the requirements of 10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c)
Question Type	Application Specific
Description	<p>Applicant stated at the hydrology site visit the week of May 13, 2008, that the private residential wells across Town Creek from the proposed plant were completed in the Knox Group, and that the Knox Group and Stones River Group are hydraulically isolated from each other. (Such isolation could help to protect the private residential wells if releases occurred at the plant.) The FSAR states that</p> <p style="text-align: center;"><i>Within the Knox Group deposits northwest of the BLN site, large shallow closed depressions in the land surface, or sinkholes, show where significant karst development has occurred. (FSAR 2.5.1.2.2, p. 2.5-35)</i></p> <p>Given the potential karst development of the Knox Group and the Stones River Group, provide the technical basis for the assumption that these formations are hydraulically isolated from each other in the area of Town Creek. This issue is associated with Attachment 5, item 8, of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).</p>
Relates to Question	
Question Number	02.04.12-2
Answer	
Official Response Date	
Response Accession #	
Attachments	View Attachments

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This Site: RAI

RAI > Questions > Bellefonte Units 3 and 4 - 02.04.12 - Groundwater - Question 1293

Questions : Bellefonte Units 3 and 4 - 02.04.12 - Groundwater - Question 1293

[New Item](#) | [Edit Item](#) | [Delete Item](#) | [Alert Me](#) | [Version History](#)

Title	Bellefonte Units 3 and 4 - 02.04.12 - Groundwater - Question 1293
RAI ID	404
Status	Reviewed (Final)
Acceptance Criteria	To meet the requirements of 10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c)
Question Type	Application Specific
Description	<p>The FSAR states that:</p> <p><i>During dry periods (July and August, 2006) a groundwater depression was observed adjacent to Town Creek to the northwest of Unit 3. This appears to represent a depletion of the epikarst aquifer and slow drainage into the lower bedrock zone. As precipitation events occur with greater frequency in September and the following fall and winter months, the epikarst aquifer refills and groundwater reestablishes its normal drainage pattern to Town Creek. (FSAR 2.4.12.2.3, p. 2.4-51; Fig. 2.4.12-214)</i></p> <p>This interpretation of the groundwater head observations indicates downward movement of groundwater at MW-1212. Discuss why and how such downward movement of groundwater may occur.</p> <p>This statement from the FSAR implies that the downward movement of groundwater (drainage into the lower bedrock zone) occurs only during relatively dry periods. Provide the technical basis for this conclusion. If the implication was not intended, provide a discussion of the relevance of the downward movement of groundwater at this location to subsurface pathways.</p> <p>Please provide any other plausible explanations for the groundwater depression.</p> <p>This issue is associated with Attachment 5, item 8, of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).</p>
Relates to Question	
Question Number	02.04.12-3
Answer	
Official Response Date	
Response Accession #	
Attachments	View Attachments

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This Site: RAI

RAI > Questions > Bellefonte Units 3 and 4 - 02.04.12 - Groundwater - Question 1294

Questions : Bellefonte Units 3 and 4 - 02.04.12 - Groundwater - Question 1294

[New Item](#) | [Edit Item](#) | [Delete Item](#) | [Alert Me](#) | [Version History](#)

Title	Bellefonte Units 3 and 4 - 02.04.12 - Groundwater - Question 1294
RAI ID	405
Status	Reviewed (Final)
Acceptance Criteria	To meet the requirements of 10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c)
Question Type	Application Specific
Description	<p>From an examination of the pumping test and borehole packer test reports, it appears that the pumping test assumed a 14 ft. saturated thickness and the packer tests used 10 ft. intervals in computing hydraulic conductivity values from transmissivity estimates. It is not clear from the pumping test and borehole packer test reports whether the tests were interpreted in a manner consistent with the fractured flow observed at the site. If flow is primarily through fractures, then these hydraulic conductivity values may not be representative of the fracture permeability, and groundwater velocities based on them may underestimate the true velocities. In the pumping test report, increased head during the later part of the pumping test were attributed to a precipitation event. A rapid head response to precipitation appears consistent with high-velocity fracture flow. Provide the technical basis for interpreting the pumping test and borehole packer test results in the fractured flow geologic setting.</p> <p>The pumping test report also stated that the test was conducted as a constant-drawdown test. However, the pumping level was not stabilized for several hours after the test began. Describe why the hydraulic conductivity value derived from the test is considered valid in light of this departure from constant-drawdown test conditions.</p> <p>This issue is associated with Attachment 5, item 12, of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).</p>

Relates to Question

Question Number	02.04.12-4
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Answer	
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Official Response Date	
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Response Accession #	
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This Site: RAI

RAI > [Questions](#) > Bellefonte Units 3 and 4 - 02.04.12 - Groundwater - Question 1295

Questions : Bellefonte Units 3 and 4 - 02.04.12 - Groundwater - Question 1295

[New Item](#) | [Edit Item](#) | [Delete Item](#) | [Alert Me](#) | [Version History](#)

Title	Bellefonte Units 3 and 4 - 02.04.12 - Groundwater - Question 1295
RAI ID	406
Status	Reviewed (Final)
Acceptance Criteria	10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c)
Question Type	Application Specific
Description	Provide the technical basis for determining porosity (total and effective) and calculating groundwater velocities consistent with the conceptual model of groundwater flow and the occurrence of fracture flow at the site. This issue is associated with Attachment 5, item 11, of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).
Relates to Question	
Question Number	02.04.12-5
Answer	
Official Response Date	
Response Accession #	
Attachments	View Attachments

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This Site: RAI

RAI > Questions > Bellefonte Units 3 and 4 - 02.04.12 - Groundwater - Question 1363

Questions : Bellefonte Units 3 and 4 - 02.04.12 - Groundwater - Question 1363

[New Item](#) | [Edit Item](#) | [Delete Item](#) | [Alert Me](#) | [Version History](#)

Title	Bellefonte Units 3 and 4 - 02.04.12 - Groundwater - Question 1363
RAI ID	426
Status	Reviewed (Final)
Acceptance Criteria	To meet the requirements of 10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c)
Question Type	Application Specific
Description	<p>During the May 13-16, 2008, hydrology site visit TVA indicated that it would make several changes to the application to clarify issues associated with the ground water review. These clarifications are described below. TVA should provide a commitment or a schedule for when these changes will be made to the Bellefonte COL application. At the beginning of the question there is a cross reference to the item number contained in Attachment 5 of the May 13-16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).</p> <p>a) Attachment 5, item 2, of the May 13-16, 2008 trip report stated that TVA should provide a subject matter expert (SME) to identify the local water users including those around Town Creek. The applicant stated that the State of Alabama does not require registration of groundwater wells and that the wells on the other side of Town Creek are generally located in a formation distinct from the formation on the plant side of Town Creek. According to the applicant the closest large capacity well (Hollywood #2) is over 2 miles away and has been abandoned.</p> <p>Commitment: TVA is to identify location of the discussion of the wells in a separate formation in the final safety analysis report.</p> <p>b) Attachment 5, item 3, of the May 13-16, 2008 trip report stated that TVA should provide a subject matter expert (SME) to describe the evidence for the existence of perched or semi-perched conditions at the site. The applicant stated that the terms 'perched' and 'semi-perched' do not well represent the conditions at the site.</p> <p>Commitment: TVA will document changes to the final safety analysis report to eliminate the use of these terms.</p> <p>c) Attachment 5, item 6, of the May 13-16, 2008 trip report stated that TVA should provide a SME to explain the large variability in wells WT2 and WT5 (and WT1?) during the 1970s seen in Fig. 2.4.12-211. In response the applicant stated that the variability was a result of construction activities and dewatering. Excavations occurred between 1974 and 1975 and were documented in photos of the excavation activities. The applicant also stated that the flood in 1973 may have affected water levels.</p> <p>Commitment: TVA will change the application to indicate that the historical data in Figure 2.4.12-211 is not inconsistent with the applicant's conceptual model of the groundwater conditions at the site.</p> <p>d) Attachment 5, item 7, of the May 13-16, 2008 trip report stated that TVA should provide an SME to identify the 12 aquifer test observation wells. The applicant identified the figure in the FSAR.</p> <p>Commitment: TVA will provide coordinates of observation wells</p> <p>e) Attachment 5, item 10, of the May 13-16, 2008 trip report stated that TVA should provide an SME to discuss the protocols by which samples were classified as soil, epikarst, or bedrock and the methods used to conceptualize the lithology through various cross sections. The applicant's SME described the characterization activities and stated the 'top of rock' elevation is based on interpretation of the geotechnical boring logs by the geology expert. A copy of the FSAR Appendix 2.BB was reviewed by the staff. Staff identified some boring logs that were omitted from the document and possible revisions that were not included in the document.</p> <p>Commitment: TVA will provide a copy of the FSAR Appendix 2.BB that includes the latest revision of</p>

boring logs for all boreholes.

f) Attachment 5, item 11, of the May 13-16, 2008 trip report stated that TVA should provide an SME to discuss methods used to estimate porosity and the depth of the abrupt porosity change. The applicant self-identified an error in the porosity estimate. The applicant stated that FSAR 2.5 describes the calculation of the porosity as the fractional length of voids and/or cavities encountered divided by the length of the borehole, and the minimum fracture size in this estimate was of 1/10 ft. The applicant stated that the two porosity values provided in the FSAR were average values above and below the 20 ft. depth, but that there is no abrupt change in porosity.

Commitment: TVA will advise NRC of the timeline for completing a revised analysis of porosity and all calculations dependent on the porosity estimate. The applicant will provide a discussion of the estimation of both "total porosity" and "effective porosity". The applicant will ensure that the porosity is consistent with discussion in 2.5 regarding porosity.

g) Attachment 5, item 12 of the May 13-16, 2008 trip report stated that TVA should provide an SME to discuss methods used to provide a conservative estimate of the hydraulic conductivity. The applicant stated they will revise calculations and the FSAR to use the highest conductivity value observed. The applicant provided copies of the pump test report and the borehole packer test report which the staff reviewed.

Commitment: TVA will revise calculations and the FSAR to use the highest conductivity value and agreed to provide the pump test data.

h) Attachment 5, item 22, of the May 13-16, 2008 trip report stated that TVA should provide the correct citation for second complete paragraph on FSAR p. 2.4-50 (Reference 205 is apparently incorrect). The applicant stated that the citation was in error and would be deleted in future revisions.

Commitment: TVA will delete the reference in future revision.

i) Attachment 5, item 23, of the May 13-16, 2008 trip report stated that TVA should provide an SME to discuss the rationale for excluding wells completed in the soil zone in preparation of groundwater piezometric surface maps. The applicant stated that soil zone water level maps were not produced due to limited amount of data with water table in soil zone.

Commitment: TVA will clarify wording.

Relates to Question

Question Number 02.04.12-6

Answer

Official Response Date

Response Accession #

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This Site: RAI

RAI > Questions > Bellefonte Units 3 and 4 - 02.04.12 - Groundwater - Question 1760

Questions : Bellefonte Units 3 and 4 - 02.04.12 - Groundwater - Question 1760

[New Item](#) | [Edit Item](#) | [Delete Item](#) | [Alert Me](#) | [Version History](#)

Title	Bellefonte Units 3 and 4 - 02.04.12 - Groundwater - Question 1760
RAI ID	521
Status	Reviewed (Final)
Acceptance Criteria	Acceptance criteria: To meet the requirements of 10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c).
Question Type	Application Specific
Description	Describe how the applicant determined that the conceptual site model of the subsurface environment of the Bellefonte site is the most conservative conceptual model that is plausible for this site. This description should focus on the process that was used for the determination rather than the details of the resulting site model, which are discussed elsewhere in the application. Examples of elements that may be relevant to this description (but were not necessarily required) include: work plans for site characterization; management controls and processes for implementation of work plans; kinds of technical specialists involved in developing the model, and how they interacted; iterative processes for improving the model based on field evidence; reviews of technical literature; generally accepted conceptual models of the depositional environments in which the subsurface materials were formed; mathematical or computer models of groundwater levels and flow; processes used to integrate different kinds of evidence into comprehensive models; exploration of possible extreme conditions, for example the widest plausible range of groundwater flow directions, and the conditions under which reversals of flow direction may occur; sensitivity analyses; and the process used for preparing the final description of the conceptual model.
Relates to Question	
Question Number	02.04.12-7
Answer	
Official Response Date	
Response Accession #	
Attachments	View Attachments

Version: 9.0
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This Site: RAI

RAI > Questions > Bellefonte Units 3 and 4 - 02.04.13 - Accidental Releases of Radioactive Liquid Effluents in Ground and Surface Waters - Question 1297

Questions : Bellefonte Units 3 and 4 - 02.04.13 - Accidental Releases of Radioactive Liquid Effluents in Ground and Surface Waters - Question 1297

[New Item](#) | [Edit Item](#) | [Delete Item](#) | [Alert Me](#) | [Version History](#)

Title	Bellefonte Units 3 and 4 - 02.04.13 - Accidental Releases of Radioactive Liquid Effluents in Ground and Surface Waters - Question 1297
RAI ID	407
Status	Reviewed (Final)
Acceptance Criteria	Acceptance criteria: To meet the requirements of 10 CFR 100.20(c), 10 CFR 100.23(d), and 10 CFR 52.79(a)(1)(iii).
Question Type	Application Specific
Description	The private residences across Town Creek, with their groundwater wells, are the water users closest to the site with a potential to be impacted by an accidental release of radioactive liquid effluents. The potential alternative groundwater pathway to the area of these residences is not evaluated in FSAR 2.4.13. Provide a description of the data and analysis used to determine that this alternative pathway was either implausible or is not a bounding pathway. This issue is associated with Attachment 5, items 2 and 29, of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).
Relates to Question	
Question Number	02.04.13-1
Answer	
Official Response Date	
Response Accession #	
Attachments	View Attachments

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This Site: RAI

RAI > [Questions](#) > Bellefonte Units 3 and 4 - 02.04.13 - Accidental Releases of Radioactive Liquid Effluents in Ground and Surface Waters - Question 1298

Questions : Bellefonte Units 3 and 4 - 02.04.13 - Accidental Releases of Radioactive Liquid Effluents in Ground and Surface Waters - Question 1298

[New Item](#) | [Edit Item](#) | [Delete Item](#) | [Alert Me](#) | [Version History](#)

Title	Bellefonte Units 3 and 4 - 02.04.13 - Accidental Releases of Radioactive Liquid Effluents in Ground and Surface Waters - Question 1298
RAI ID	408
Status	Reviewed (Final)
Acceptance Criteria	To meet the requirements of 10 CFR 100.20(c), 10 CFR 100.23(d), and 10 CFR 52.79(a)(1)(iii)
Question Type	Application Specific
Description	The RESRAD groundwater transport model used in FSAR 2.4.13 embodies a conceptual model of groundwater flow consistent with a continuum porous medium. The site geology is described, however, as karst with groundwater flow occurring in fractures, some of which may be solutionally enlarged. Provide the technical basis for representing a fractured site using a continuum model. Provide a description of the data and analysis used to determine that an alternative model of fractured flow and transport was either implausible or is not a bounding scenario. This issue is associated with Attachment 5, items 29 and 34, of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).
Relates to Question	
Question Number	02.04.13-2
Answer	
Official Response Date	
Response Accession #	
Attachments	View Attachments

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This Site: RAI

RAI > Questions > Bellefonte Units 3 and 4 - 02.04.13 - Accidental Releases of Radioactive Liquid Effluents in Ground and Surface Waters - Question 1299

Questions : Bellefonte Units 3 and 4 - 02.04.13 - Accidental Releases of Radioactive Liquid Effluents in Ground and Surface Waters - Question 1299

[New Item](#) | [Edit Item](#) | [Delete Item](#) | [Alert Me](#) | [Version History](#)

Title	Bellefonte Units 3 and 4 - 02.04.13 - Accidental Releases of Radioactive Liquid Effluents in Ground and Surface Waters - Question 1299
RAI ID	409
Status	Reviewed (Final)
Acceptance Criteria	To meet the requirements of 10 CFR 100.20(c), 10 CFR 100.23(d), and 10 CFR 52.79(a)(1)(iii)
Question Type	Application Specific
Description	<p>The RESRAD model provides a default volume of 150,000 m³ of surface water into which radionuclides are discharged at the end of their groundwater flow path. At Bellefonte, this default volume was used to represent a portion of Town Creek. Provide the technical basis for adopting this default volume.</p> <p>Alternatively, provide the technical basis for a different volume that is more defensible in terms of the actual conditions in Town Creek, and discuss any differences in estimates that result from using this different volume.</p> <p>Or, as another alternative, use groundwater radionuclide concentrations and flow rates derived from RESRAD as inputs into a surface-water mixing zone model (such as for example CORMIX) that can represent concentrations in surface water in a more physically-based manner. Discuss any differences in estimates that result from using this different modeling approach.</p> <p>This issue is associated with Attachment 5, item 26, of the May 13 -16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).</p>
Relates to Question	
Question Number	02.04.13-3
Answer	
Official Response Date	
Response Accession #	
Attachments	View Attachments

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 Last modified at 7/3/2008 9:33 AM by [Joseph Sebrosky](#)



This Site: RAI

RAI > Questions > Bellefonte Units 3 and 4 - 02.04.13 - Accidental Releases of Radioactive Liquid Effluents in Ground and Surface Waters - Question 1366

Questions : Bellefonte Units 3 and 4 - 02.04.13 - Accidental Releases of Radioactive Liquid Effluents in Ground and Surface Waters - Question 1366

[New Item](#) | [Edit Item](#) | [Delete Item](#) | [Alert Me](#) | [Version History](#)

Title	Bellefonte Units 3 and 4 - 02.04.13 - Accidental Releases of Radioactive Liquid Effluents in Ground and Surface Waters - Question 1366
RAI ID	427
Status	Reviewed (Final)
Acceptance Criteria	Acceptance criteria: To meet the requirements of 10 CFR 100.20(c), 10 CFR 100.23(d), and 10 CFR 52.79(a)(1)(iii).
Question Type	Application Specific
Description	<p>During the May 13-16, 2008, hydrology site visit TVA indicated that it would make several changes to the application to clarify issues associated with the ground water review. These clarifications are described below. TVA should provide a commitment or a schedule for when these changes will be made to the Bellefonte COL application. At the beginning of the question there is a cross reference to the item number contained in Attachment 5 of the May 13-16, 2008, hydrology-related safety site trip report dated June 12, 2008 (ADAMS accession number ML081610308).</p> <p>a) Attachment 5, item 26 of the May 13-16, 2008 trip report stated that TVA should provide a subject matter expert (SME) to discuss the values in the RESRAD input file(s) used in this section.</p> <p>Commitment: TVA will provide the RESRAD input files, once the input parameters are revised.</p> <p>b) Attachment 5, item 29 of the May 13-16, 2008 trip report stated that TVA should provide an SME to discuss the basis for the sequence of events and time scales used in the transport analysis. The applicant stated that the residence time of one year was chosen to coincide with the annual limits in 10 CFR 20 Appendix B, that the 70-day calculation interval was chosen to reduce computation and the amount of output; and that the 50-year simulation period encompassed all concentration peaks.</p> <p>Commitment: TVA will provide a technical basis for the selection of a dilution volume in Town Creek.</p> <p>c) Attachment 5, item 30 of the May 13-16, 2008 trip report stated that TVA should provide an SME to discuss the basis for using Parameter Values in Table 2.4.13-203 relative to the minimum observed values as reported in Table 2.4.13-202. The applicant stated they used Kds based on closest measurement to the source not the lowest measurement. Given the likely variability along the pathway, the applicant stated that using the minimum Kd would be conservative and appropriate.</p> <p>Commitment: TVA will revise transport analyses using the minimum Kds.</p> <p>d) Attachment 5, item 31 of the May 13-16, 2008 trip report stated that TVA should have a calc package for review (or/and an SME to describe) the computation of the Area of Contaminated Zone in Table 2.4.13-203. The applicant stated the area was based on a 2 meter deep volume sitting atop the saturated zone. The applicant acknowledged an apparent math error in the estimation of the Area of Contaminated Zone.</p>

Commitment: TVA will revise the area based on a corrected computation.

e) Attachment 5, item 32 of the May 13-16, 2008 trip report stated that TVA should provide an SME to clarify whether the contaminant source is assumed to be directly in the saturated zone as illustrated in Figure 2.4.13-201. If so, explain the use and impact of the contaminated and unsaturated zone parameters. The applicant stated the area was based on a 2 meter deep volume sitting atop the saturated zone.

Commitment: The applicant will revise the figure to identify the correct location of the contaminated zone and assumed pathway.

f) Attachment 5, item 33 of the May 13-16, 2008 trip report stated that TVA should provide an SME to explain how alternative plausible scenarios, consistent with limited data available, for groundwater radionuclide migration eastward from Unit 4 toward the intake structure on Guntersville Reservoir were filtered to determine that the postulated scenario was conservative. The applicant stated that they are already responding to this item in H8 from the environmental audit.

Commitment: The applicant will provide a written response through the environmental responses to NRC.

Relates to Question

Question Number 02.04.13-4

Answer

Official Response Date

Response Accession #

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This Site: RAI

RAI > Questions > Bellefonte Units 3 and 4 - 02.04.13 - Accidental Releases of Radioactive Liquid Effluents in Ground and Surface Waters - Question 1761

Questions : Bellefonte Units 3 and 4 - 02.04.13 - Accidental Releases of Radioactive Liquid Effluents in Ground and Surface Waters - Question 1761

[New Item](#) | [Edit Item](#) | [Delete Item](#) | [Alert Me](#) | [Version History](#)

Title	Bellefonte Units 3 and 4 - 02.04.13 - Accidental Releases of Radioactive Liquid Effluents in Ground and Surface Waters - Question 1761
RAI ID	522
Status	Reviewed (Final)
Acceptance Criteria	Acceptance criteria: To meet the requirements of 10 CFR 50.55a, 10 CFR 100.20(c)(3), 10 CFR 100.23(d), and 10 CFR 100.20(c).
Question Type	Application Specific
Description	Describe how the applicant determined that the analysis of the dose consequences of an accidental release was bounding, in the sense of being the most extreme plausible dose consistent with the conceptual site model of the subsurface, with assumptions regarding the radionuclide source term associated with the accidental release, and with the physical processes in the subsurface environment that govern transport of radionuclides. This description should focus on the process that was used for the determination rather than the details of the resulting dose consequences, which are discussed elsewhere in the application. Examples of elements that may be relevant to this description (but are not necessarily required) include: work plans for the analysis of accidental release consequences; management controls and processes for implementation of work plans; kinds of technical specialists involved in developing the analysis, and how they interacted; reviews of technical literature; the manner in which the conceptual model of the subsurface was used in the analysis; how measurements of material properties such as K_d were integrated into the analysis; exploration of possible extreme conditions or assumptions; sensitivity analyses; and the process used for preparing the final description of the results of the analysis.
Relates to Question	
Question Number	02.04.13-5
Answer	
Official Response Date	