PMBeICOL PEmails

From:	Ray, Phillip M [pmray@tva.gov]
Sent:	Friday, August 15, 2008 4:00 PM
To:	Joseph Sebrosky
Cc:	Sterdis, Andrea Lynn; Bob Hirmanpour; erg-xl@cox.net; Spink, Thomas E
Subject:	Response to letters 73 and 82
Attachments:	BLN RAI Response to RAI Letter 073 for signature20080812 - TSB2pmr.pdf; RAI Response to RAI Letter 082 for Signature 20080813pmr.pdf

Joe,

Attached are courtesy copies of our responses to letters 73 and 82.

Phil

Hearing Identifier: Bellefonte_COL_Public_EX
Email Number: 884

Mail Envelope Properties (28921B76CDD05940A918AEEC9EBCA7C0078D837B)

Subject: Response to letters 73 and 82
Sent Date: 8/15/2008 4:00:23 PM
Received Date: 8/15/2008 4:02:22 PM
From: Ray, Phillip M

Created By: pmray@tva.gov

Recipients:
"Sterdis, Andrea Lynn" <alsterdis@tva.gov>
Tracking Status: None
"Bob Hirmanpour" <bob.hirmanpour@excelservices.com>
Tracking Status: None
"erg-xl@cox.net" <erg-xl@cox.net>
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"Spink, Thomas E" <tespink@tva.gov>
Tracking Status: None
"Joseph Sebrosky" <Joseph.Sebrosky@nrc.gov>
Tracking Status: None

Post Office: TVACOCXVS1.main.tva.gov

Files	**Size**	**Date & Time**	
MESSAGE	85	8/15/2008 4:02:22 PM	
BLN RAI Response to RAI Letter 073 for signature20080812 - TSB2pmr.pdf			256295
RAI Response to RAI Letter 082 for Signature 20080813pmr.pdf			304326

Options
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Expiration Date:
Recipients Received:

Tennessee Valley Authority, 1101 Market Street, LP 5A, Chattanooga, Tennessee 37402-2801

August 15, 2008

10 CFR 52.79

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

In the Matter of)
Tennessee Valley Authority)

Docket No. 52-014 and 52-015

BELLEFONTE COMBINED LICENSE APPLICATION – RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION – ACCIDENTIAL RELEASES OF RADIOACTIVE LIQUID EFFLUENTS IN GROUND AND SURFACE WATERS

Reference: Letter from Joseph Sebrosky (NRC) to Andrea L. Sterdis (TVA), Request for Additional Information Letter No. 073 Related to SRP Section 2.4.13 for the Bellefonte Units 3 and 4 Combined License Application, dated July 16, 2008.

This letter provides the Tennessee Valley Authority's (TVA) response to the Nuclear Regulatory Commission's (NRC) request for additional information (RAI) items included in the reference letter.

A response to the NRC request in the subject letter is addressed in the enclosure which does not identify any associated changes to be made in a future revision of the BLN application.

If you should have any questions, please contact Phillip Ray at 1101 Market Street, LP5A, Chattanooga, Tennessee 37402-2801, by telephone at (423) 751-7030, or via email at pmray@tva.gov.

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

Executed on this 15th day of Aug, 2008.

Andrea L. Sterdis
Manager, New Nuclear Licensing and Industry Affairs
Nuclear Generation Development & Construction

Enclosure
cc: See Page 2

cc: (Enclosures)

J. P. Berger, EDF
J. M. Sebrosky, NRC/HQ
E. Cummins, Westinghouse
S. P. Frantz, Morgan Lewis
M.W. Gettler, FP&L
R . Grumbir, NuStart
P. S. Hastings, NuStart
P Hinnenkamp, Entergy
M.C. Kray, NuStart
D. Lindgren, Westinghouse
G. D. Miller, PG&N
M.C. Nolan, Duke Energy
N. T. Simms, Duke Energy
K. N. Slays, NuStart
G. A. Zinke, NuStart

cc: (w/o Enclosure)

B. C. Anderson, NRC/HQ
M.M. Comar, NRC/HQ
B. Hughes/NRC/HQ
R G. Joshi, NRC/HQ
R. H. Kitchen, PGN
M C Kray, NuStart
A. M. Monroe, SCE&G
C. R. Pierce, SNC
R. Reister, DOE/PM
L. Reyes, NRC/RII
T. Simms, NRC/HQ

Enclosure
TVA letter dated August 15, 2008
RAI Response

Responses to NRC Request for Additional Information letter No.073 dated July 16, 2008
(3 pages, including this list)

Subject: Accidental Releases of Radioactive Liquid Effluents in Ground and Surface Waters in the Final Safety Analysis Report

RAI Number	Date of TVA Response
02.04.13-05	This letter – see following pages

Associated Additional Attachments / Enclosures	Pages Included
None	

NRC Letter Dated: July, 16, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 02.04.13-05

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 Kd 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.

BLN RAI ID: 0705

BLN RESPONSE:

The process of identifying a conservative plausible dose resulting from an accidental release began with determining the most appropriate method for data collection and evaluation. This process was initiated through discussions involving subject matter experts (SME) in several disciplines, including, but not limited to, geologists, engineers, health physicists, and regulatory specialists. The goal of these discussions was to define the objectives and methods used in performing the evaluation of the accidental release scenario. These initial discussions led to the eventual decision to use the RESRAD-OFFSITE Version 2.0 code as the model of choice for this evaluation as opposed to a more manual method using spreadsheets and data tables.

Subsequent discussions centered on identifying the conservative parameters to be used as input values to the RESRAD-OFFSITE model. These discussions aided in determining the origin of various data, including when it was appropriate to use RESRAD-OFFSITE default values, when region-specific values were appropriate, and when site-specific data was required. During the conceptual model evolution, numerous parameters were determined to have no effect on the outcome; the values for these parameters subsequently remained as the RESRAD-OFFSITE default value or were disabled, as appropriate.

Collection of site-specific hydrogeologic data determined to be relevant to the accident scenario was carried out under the direction of the geologist SME during the site groundwater investigation. This data was compiled and provided to the health physicist SME for inclusion in the RESRAD-OFFSITE model. The data compilation aided in defining the shortest straight-line pathway using the hydrogeological conditions at the Bellefonte site. The TVA response to BLN-RAI-LTR-063, dated August 1, 2008, provides additional information pertaining to parameter selection. When the dose consequence evaluation was complete, the review and approval process included the engineering and regulatory SMEs.

Branch Technical Position 11-6 directs that the accident evaluation be performed for the nearest potable water source within an unrestricted area. Town Creek was identified during the site investigation process as that potable water source. Choosing the environmental parameters for use in the RESRAD-OFFSITE model began with identifying parameter values that contributed to the most rapid groundwater transport to Town Creek, which subsequently provides the greatest concentration of radionuclides in the receptor body. Individual parameter values were selected using the following hierarchy until such a point where an available, appropriate and conservative individual parameter value was identified:

1. A single, appropriate site-specific parameter value
2. A conservative parameter value from a site-specific range
3. A single, appropriate region-specific parameter value
4. A conservative parameter value from a region-specific range
5. A conservative parameter value from appropriate published values
6. The RESRAD-OFFSITE default parameter value.

Using this ordered list, the selection of the most appropriate, yet conservative value available was assured as input to the RESRAD-OFFSITE model.

Sensitivity analyses were performed on numerous parameters to determine that the chosen value for each parameter was appropriate. The sensitivity analyses also demonstrated that under varying conditions that may affect those parameter values, the radionuclide concentration in the receptor body remains within the comparison values.

Throughout the process, independent reviews of the RESRAD-OFFSITE model were carried out by a reviewer equally proficient with the RESRAD-OFFSITE code to confirm a conservative plausible evaluation was being performed. Additional discussions between the SMEs upon completion of the RESRAD-OFFSITE model identified the method for documenting the results and preparing the final description of the analysis results.

This response is PLANT-SPECIFIC.

ASSOCIATED BLN COL APPLICATION REVISIONS:

No COLA revisions have been identified associated with this response.

ASSOCIATED ATTACHMENTS/ENCLOSURES:

None

Tennessee Valley Authority, 1101 Market Street, LP 5A, Chattanooga, Tennessee 37402-2801

August 15, 2008

10 CFR 52.79

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

In the Matter of)
Tennessee Valley Authority)

Docket No. 52-014 and 52-015

BELLEFONTE COMBINED LICENSE APPLICATION – RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION – HYDROLOGY

Reference:
1. Letter from Joseph M. Sebrosky (NRC) to Andrea L. Sterdis (TVA), Request for Additional Information Letter No. 082 Related to SRP Section 02.04.03 for the Bellefonte Units 3 and 4 Combined License Application, dated July 17, 2008.
2. Letter from Jack A. Bailey (TVA) to Document Control Desk (NRC), White Paper – Hydrologic Analysis Description, dated July 25, 2008.

This letter provides the Tennessee Valley Authority's (TVA) response to the Nuclear Regulatory Commission's (NRC) request for additional information (RAI) items included in the reference letter.

A response to each NRC request in the subject letter is addressed in the enclosure which also identifies any associated changes that will be made in a future revision of the BLN application.

If you should have any questions, please contact Phillip Ray at 1101 Market Street, LP5A, Chattanooga, Tennessee 37402-2801, by telephone at (423) 751-7030, or via email at pmray@tva.gov.

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

Executed on this 15th day of Aug, 2008.

Andrea L. Sterdis
Manager, New Nuclear Licensing and Industry Affairs
Nuclear Generation Development & Construction

Enclosure
cc: See Page 2

cc: (Enclosures)
J. P. Berger, EDF
J. M. Sebrosky, NRC/HQ
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S. P. Frantz, Morgan Lewis
M.W. Gettler, FP&L
R . Grumbir, NuStart
P. S. Hastings, NuStart
P Hinnenkamp, Entergy
M.C. Kray, NuStart
D. Lindgren, Westinghouse
G. D. Miller, PG&N
M.C. Nolan, Duke Energy
N. T. Simms, Duke Energy
K. N. Slays, NuStart
G. A. Zinke, NuStart

cc: (w/o Enclosure)
B. C. Anderson, NRC/HQ
M.M. Comar, NRC/HQ
B. Hughes/NRC/HQ
R. G. Joshi, NRC/HQ
R. H. Kitchen, PGN
M.C. Kray, NuStart
A. M. Monroe, SCE&G
C. R. Pierce, SNC
R. Reister, DOE/PM
L. Reyes, NRC/RII
T. Simms, NRC/HQ

Enclosure
TVA letter dated August 15, 2008
RAI Responses

Responses to NRC Request for Additional Information letter No. 082 dated July 17, 2008
(10 pages, including this list)

Subject: Hydrology in the Final Safety Analysis Report

RAI Number	Date of TVA Response
02.04.03-01	This letter – see following pages
02.04.03-02	This letter – see following pages
02.04.03-03	This letter – see following pages
02.04.03-04	This letter – see following pages
02.04.03-05	This letter – see following pages
02.04.03-06	This letter – see following pages
02.04.03-07	This letter – see following pages

Associated Additional Attachments / Enclosures	Pages Included
None	

NRC Letter Dated: July 17, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 02.04.03-01

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).

BLN RAI ID: 0660

BLN RESPONSE:

Section 4.1.2.2.2 of Revision 1 of the Hydrology White Paper (Reference 2), submitted to NRC on July 25, 2008, provides the requested additional detail regarding the method used by TVA to estimate precipitation losses.

TVA has performed sensitivity runs using a non-V&V version of the SOCH code and presented the findings at the June 23, 2008, workshop in Knoxville, Tennessee. The results from the non-V&V code sensitivity runs showed that increasing the precipitation runoff to 100% resulted in a PMF water level at plant grade. TVA will replicate this SOCH simulation run using the final V&V version of the code, and will also perform sensitivity runs by increasing the runoff by some lesser, more appropriate amount. The results of these sensitivity runs will be documented in a calculation.

A copy of 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, was provided to the NRC at the June 23, 2008, workshop in Knoxville, Tennessee.

This response is PLANT-SPECIFIC.

ASSOCIATED BLN COL APPLICATION REVISIONS:

No COLA revisions have been identified associated with this response.

ASSOCIATED ATTACHMENTS/ENCLOSURES:

None

NRC Letter Dated: July 17, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 02.04.03-02

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).

BLN RAI ID: 0661

BLN RESPONSE:

Section 4.1.2.1 of Revision 1 of the Hydrology White Paper (Reference 2), submitted to NRC on July 25, 2008, provides the requested additional detail regarding the Goodrich Semi-graphical method used in the tributary routing. The Goodrich semi-graphical method was used in the original studies to allow manual routing of flows through the tributaries.

This response is PLANT-SPECIFIC.

ASSOCIATED BLN COL APPLICATION REVISIONS:

No COLA revisions have been identified associated with this response.

ASSOCIATED ATTACHMENTS/ENCLOSURES:

None

NRC Letter Dated: July 17, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 02.04.03-03

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).

BLN RAI ID: 0662

BLN RESPONSE:

There are no current plans to modify the Chickamauga Dam or make improvements associated with the Dam Safety Program. Studies have shown that little benefit on downstream flood levels would be gained from such modifications. The revised wording will be captured in the draft FSAR revision previously committed to being submitted by December 31, 2008.

This response is PLANT-SPECIFIC.

ASSOCIATED BLN COL APPLICATION REVISIONS:

COLA revisions associated with this response have not been finalized and will be provided as indicated.

ASSOCIATED ATTACHMENTS/ENCLOSURES:

None

NRC Letter Dated: July 17, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 02.04.03-04

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.

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.

BLN RAI ID: 0663

BLN RESPONSE:

The final configuration of the Chickamauga Dam after modifications associated with the new lock are complete will be used for analyses supporting BLN Units 3 and 4. The impact of the lock modifications includes the permanent removal of five of the 18 available spillways. Lock modifications, and thus spillway impacts, are planned to be complete prior to the BLN commercial operation date. Sensitivity runs will also be performed to document the minor impact on BLN PMF levels associated with Chickamauga Dam spillway operation. Documentation of these sensitivity runs and their results will be available for review on or before April 28, 2009.

This response is PLANT-SPECIFIC.

ASSOCIATED BLN COL APPLICATION REVISIONS:

No COLA revisions have been identified associated with this response.

ASSOCIATED ATTACHMENTS/ENCLOSURES:

None

NRC Letter Dated: July 17, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 02.04.03-05

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).

BLN RAI ID: 0664

BLN RESPONSE:

Section 5.3 of Revision 1 of the Hydrology White Paper (Reference 2), submitted to NRC on July 25, 2008, provides the requested additional description of the method used to establish initial reservoir levels. As indicated in the paper, full pool conditions are not assumed at the start of the antecedent storm. The paper states that *"Median initial reservoir elevations were used at the start of the storm sequence used to define the PMF to be consistent with statistical experience and to avoid unreasonable combinations of extreme events. As a result, 53 percent of the total reserved system flood detention capacity was occupied at the start of the main flood based on SOCH code output. Studies made by TVA for the Watts Bar and Sequoyah Nuclear Plants have shown that the initial reservoir levels would not have a significant effect on maximum flood discharges and elevations at the plant site because spillway capacities, and hence uncontrolled conditions, are reached early in the flood."* SRP 2.4.4 indicates the need for "consideration of full pool levels." The TVA tributary projects have been subjected analytically to and modified to safely pass the probable maximum flood (PMF) from their own contributing watershed as a part of the Dam Safety Program. The PMF for the tributary projects is a summer event with pool levels at summer level at the beginning of their PMF. The BLN PMF is a much smaller event on the tributary projects and does not pose a potential threat from overtopping these projects. The antecedent flood for the design basis PMF at BLN determines the starting reservoir levels at the beginning of the main storm. The assumption of median reservoir levels at the beginning of the antecedent storm on March 15, coupled with recovery during the 3 day dry period, results in about 53% of the reserved flood capacity being occupied at the beginning of the main storm. TVA has considered the use of a full pool assumption and determined that starting levels defined by the antecedent storm are consistent with statistical experience and avoid an unreasonable combination of extreme events. These assumptions regarding initial reservoir levels will be fully documented and justified in the calculation which will be issued on or before March 16, 2009.

This response is PLANT-SPECIFIC.

ASSOCIATED BLN COL APPLICATION REVISIONS:

No COLA revisions have been identified associated with this response.

ASSOCIATED ATTACHMENTS/ENCLOSURES:

None

NRC Letter Dated: July 17, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 02.04.03-06

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).

BLN RAI ID: 0665

BLN RESPONSE:

Section 2 (page10) of Revision 1 of the Hydrology White Paper (Reference 2), submitted to NRC on July 25, 2008, provides the requested additional detail regarding the impacts of the river operations study on flood levels. Specifically, the winter flood guide was raised on eleven reservoirs; however, based on extensive analyses performed in support of the ROS, these changes did not increase flood risk at downstream locations for floods of magnitudes up to and including the 500-year recurrence interval events. PMF levels at selected other locations on the TVA river system were also evaluated during the ROS and determined to be unaffected.

This response is PLANT-SPECIFIC.

ASSOCIATED BLN COL APPLICATION REVISIONS:

No COLA revisions have been identified associated with this response.

ASSOCIATED ATTACHMENTS/ENCLOSURES:

None

NRC Letter Dated: July 17, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 02.04.03-07

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.

BLN RAI ID: 0666

BLN RESPONSE:

The following descriptions identify the calculation process used to determine that the conceptual models employed for a) site flooding b) Town Creek drainage flooding and c) regional flooding of the Tennessee River are sufficiently conservative and provide adequate protection from flooding of safety-related facilities.

a) Site Flooding

Site flooding was analyzed using the principles of the rational method, the standard-step backwater method, and open channel flow utilizing the continuity equation and Manning's formula (FSAR Reference 202 – American Iron and Steel Institute, "Modern Sewer Design," AISC, Washington, D.C., Fourth Edition 1999). The rational method is an industry standard modeling technique and was chosen for its applicability to the small drainage areas considered, i.e. less than 100 acres. With reference to FSAR Figure 2.4.2-202, the BLN Unit 3 and 4 "Grading and Drainage Plan," and Table 2.4.2-207, "Site Drainage Area Details and Results of the Effects of Local Intense Precipitation," the largest drainage area is less than 30 acres.

As shown in FSAR Figure 2.4.2-202, drainage area A overflows into drainage area B which subsequently overflows into drainage area C. The rational method maximizes the runoff for each drainage area without regard to the timing of the runoff. Therefore, use of the rational method is more conservative than unit hydrograph methods because the peak runoff of the upstream basin is added to the peak runoff of the downstream basin. (Runoff using a unit hydrograph method would combine the runoff relative to the timing for each drainage area resulting in an overall smaller peak runoff for the downstream drainage area).

As indicated, drainage areas B and C are low lying catch basins that are conservatively assumed to be non-functional. This results in total surface water drainage without considering any routing through storm water piping. Additionally, storage routing was not considered for the storage space of the catch basins. Instantaneously combining peak runoffs calculated using the rational method is more conservative than storage routing methods, since storage routing would reduce the peak runoff flow rates because of the time required for runoff to fill the catch basin storage space.

The overflow from drainage area B into drainage area C and overflow from drainage area C downstream was initially examined by hand calculation using open channel flow and broad crested weir flow equations. However, final analysis was performed using the U.S. Army Corps of Engineers HEC-RAS version 3.1.3 software to capture the interaction between the two basins and the downstream tailwater. Storage routing was not considered in the HEC-RAS analysis. HEC-RAS is industry standard software and is typically used to evaluate open channel flow similar to the conditions represented by drainage areas

B and C. Backwater effects included in the HEC-RAS analysis are more conservative than simplified hand calculations that ignore backwater effects. Furthermore, the probable maximum flood elevation for the Tennessee River was assumed for the tailwater conditions. This assumption is conservative because it maximizes the tailwater elevation. As the tailwater increases, the resulting water surface elevation for drainage areas B and C also increases.

For all areas, the rational method runoff coefficient was assumed equal to one. This assumption is conservative by not accounting for any runoff losses to occur, thus maximizing the peak runoff and resulting water surface elevation.

Intensity was determined from the time of concentration, calculated using the NRCS methodology identified in TR-55 (FSAR Reference 214 – Natural Resources Conservation Service "Urban Hydrology for Small Watersheds," TR-55, Second Edition, June 1986), and the intensity duration curve provided in FSAR Figure 2.4.2-204, BLN Unit 3 and 4 “HMR 56 Local Intense Probable Maximum Precipitation Intensity Duration Curve.” For drainage area D, the sheet flow portion of the time of concentration was limited to approximately 154 ft., minimizing the time of concentration, 6.7 minutes, as much as reasonably possible. A minimum time of concentration results in a greater intensity and higher runoff. Drainage areas E and F were assumed to have the minimum time of concentration of 5 minutes. This assumption maximizes the rainfall intensity and peak runoff. Other areas are graded to drain away from safety-related structures over wide open areas without obstruction.

For open channel flow calculations, the Manning’s roughness coefficient was examined using a value at the higher range of values published for grass lined channels or maintained short grass areas. Sensitivity analyses of Manning’s roughness coefficients were also examined using a 50 percent increase and decrease to the values. Drainage area A includes offsite areas located on wooded steeper slopes. An increased Manning’s roughness coefficient was used for this area, with sensitivities examined using a 50 percent increase and decrease to the value.

b) Town Creek Drainage Flooding

Town Creek drainage flooding was analyzed assuming the receiving Town Creek water body acts as a retention basin and that all rainfall is converted to runoff. Although hydraulically connected, no discharge to the Tennessee River is assumed. This assumption is more conservative than using the rational method or unit hydrograph runoff and storage routing models, since the resulting water surface elevation is determined by instantaneous capture of the total rainfall runoff volume rather than examining a peak flow rate or storage volume relative to outlet conditions over time.

The antecedent water surface elevation for the Town Creek water body was assumed to be the normal full pool elevation of the Tennessee River at 595 ft. Available storage volume was determined by averaging the surface area of U.S. Geological Survey quadrangle contours multiplied by the depth of the 10 ft. contour intervals. The resulting maximum water surface elevation was interpolated to be 610.68 ft.

According to the Tennessee Valley Authority flood risk profile described in the Guntersville Reservoir land management plan (FSAR Reference 224 – Tennessee Valley Authority, "Final Environmental Impact Statement and Land Management Plan Guntersville Reservoir," Volume 1, August 2001), the 500-year flood risk elevation at the confluence of Town Creek and the Tennessee River is 8.1 ft. higher than the normal full pool elevation. Assuming a 500-year coincident flooding event on the Tennessee River, the resulting Town Creek flooding elevation would increase to 618.78 ft. using the same methodology as above. This assumption is conservative given that additional storage volume would be available at higher elevations due to an increase of surface area. The resulting flood elevation does not exceed the controlling flood scenario or affect safety-related facilities at elevation 628.6 ft.

c) Regional Flooding of the Tennessee River

The models developed by TVA and used to predict regional flooding, or the design basis PMF flood, are consistent with guidance provided in ANS 2.8-1992, which has been recognized in current guidance for

COLA development. The methodology used and the models developed over the span of several years, used in the support of BLN licensing, have also been found acceptable in the successful and now complete licensing actions regarding three other operating TVA nuclear plants, and one unfinished plant. Such models are plausible, as they have been shown to replicate known flood events. Calibration of the models against low flow events as well as alternately analyzed higher steady state backwater flows results in a robust conceptual model of the river basin, providing high confidence that the results are reasonable and plausible. The models were developed following approved guidance and recognized, generally accepted hydrological practices. The models are considered conservative, in that sensitivity runs performed on any one input assumption, consistent with ANS 2.8-1992 guidance, have shown only small incremental increases in predicted PMF levels. The PMF is itself a conservative event, and the PMF, not upstream seismic dam failures, defines the controlling licensing and design basis flood level for the site.

This response is PLANT-SPECIFIC.

ASSOCIATED BLN COL APPLICATION REVISIONS:

No COLA revisions have been identified associated with this response.

ASSOCIATED ATTACHMENTS/ENCLOSURES:

None