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June 27, 2012

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Duke Energy Carolinas, LLC
William States Lee III Nuclear Station – Docket Nos. 52-018 and 52-019
AP1000 Combined License Application for the
William States Lee III Nuclear Station Units 1 and 2
Supplemental Response to Request for Additional Information
Ltr# WLG2012.06-10

References:

1. Letter from Brian C. Anderson (NRC) to Peter S. Hastings (Duke Energy), Request for Additional Information Letter No. 003, Related to SRP Section 10.04.05 for the William States Lee III Units 1 and 2 Combined License Application, dated August 11, 2008 (ML082240712)
2. Letter from Ronald A. Jones (Duke Energy) to NRC Document Control Desk, Supplemental Response to Request for Additional Information Letter No. 003 Related to SRP Section 10.04.05 for the *William States Lee III Units 1 and 2 Combined License Application*, Ltr # WLG2011.11-05, dated November 22, 2011 (ML11332A156)

This letter provides supplemental information to Duke Energy's response (Reference 2) to the Nuclear Regulatory Commission's request for additional information (RAI 10.04.05-002) included in Reference 1.

The supplemental information for the response is addressed in Enclosure 1, which also identifies associated changes to be made in a future revision of the Final Safety Analysis Report for the Lee Nuclear Station. Enclosure 2 contains input-output files related to analyses discussed in this supplemental information.

If you have any questions or need any additional information, please contact James R. Thornton, Nuclear Plant Development Licensing Manager (Acting), at (704) 382-2612.

Sincerely,

Christopher M. Fallon

Christopher M. Fallon
Vice President
Nuclear Development (Acting)

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NRO

Enclosures:

1) Lee Nuclear Station Supplemental Response to Request for Additional Information (RAI), Letter No. 003, RAI 10.04.05-002
2) HEC-HMS / HEC-RAS Input-Output Files Related to Analysis of Site Local Intense Precipitation

xc (w/out enclosures):

Frederick Brown, Deputy Regional Administrator, Region II

xc (w/ enclosures):

Brian Hughes, Senior Project Manager, DNRL

AFFIDAVIT OF CHRISTOPHER M. FALLON

Christopher M. Fallon, being duly sworn, states that he is Vice President, Nuclear Development (Acting), Duke Energy Carolinas, LLC, that he is authorized on the part of said Company to sign and file with the U. S. Nuclear Regulatory Commission this combined license application for the William States Lee III Nuclear Station, and that all the matter and facts set forth herein are true and correct to the best of his knowledge.

Christopher M. Fallon

Christopher M. Fallon, Vice President
Nuclear Development (Acting)

Subscribed and sworn to me on June 27, 2012

Freda K. Crump

Notary Public

My commission expires: August 17, 2016

SEAL

FREDA K CRUMP
NOTARY
PUBLIC
LINCOLN COUNTY, NC

Lee Nuclear Station Supplemental Response to Request for Additional Information (RAI)

RAI Letter No. 003

NRC Technical Review Branch: Balance of Plant Branch 1

Reference NRC RAI Number(s): 10.04.05-002

NRC Request for Additional Information:

10.04.05-2: In FSAR Section 10.4.5.2.2, the applicant stated that little or no water would reach the plant from a cooling tower basin wall breach due to the remote location of the tower and the grading of the site. However, the staff could not find any further details regarding the location and proximity of the mechanical draft cooling towers with respect to the plant and safety-related equipment. Regarding the circulating water system (CWS), the regulatory basis for acceptance of COL Information Item 10.4-1 (COL Action Item 10.5-3) is established in General Design Criterion (GDC 4), "Environmental and Dynamic Effects Design Bases," as it relates to design provisions to accommodate the effects of discharging water that may result from a failure of a component or piping in the CWS. In addition, Item 1.A of SRP Acceptance Criteria in SRP Section 10.4.5, "Circulating Water System," states that means should be provided to prevent or detect and control flooding of safety-related areas so that the intended safety function of a system or component will not be precluded due to leakage from the CWS.

Therefore, the staff requests additional information regarding the effects of cooling tower failure on safety-related equipment and structures of the plant. Please provide clarification and/or additional information regarding the location of the cooling towers with respect to the plant and confirm that failure of these towers will not affect the structures, systems, or components that perform or support a safety-related function.

Duke Energy Supplemental Response:

Duke Energy submitted supplemental information to the subject RAI in its letter dated November 22, 2011 (Reference 1). That submittal included updated analyses associated with the effects of local intense precipitation and Make-Up Pond B (MUPB) related flooding. Further revisions to these analyses were required to reflect the impacts of additional improvements to the site grading and drainage plan and the updated approach to MUPB flood modeling. This letter provides supplemental information reflecting these revised analyses.

<u>Analysis of the Effects of Local Intense Precipitation (Local Site PMP Event)</u> The site grading and drainage plan is illustrated in revised FSAR Figure 2.4.2-202 (see Attachment 3). The revised plan provides additional improvement to overall site drainage via the following changes:

- The southwest channel is widened, providing for increased drainage toward MUPB.
- A berm located in the southeast area of site, near Make-Up Pond A (MUPA), is removed, providing the channel on the southeast side of the site (i.e., the "southeast channel").
- The perimeter roadway around the Unit 1 and Unit 2 power blocks is graded to provide a smooth transition, having the impact of removing a weir-effect at the road and allowing the modeling of this area as open channel flow.

Site grading changes required changes in the modeling and analysis of the local intense precipitation effects. The revised model reflects the updated grading and drainage plan, showing runoff drainage away from the safety-related structures through five grass covered drainage channels, illustrated in revised FSAR Figure 2.4.2-202 (see Attachment 3). These five site drainage channels consist of: (1) west; (2) southwest; (3) east; (4) southeast (added due to berm removal, discussed above), and (5) a new north channel, added to the model to account for runoff allowed by the topography generally to the north of Unit 1.

For modeling purposes each unit's power block is divided into four drainage areas. The modified model design reflects the current site grading and drainage plan. The power block specific drainage areas are illustrated in revised FSAR Figure 2.4.2-204 (see Attachment 3).

The resulting water surface elevations from the local intense precipitation analysis are provided in revised FSAR Table 2.4.2-204 (see Attachment 3). The resulting maximum water surface elevation is 589.59 ft. msl and occurs in drainage area B1 of the Unit 1 power block area and in drainage area B2 of the Unit 2 power block area. These drainage areas, B1 and B2, are located on the west side of each respective power block area between the Annex Building, north storage tanks and ramp, and the Transformer Area. All Lee Nuclear Station safety-related structures are located above the effects of local intense precipitation at plant elevation 590 ft. msl.

Changes in the site grading and drainage plan also impacted the analysis of site-related surface water features as follows:

- Changes in grading on the eastern portion of the site at the interface with MUPA required reanalysis of the maximum flood water elevation with coincident wind wave activity for MUPA. The maximum elevation remains unchanged at 582.79 ft. msl. (FSAR Subsection 2.4.4.3). This maximum value for MUPA is associated with the flooded Broad River which inundates MUPA.
- Surge flooding (high speed winds coincident with a 100-yr storm) is reanalyzed showing an increase in the maximum water surface elevation of approximately one foot to 563.50 ft. msl for MUPA. This increase is not significant overall since this MUPA flooding elevation is bounded by the higher PMF plus wind wave activity result of 582.79 ft. msl noted above. The reanalysis of MUPB surge floods shows a relative decrease from the prior analysis to 578.60 ft. msl. FSAR Subsection 2.4.5 is revised to reflect changes in critical analysis parameters and results (see Attachment 6).
- Impacts of site grading and drainage plan on MUPB are factored into the results discussed below.

Analysis of Flooding Associated with Make-up Pond B (MUPB). The modeling and analysis of flooding associated with MUPB was also revised. In previous analyses, MUPB was evaluated as a single watershed. However, MUPB consists of the larger main body of the pond and a smaller water body associated with MUPB, as illustrated in revised FSAR Figure 2.4.1-201 (see Attachment 2). This water body is referred to as the MUPB Upper Arm and is formed by an earthen embankment dam on the northern end of the Upper Arm. Water moves from the Upper Arm to MUPB through a 54-inch culvert at elevation 575 ft msl. To provide a more defined analysis of flooding in MUPB, the MUPB related watershed was divided into two distinct sub-basins. Separation of the watershed allowed the modeling of the Upper Arm separately, and the subsequent failure of the Upper Arm Dam and its impacts on discharges to the main body of MUPB. The revised MUPB flooding analysis also reflects the impacts of improvements in the site grading and drainage plan.

The updated maximum water surface elevation (PMF) for MUPB assuming failure of Upper Arm Dam is 584.58 ft. msl. The resulting PMF for MUPB with coincident wind wave activity is 585.8 ft. msl, representing an increase of 0.1 feet relative to the prior analysis. FSAR Subsections 2.4.1, 2.4.2, 2.4.3 and 2.4.4 are revised (see Attachments 2, 3, 4, and 5) to reflect the description of the MUPB Upper Arm, the updated local site PMP analysis and associated results.

Design Basis Considerations. Regulatory Guide 1.206 (Revision 0) Section C.I.2.4.2.2, indicates that the applicant "should show how design flood protection for safety related components and structures of the plant is based on the highest calculated flood water level elevations and flood wave effects (site-characteristic flood) resulting from analyses of several different hypothetical causes." As discussed in revised FSAR Subsection 2.4.2.2 (see Attachment 3), "Flood Design Considerations," the maximum calculated flood water elevation is identified as follows:

> The maximum flood level at the Lee Nuclear Station is established as a maximum of calculated results from flooding events analyzed in Section 2.4. That maximum flood level is elevation 589.59 ft. msl. This elevation would result from a PMP event on the Lee Nuclear Station site (local intense precipitation) as described in Subsection 2.4.2.3. The Lee Nuclear Station safety-related plant elevation is 590 ft. msl.

The FSAR content above satisfies the guidance in Regulatory Guide 1.206, Section C.I.2.4.2.2, for reporting the analyses and associated maximum flood level at the Lee Nuclear Station site as discussed in FSAR Subsections 2.4.2 through 2.4.7. The analyses include the effects of local intense precipitation and a wide range of flooding scenarios associated with surface water features (e.g., PMF on local streams, rivers and lakes, potential dam failures, probable maximum surge and seiche, probable maximum tsunami, and ice effects) at or near the site.

The maximum flood level of 589.59 ft. msl is reported as the site characteristic used to demonstrate compliance with the AP1000 DCD site parameter of Flood Level, in revised FSAR Table 2.0-201, Sheet 6 (see Attachment 1).

Regulatory Guide 1.102 (Revision 1) defines the Design Basis Flooding Level (DBFL) as the "maximum water elevation attained by the controlling flood, including coincident wind-generated wave effects." This Guide also recognizes that the local site PMP could also produce the DBFL. As noted in the Guide, "the intensity of this rainfall and the usual design of the drainage system may result in ponding in the plant yard could produce the DBFL" (Section B, Discussion, pages 1.102-2 and -3). The NRC Standard Review Plan, NUREG-0800, Section 2.4.2, "Floods" (Revision 4) recognizes that the analysis of the local intense precipitation event is important in terms of the design of site grading and drainage provisions (I.1.B on p. 2.4.2-2 and III.1 on p. 2.4.2-9).

The results of the local site PMP analysis demonstrate the adequacy of site grading and drainage systems in protecting safety functions during this event. The resulting maximum surface water elevation from this PMP analysis establishes the Lee Nuclear Station site's DBFL. Note, due to the conservative treatment of the storm's magnitude and other analysis assumptions, combined with the typical approach to plant building and layout design, this analysis would be expected to produce a maximum water elevation that is relatively close to the plant design interface requirement regardless of site location. For example, a number of the new nuclear plant projects referencing the standard AP1000 design, either licensed or in some phase of the review process, report a maximum water elevation less than one foot from the AP1000 DCD site parameter for Flood Level of 100 ft. (DCD Tier 2 Table 2-1, Sheet 3 of 4). See References 3, 4, and 5.

The PMF analysis of surface water features, like that of the local site PMP, is conservative and considers a range of storm durations and temporal distributions. However, this analysis differs from the local PMP analysis because it considers dam failures and wind wave activity to demonstrate adequate protection of safety function during flooding and other extreme events associated with surface water features (e.g., streams, rivers, lakes, ponds, etc.). Given the differences between a PMF and local PMP event, a maximum surface feature flood elevation should be established from the analysis of potential events involving surface water features.

The limiting maximum water surface elevation associated with flooding of surface water features for the Lee Nuclear Station Site (evaluated and reported in FSAR Subsections 2.4.3 through 2.4.7) is established by the flooding analysis of MUPB (i.e., the PMF with coincident wind wave activity). This maximum surface water elevation is 585.8 ft. msl and provides the maximum surface feature flood elevation for the Lee Nuclear Station site.

Additional, Related FSAR Changes. FSAR Subsection 2.4.1.2.2.5 is revised to reference FSAR Subsections 2.4.2 through 2.4.4 for the discussion of Broad River flooding including deletion of wording "Broad River design basis flood elevation" (see Attachment 2). FSAR Figure 2.4.1-201 is revised to update the Hold-up Pond A full pond elevation (see Attachment 2). FSAR Subsection 2.4.14 and Table 19.58-201 are revised to update the analysis results associated with the effects of local intense precipitation and MUPB flooding (see Attachments 7 and 8).

References:

1. Letter from Ronald A. Jones (Duke Energy) to Document Control Desk (NRC), Supplemental Response to Request for Additional Information Letter No. 003, Related to SRP Section 10.04.05 for the William States Lee III Units 1 and 2 Combined License Application, dated November 22, 2011 (ML11332A157).
2. Vogtle Electric Generating Plant, Units 3 & 4, COL Application, Part 2, Final Safety Analysis Report, Revision 5, Table 2.0-201 (Sheet 7 of 9).
3. V. C. Summer Nuclear Station, Units 2 and 3, COL Application, Part 2, Final Safety Analysis Report, Revision 5 Subsection 2.4.2.2.
4. Levy Nuclear Power Plants Units 1 and 2, COL Application, Part 2, Final Safety Analysis Report, Revision 2, Subsection 2.4.2.3.

Associated Revisions to the Lee Nuclear Station Final Safety Analysis Report:

1. FSAR Table 2.0-201
2. FSAR Subsection 2.4.1.2.2.5
3. FSAR Subsection 2.4.1.2.2.6
4. FSAR Figure 2.4.1-201
5. FSAR Subsection 2.4.2.2
6. FSAR Subsection 2.4.2.3
7. FSAR Table 2.4.2-204
8. FSAR Figure 2.4.2-202
9. FSAR Figure 2.4.2-204
10. FSAR Subsection 2.4.3
11. FSAR Subsection 2.4.3.1
12. FSAR Subsection 2.4.3.3
13. FSAR Subsection 2.4.3.4
14. FSAR Subsection 2.4.3.5
15. FSAR Subsection 2.4.3.6
16. FSAR Table 2.4.3-208
17. New FSAR Table 2.4.3-209
18. FSAR Figure 2.4.3-201
19. FSAR Figure 2.4.3-227
20. FSAR Figure 2.4.3-228
21. FSAR Figure 2.4.3-230
22. FSAR Figure 2.4.3-231
23. FSAR Figure 2.4.3-233
24. FSAR Figure 2.4.3-234
25. FSAR Figure 2.4.3-237
26. New FSAR Figure 2.4.3-246
27. New FSAR Figure 2.4.3-247
28. New FSAR Figure 2.4.3-248
29. New FSAR Figure 2.4.3-249

30. FSAR Subsection 2.4.4
31. FSAR Subsection 2.4.4.1
32. FSAR Subsection 2.4.4.3
33. New FSAR Figure 2.4.4-203
34. New FSAR Figure 2.4.4-204
35. New FSAR Figure 2.4.4-205
36. FSAR Subsection 2.4.5
37. FSAR Figure 2.4.5-201
38. FSAR Figure 2.4.5-202
39. FSAR Subsection 2.4.14
40. FSAR Table 19.58-201

Attachments:

1. Lee Nuclear Station Supplemental Response to Request for Additional Information, RAI 10.04.05-02, Revisions to FSAR Chapter 2, Section 2.0
2. Lee Nuclear Station Supplemental Response to Request for Additional Information, RAI 10.04.05-02, Revisions to FSAR Chapter 2, Sections 2.4.1
3. Lee Nuclear Station Supplemental Response to Request for Additional Information, RAI 10.04.05-02, Revisions to FSAR Chapter 2, Section 2.4.2
4. Lee Nuclear Station Supplemental Response to Request for Additional Information, RAI 10.04.05-02, Revisions to FSAR Chapter 2, Section 2.4.3
5. Lee Nuclear Station Supplemental Response to Request for Additional Information, RAI 10.04.05-02, Revisions to FSAR Chapter 2, Section 2.4.4
6. Lee Nuclear Station Supplemental Response to Request for Additional Information, RAI 10.04.05-02, Revisions to FSAR Chapter 2, Section 2.4.5
7. Lee Nuclear Station Supplemental Response to Request for Additional Information, RAI 10.04.05-02, Revisions to FSAR Chapter 2, Section 2.4.14
8. Lee Nuclear Station Supplemental Response to Request for Additional Information, RAI 10.04.05-02, Revisions to FSAR Chapter 19

Attachment 1

Lee Nuclear Station Supplemental Response to Request for Additional Information

RAI 10.04.05-02

Revisions to FSAR Chapter 2, Section 2.0

Table 2.0-201, Sheets 6 and 8

1. COLA Part 2, FSAR Table 2.0-201, Sheets 6 and 8 of 8 are revised as follows:

WLS SUP 2.0-1

TABLE 2.0-201 (Sheet 6 of 8)
COMPARISON OF AP1000 DCD SITE PARAMETERS AND LEE NUCLEAR STATION UNITS 1 & 2 SITE CHARACTERISTICS

	AP 1000 DCD Site Parameters	WLS Site Characteristic	WLS FSAR Reference	WLS Within Site Parameter
Flood Level	Less than plant elevation 100' (WLS Elevation 590' msl)	~~589.62~~589.59 ft. msl[(1)]	Subsection 2.4.2.3	Yes
Groundwater Level	Less than plant elevation 98' (WLS Elevation 588' msl)	Maximum groundwater elevation considering the most severe historically recorded natural phenomena has been estimated to be approximately 584 ft. msl, with AP1000 elevation 100 ft at 590 ft. msl. This allows for approximately 6 ft. of unsaturated interval below the plant grade elevation 100 ft.	Subsection 2.4.12.2.3.1	Yes
Plant Grade Elevation	Less than plant elevation 100' (WLS elevation 590' msl) except for portion at a higher elevation adjacent to the annex building	589.5 ft. msl	Subsection 2.4.1.1.3	Yes
Precipitation				
Rain	20.7 in./hr [1-hr 1-mi^2 PMP]	18.9 in./hr. [1-hr 1-mi^2 PMP]	Table 2.4.2-203	Yes
Snow / Ice	75 pounds per square foot on ground with exposure factor of 1.0 and importance factors of 1.2 (safety) and 1.0 (non-safety)	17.7 pounds per square foot	Subsection 2.3.1.2.7.3	Yes

WLS SUP 2.0-1

TABLE 2.0-201 (Sheet 8 of 8)
COMPARISON OF AP1000 DCD SITE PARAMETERS AND LEE NUCLEAR STATION UNITS 1 & 2 SITE CHARACTERISTICS

	AP 1000 DCD Site Parameters	WLS Site Characteristic	WLS FSAR Reference	WLS Within Site Parameter
Population Distribution				
Exclusion area (site)	0.5 mi	Minimum distance from the Effluent Release Boundary to the Exclusion Area Boundary is 2113 feet. The radius of the effluent release boundary is 550 feet. The total minimum distance from the site center point to the EAB is 2663 feet (0.50 mi).	Subsection 2.1 _Figure 2.1-209	Yes

a) Maximum and minimum safety values are based on historical data and exclude peaks of less than 2 hours duration.
b) The maximum normal value is the 1-percent seasonal exceedance temperature. The minimum normal value is the 99-percent seasonal exceedance temperature. The minimum temperature is for the months of December, January, and February in the northern hemisphere. The maximum temperature is for the months of June through September in the northern hemisphere. The 1-percent seasonal exceedance is approximately equivalent to the annual 0.4-percent exceedance. The 99-percent seasonal exceedance is approximately equivalent to the annual 99.6-percent exceedance.
c) The noncoincident wet bulb temperature is applicable to the cooling tower only.
d) With ground response spectra as given in DCD Figure 3.7.1-1 and DCD Figure 3.7.1-2. Seismic input is defined at finished grade except for sites where the nuclear island is founded on hard rock.
e) Sites that fall within the hard rock high frequency envelope response spectra given in DCD Figures 3I.1-1 and 3I.1-2 and satisfy the limitation on shear wave velocity in DCD Subsection 2.5.2.1 are acceptable.
f) Per APP-GW-GLR-020, the kinetic energies of the missiles discussed in DCD Section 3.5 are greater than the kinetic energies of the missiles discussed in Regulatory Guide 1.76 and results in a more conservative design.
g) For AP1000, the term "site boundary" and "exclusion area boundary" are used interchangeably. Thus, the X/Q specified for the site boundary applies whenever a discussion refers to the exclusion area boundary. At Lee Nuclear Station, the "site boundary" and the "exclusion area boundary" are not interchangeable. See Figure 2.1-209.
h) The containment pressure response analysis is based on a conservative set of dry-bulb and wet-bulb temperatures. These results envelop any conditions where the dry-bulb temperature is 115°F or less and wet-bulb temperature of less than or equal to 86.1°F.
(i) The maximum flood level of ~~589.62~~589.59 ft. msl is a result of local PMP event as described in Subsection 2.4.2.3. See Subsection 2.4.2.2 for discussion of design basis considerations. ~~The maximum flood level in surface water is 585.7 ft. msl in Make-Up Pond B as described in Subsection 2.4.3.6.~~

Attachment 2

Lee Nuclear Station Supplemental Response to Request for Additional Information

RAI 10.04.05-02

Revisions to FSAR Chapter 2, Subsection 2.4.1

Subsection 2.4.1.2.2.5
Subsection 2.4.1.2.2.6
Figure 2.4.1-201

1) COLA Part 2, FSAR Chapter 2, Subsection 2.4.1.2.2.5, second paragraph under the sub-heading 'Reservoir Characteristics' is revised to read:

From October 1998 to 2006, the USGS recorded a minimum pool elevation in the Ninety-Nine Islands Reservoir of 508.20 ft. on February 14, 2005 (Reference 293). Duke Power data from 1964 to 1973 indicate that the minimum pool elevation was 505.6 ft. during May 1965 (Reference 214). Low water considerations are discussed in Subsection 2.4.11. ~~The Broad River design basis flood elevation is 549.77 ft above msl (Subsections 2.4.2 and 2.4.3).~~ The maximum water surface elevation for the Broad River at the site is discussed in Subsections 2.4.2, 2.4.3 and 2.4.4. Based on the flood frequency curve generated from analysis of the USGS Gaffney gauge, the projected 100-yr flow is 97,900 cfs and the projected 500-year flow is 127,000 cfs. The corresponding elevations based on interpolation of the rating curve for Ninety-Nine Islands Dam and assuming flashboard failure are 520.95 ft. and 522.63 ft. for the 100-year and 500-year events, respectively.

2) COLA Part 2, FSAR Chapter 2, Subsection 2.4.1.2.2.6, first paragraph, first sentence is revised to read:

The Lee Nuclear Site has three manmade impoundments: (1) Make-Up Pond B, including the Upper Arm feature (2) Make-Up Pond A, and (3) Hold-Up Pond A.

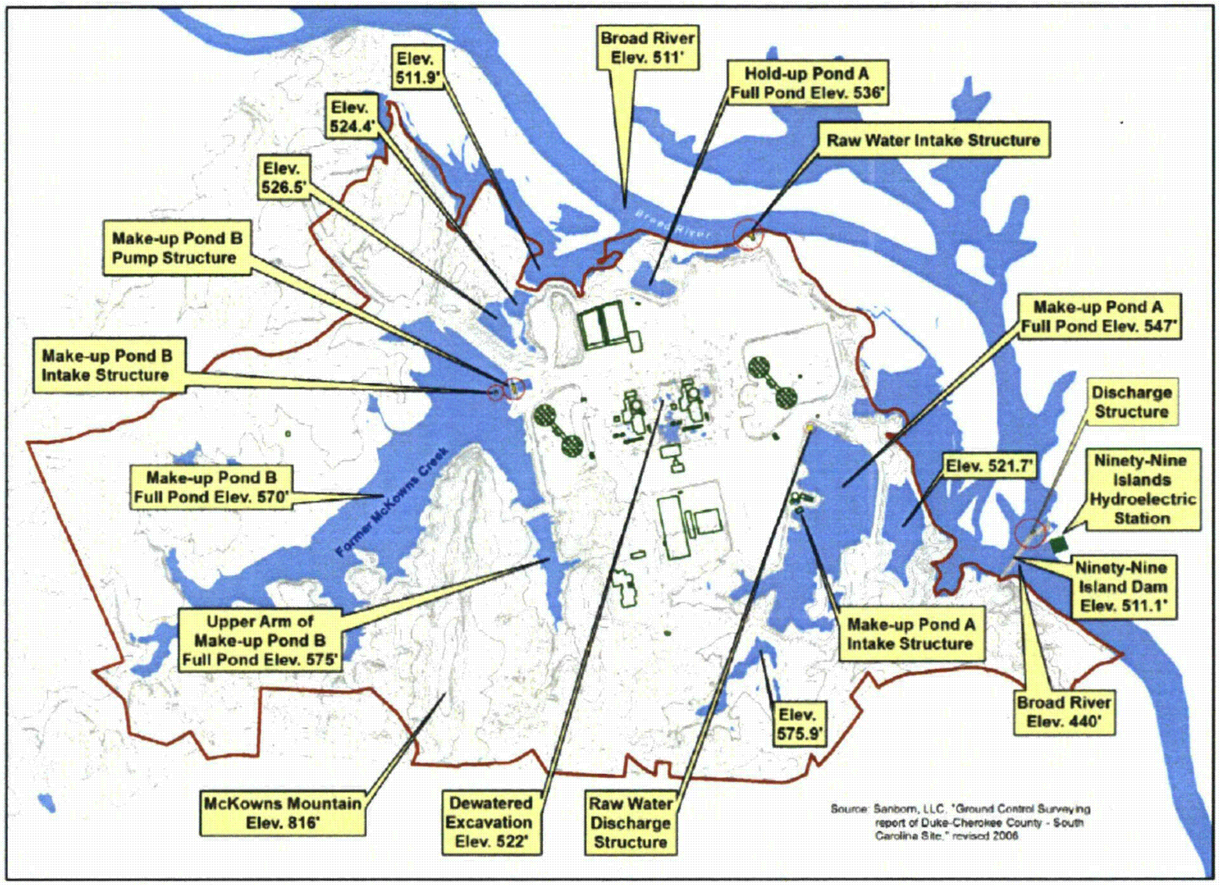
3) COLA Part 2, FSAR Chapter 2, Subsection 2.4.1.2.2.6, sixth paragraph under the sub-heading 'Make-Up Pond B' is revised to read:

The maximum flood level of surface water features at the Lee Nuclear Station is elevation 585.8~~7~~ ft. msl. This elevation would result from a Probable Maximum Flood (PMF) event on Make-Up Pond B watershed with the added effects of coincident wind wave activity as described in Subsection ~~2.4.3~~2.4.4. The Lee Nuclear Station safety-related structures have a grade elevation of 590 ft. msl.

An access road spanning across the Upper Arm Dam embankment was constructed in the late 1970's during Cherokee Nuclear Station construction. The result of this construction created a separate impoundment of Make-Up Pond B that takes surface water runoff from the east slope of McKowns Mountain, and from the west slope of ridge to east of Upper Arm. A 54 in. culvert pipe was placed to allow for positive drainage between the Upper Arm and Make-Up Pond B. The location of this dam is shown on Figure 2.4.1-209, Sheet 2.

The Upper Arm Dam has a design crest elevation of 590 ft. located at the access road. The normal pool elevation of the Upper Arm is 575 ft and the Upper Arm occupies approximately 5 percent of the total drainage area of the Make-Up Pond B watershed. Bathymetry exhibited a maximum depth of 32.2 ft., a mean depth of 31.4 ft., total storage capacity of approximately 101 ac.-ft. and the surface area at full pond is approximately 9.1 ac. (Figure 2.4.1-209, Sheet 2).

4) COLA Part 2, FSAR Figure 2.4.1-201 is revised as shown:



Legend

- Site Boundary
- Water Bodies
- Permanent Structures
- Intake and Outfall

0.5 0.25 0 0.5
Miles

Elevations are in feet (ft.) above mean sea level (msl).

GCS North American 1983
NAD 1983 UTM Zone 17N

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Site Surface Water Features

WLS COL 2.4-1

Datum: South Carolina State Plane Coordinate System
NAD 83, NAVD 88, UTM Zone 17N

FIGURE 2.4.1-201

Attachment 3

Lee Nuclear Station Supplemental Response to Request for Additional Information

RAI 10.04.05-02

Revisions to FSAR Chapter 2, Section 2.4.2

Subsection 2.4.2.2
Subsection 2.4.2.3
Table 2.4.2-204
Figure 2.4.2-202
Figure 2.4.2-204

1) COLA Part 2, Subsection 2.4.2.2, fourth paragraph is revised to read:

The maximum flood level at the Lee Nuclear Station is established as a maximum of calculated results from flooding events analyzed in Section 2.4. That maximum flood level is elevation 589.5962 ft. msl. This elevation would result from a PMP event on the Lee Nuclear Station site (local intense precipitation) as described in Subsection 2.4.2.3. The Lee Nuclear Station safety-related plant elevation is 590 ft. msl. This maximum flood level is identified as a site characteristic in Table 2.0-201.

2) COLA Part 2, FSAR Chapter 2, Subsection 2.4.2.3 is revised as follows:

2.4.2.3 Effects of Local Intense Precipitation

The Lee Nuclear Station drainage system was evaluated for a storm producing the PMP on the local area. For the purpose of the evaluation all subsurface drainage features (i.e., culverts, inlets, etc.) including the vehicle barrier system trench are assumed non-functional and all precipitation is assumed to be transformed to runoff.

Portions of the site are relatively flat; however, the site is graded such that ~~overall~~ runoff will drain away from safety-related structures either to Make-Up Pond B, Make-Up Pond A, or directly to the Broad River through five-grass covered drainage channels. These channels, illustrated in Figure 2.4.2-202, are assumed to be the only flow paths for runoff from the site and establish the downstream boundary conditions for site runoff for modeling purposes. Runoff from a specific power block area flows through four graded channels per unit as described in the discussion below and then through the five site discharge channels to the receiving water body. ~~The PMP flood analysis assumes that all discharge structures are non-functioning.~~ Computed water surface elevations in the vicinity of safety-related structures are below plant elevation ~~of~~ 590 ft. The site grading and drainage plan is shown in Figure 2.4.2-202.

The site is graded to drain runoff away from the power blocks. The finished floor elevation of the safety related structures for each unit is 590 ft. The areas immediately adjacent to the power blocks range in elevation from ~~589.5~~589 ft. to 587 ft. ~~The adjacent grading also incorporates catch basins at an elevation as low as 586 ft.~~ The adjacent area is generally bounded by a roadway surrounding the power blocks. The power block area bounded by the roadway is either paved or gravel ~~surface~~ surfaced. Areas beyond the roadway are generally maintained grass surfaces. Further from the power blocks, the site gently slopes away from the roadway to the vehicle barrier system at elevation 586.5 ft. Beyond the vehicle barrier system, the site continues to gently slope away to a general elevation ranging from 586 ft. to 585 ft. before encountering the steeper slopes into the adjacent, downstream water bodies.

The effects of local intense precipitation are analyzed using a series of models, each establishing boundary conditions for additional modeling. Because the slopes across the site are generally very shallow, the overall site is idealized as a dry reservoir and modeled using level-pool storage routing with U.S. Army Corps of Engineers HEC-HMS 3.5 computer software (Reference 302) for the site drainage area shown in Figure 2.4.2-202. The idealized reservoir is defined by an elevation-discharge-storage relationship. An elevation storage relationship is developed based on the available storage areas across the site within the drainage area. Storage routing does not incorporate the entire area of the power block within the 588 ft. contour that loops around the two units. In addition, all other site structures are assumed to provide no storage.

The discharge relationship for this idealized reservoir is determined by steady state, open channel flow, backwater analysis, modeled using HEC-RAS version 4.1.0 computer software (Reference 303) developed by the U.S. Army Corps of Engineers. HEC-RAS steady state modeling is used with a standard step method to iteratively solve the energy equation to determine water surface profiles at each cross section of the five discharge channels. The boundary conditions for the evaluation of these discharge channels are based on the adjacent, downstream water bodies.

~~The power block area, shown in Figure 2.4.2-204, is then evaluated using standard weir flow equations. Therefore, the HEC-HMS modeling becomes the downstream boundary condition for the weir flow evaluation.~~

~~The site is modeled as a reservoir element in HEC-HMS. The reservoir element is defined by an elevation-discharge-storage relationship. An elevation-storage relationship is developed based on the available storage areas across the site within the drainage area. No storage is assumed for entire area of the power block within the 587 ft. contour that loops around the two units. In addition, all other site structures are assumed to provide no storage.~~

~~There are~~The five~~three~~ defined discharge channels (i.e., West, Southwest, North, East, and Southeast) for the idealized reservoir directing runoff either west or southwest to Make-Up Pond B, ~~or~~ north or east to the Broad River, ~~and~~or southeast to Make-Up Pond A. ~~Although runoff would also spread out across the site, flowing north between structures to the Broad River and southeast to Make-Up Pond A, these flow paths are not considered in the analysis.~~ The five~~three~~ discharge channels are modeled using standard-step, backwater analysis with ~~U.S. Army Corps of Engineers~~ HEC-RAS 4.1.0 ~~computer~~ software ~~(Reference 303)~~ to establish the elevation-discharge relationship for ~~the~~ overall site modeling of the idealized reservoir. The downstream boundary conditions for the West and Southwest discharge channels are based on the peak PMF water surface elevations for the receiving water body, Make-Up Pond B. The downstream boundary conditions for the North and East discharge channels are based on the peak PMF water surface elevation with dam failure and wind/wave run-up for the receiving water body, ~~or~~ the Broad River. The downstream boundary condition for the Southeast discharge channel is also based on the Broad River instead of Make-Up Pond A since the Broad river inundates Make-Up Pond A during the dam failure event.

Cross sections for each of the five~~three~~ discharge channels are determined based on the site grading and drainage plan (Figure 2.4.2-202). Site structures are modeled to obstruct flow and are assumed to provide no storage. A Manning's roughness coefficient of n = 0.050 is used for all cross sections in the reservoir model, which bounds the ground cover used for site conditions (i.e., grass lined channels and/or paved-gravel areas). HEC-RAS modeling was performed using steady state analysis to establish an elevation-discharge relationship at the upstream cross section. The results for the five discharge~~three~~ channels are combined with the elevation-storage relationship to establish a complete elevation-discharge-storage relationship for the idealized reservoir.

The local intense PMP is defined by Hydrometeorological Report (HMR) Nos. 51 and 52. PMP values for durations from 6-hr. to 72-hr. are determined using the procedures as described in HMR No. 51 for areas of 10-sq. mi. (Reference 255). Using the Lee Nuclear Station location, the rainfall depth is read from the HMR No. 51 PMP charts for each duration.

The 1-sq. mi. PMP values for durations of 1-hour and less are determined using the procedures as described in HMR No. 52 (Reference 225). Using the Lee Nuclear Station location, the rainfall depth is read from the HMR No. 52 PMP charts for each duration. A

smooth curve is fitted to the points. The derived PMP curve is detailed in Table 2.4.2-203. The corresponding PMP depth duration curve is shown in Figure 2.4.2-203.

HMR 52 guidance indicates that PMP rates for 10-sq. mi. areas are the same as point rainfall. Also indicated in HMR 52, the 1-sq. mi. PMP rates may also be considered the point rainfall for areas less than 1-sq. mi. Therefore, intensities for any drainage areas with durations longer than 1-hr. are derived from the PMP rates for 10-sq. mi. areas. Intensities for drainage areas with durations equal to or less than 1-hr. are derived from the PMP rates for 1-sq. mi. areas.

The AP1000 plant design is based on a PMP of 20.7 in/hr as provided in DCD Table 2-1. As shown in Figure 2.4.2-203, the site is within the plant design limits for PMP. The PMP is identified as a precipitation site characteristic in Table 2.0-201. Roofs are sloped to preclude ponding of water.

Two storms are modeled on the basis of the PMP curve detailed in Table 2.4.2-203 and Figure 2.4.2-203. A 72-hr. duration storm with a 1-hr. precipitation interval is examined along with a 6-hr. duration storm with a 5-min. precipitation interval to capture the effect of the short-term, high intensity on the peak flow. The local intense PMP is converted to runoff at each increment by multiplying the drainage area by the intensity of each increment and converting the units to cubic feet per second. This approach is essentially equivalent to the Rational Method (Reference 201) using a runoff coefficient of one. Therefore, all rainfall is converted to runoff instantaneously and no runoff losses are included.

Runoff is applied to the site reservoir model in HEC-HMS and level-pool storage routing is used to determine the resulting water surface elevation. Several time distributions are examined for both modeled storm events. For the 72-hr. duration storm, ~~an~~ a tail end peaking storm event is found to result in the highest water surface elevation for the site. The corresponding hyetograph is provided in Figure 2.4.3-236.

As a conservative approach, the results from the 72-hr. duration storm are used to establish the starting elevation for the 6-hr. duration storm. For the 6-hr. duration storm, ~~an~~ a tail end peaking storm event is also found to result in the highest water surface elevation for the site. The corresponding hyetograph is provided in Figure 2.4.3-235. Based on a combination of the two storms the maximum water surface elevation determined using HEC-HMS is ~~588.05~~587.72 ft. This elevation is applied to the overall site and used as the downstream boundary condition for the analysis of the power block ~~area~~ areas immediately adjacent to the units.

As shown in Figure 2.4.2-204, runoff is directed away from the power block units to lower lying areas via four discharge channels. Under the assumption that all subsurface drainage features are non-functional, runoff would ~~overtop~~ flow over roadways or other topographical features as the flow exits the areas immediately adjacent to the power block units. ~~Overtopping is evaluated using the standard weir flow equation and two approaches. The first approach is based on simply applying a weir flow coefficient of C = 2.6. The second approach is based on roadway overtopping methodology (Reference 304) and adjusting an initial weir flow coefficient of C = 2.5 for gravel or C = 2.9 for paving to account for weir submergence due to downstream conditions. The more conservative of the results is selected as the maximum water surface elevation.~~

For each power block area shown in Figure 2.4.2-204, the peak runoff is determined using the maximum PMP intensity of 6.2 in/5 min from Table 2.4.2-203. The peak runoff is determined by multiplying the drainage area by the intensity and converting the units to cubic feet per second. This approach is essentially equivalent to the Rational Method using a runoff

coefficient of one. Therefore, all rainfall is converted to runoff instantaneously and no runoff losses are included.

The power block drainage areas, shown in Figure 2.4.2-204, are evaluated using the maximum water surface elevation for the idealized reservoir as the downstream boundary condition. Therefore, the HEC-HMS modeling for the idealized reservoir becomes the downstream boundary condition for the power block areas' channel flow evaluation. The four discharge channels for the Unit 1 power block area and the four discharge channels for the Unit 2 power block area are evaluated by steady state, open channel flow, backwater analysis, modeled using HEC-RAS version 4.1.0 software.

Cross sections for each of the four discharge channels (A1, B1, C1, and D1), which discharge from the Unit 1 power block area, are determined based on the grading and drainage plan. Cross sections for each of the four Unit 2 related discharge channels (A2, B2, C2, and D2), are determined in the same manner. Site structures are modeled to obstruct flow and are assumed to provide no storage. A Manning's roughness coefficient of n = 0.026 is used for all of the power block cross sections, which bounds the ground cover used for site conditions (i.e., gravel lined channels). HEC-RAS modeling was performed using steady state analysis to establish a maximum water surface elevation at the upstream cross section.

~~Runoff from Areas A, B1, and E2 overtops the roadway looping around the power block into the site area idealized as a reservoir. Runoff from Areas E1 and B2 overtops interior roadways into Area A. Runoff from Areas C1 and D1 overtops a combination of interior roadways and topographical features into Area B1. Similarly, runoff from Areas C2 and D2 overtops a combination of interior roadways and topographical features into Area B2.~~

The resulting water surface elevations are provided in Table 2.4.2-204. The maximum water surface elevation determined is 589.59~~62~~ ft. and occurs at drainage area B1 of the Unit 1 power block area and at drainage area B2 of the Unit 2 power block area. These drainage areas, B1 and B2, are located on the west side of each, respective, power block area ~~unit in the area~~ between the Annex Building, north storage tanks and ramp, and the ~~Diesel Generator Building~~Transformer Area. All Lee Nuclear Station safety-related structures are located above the effects of local intense precipitation at plant elevation 590 ft.

Due to the temperate climate and relatively light snowfall, significant icing is not expected. Based on the site layout and grading, any potential ice accumulation on site facilities is not expected to affect flooding conditions or damage safety-related facilities. Ice effects are discussed in Subsection 2.4.7.

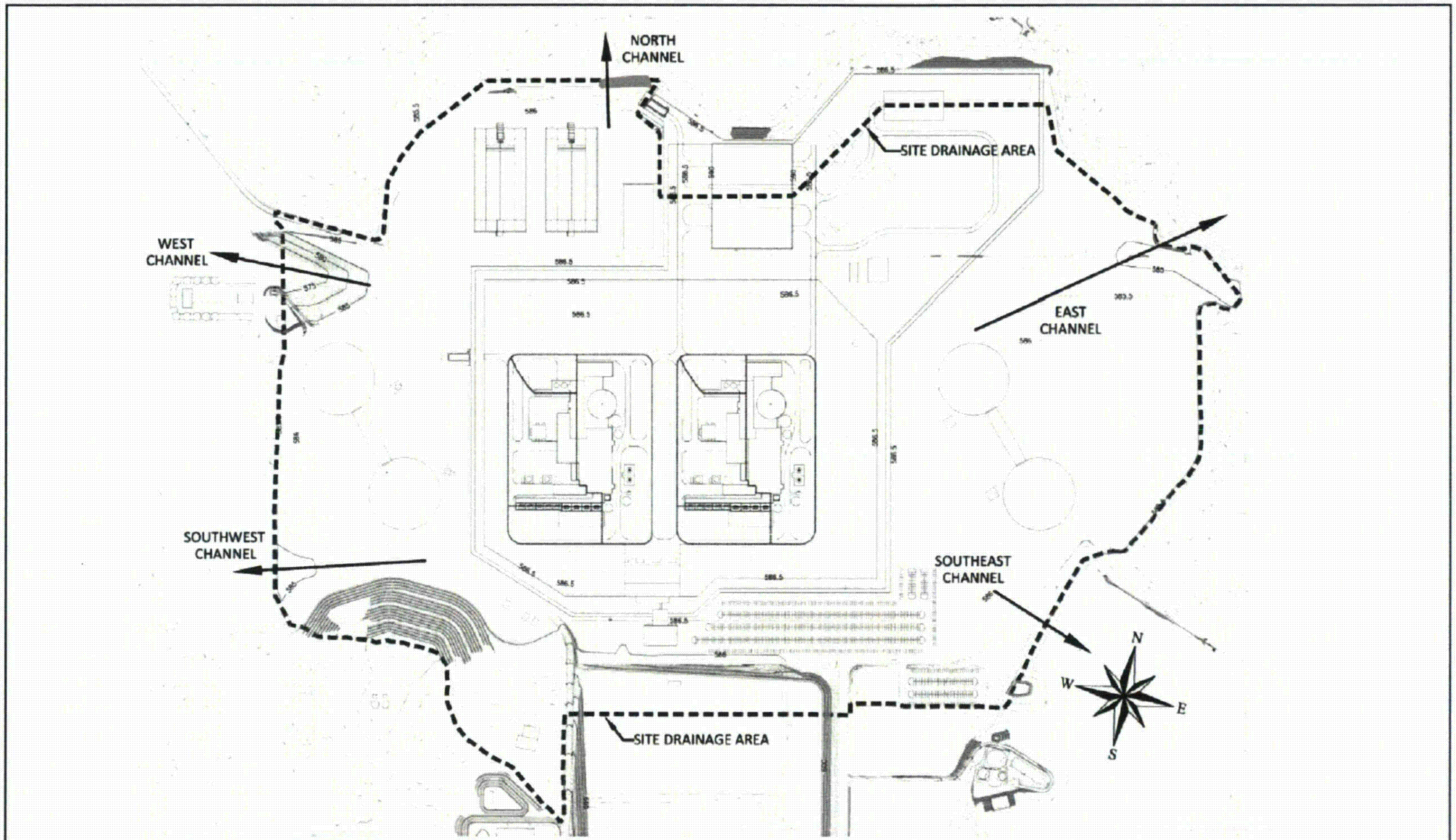
3) COLA Part 2, FSAR Table 2.4.2-204 is revised as follows:

WLS COL 2.4-2

TABLE 2.4.2-204
SITE DRAINAGE AREAS DETAILS

Drainage Area	Area Acres (ac)	Flow Rate (cfs)	Maximum Velocity (fps)	~~Weir Flow Coefficient (c)~~	~~Total Effective Weir Length (ft.)~~	Maximum Depth of Flow (ft.)	Maximum Water Surface Elevation (ft.)
A1	1.26	94.27 ~~1202~~	3.02	~~2.6~~	~~795.58~~	1.06 ~~0.75~~	589.21 ~~588.75~~
B1	4.99	374.53 ~~538~~	2.80	~~1.95~~	~~641.09~~	0.80 ~~0.57~~	589.59 ~~588.07~~
C1	2.01	150.88 ~~30~~	2.88	~~2.5~~	~~69.12~~	1.70 ~~0.62~~	588.70 ~~589.62~~
D1	7.38	553.81 ~~95~~	2.82	~~2.5~~	~~102.34~~	1.98 ~~0.69~~	588.98 ~~589.19~~
~~E1~~		~~134~~		~~0.82~~	~~241.04~~	~~0.77~~	~~588.77~~
A2	1.26	94.27	3.02			1.06	589.21
B2	4.99	374.53 ~~538~~	2.80	~~0.58~~	~~641.09~~	0.80 ~~1.28~~	589.59 ~~588.78~~
C2	2.01	150.88 ~~30~~	2.88	~~2.5~~	~~69.12~~	1.70 ~~0.62~~	588.70 ~~589.62~~
D2	6.63	497.36 ~~95~~	2.62	~~2.5~~	~~102.34~~	1.95 ~~0.69~~	588.95 ~~589.19~~
~~E2~~		~~134~~		~~2.6~~	~~241.04~~	~~0.36~~	~~588.36~~

4) COLA Part 2, FSAR Figure 2.4.2-202 is revised as shown:



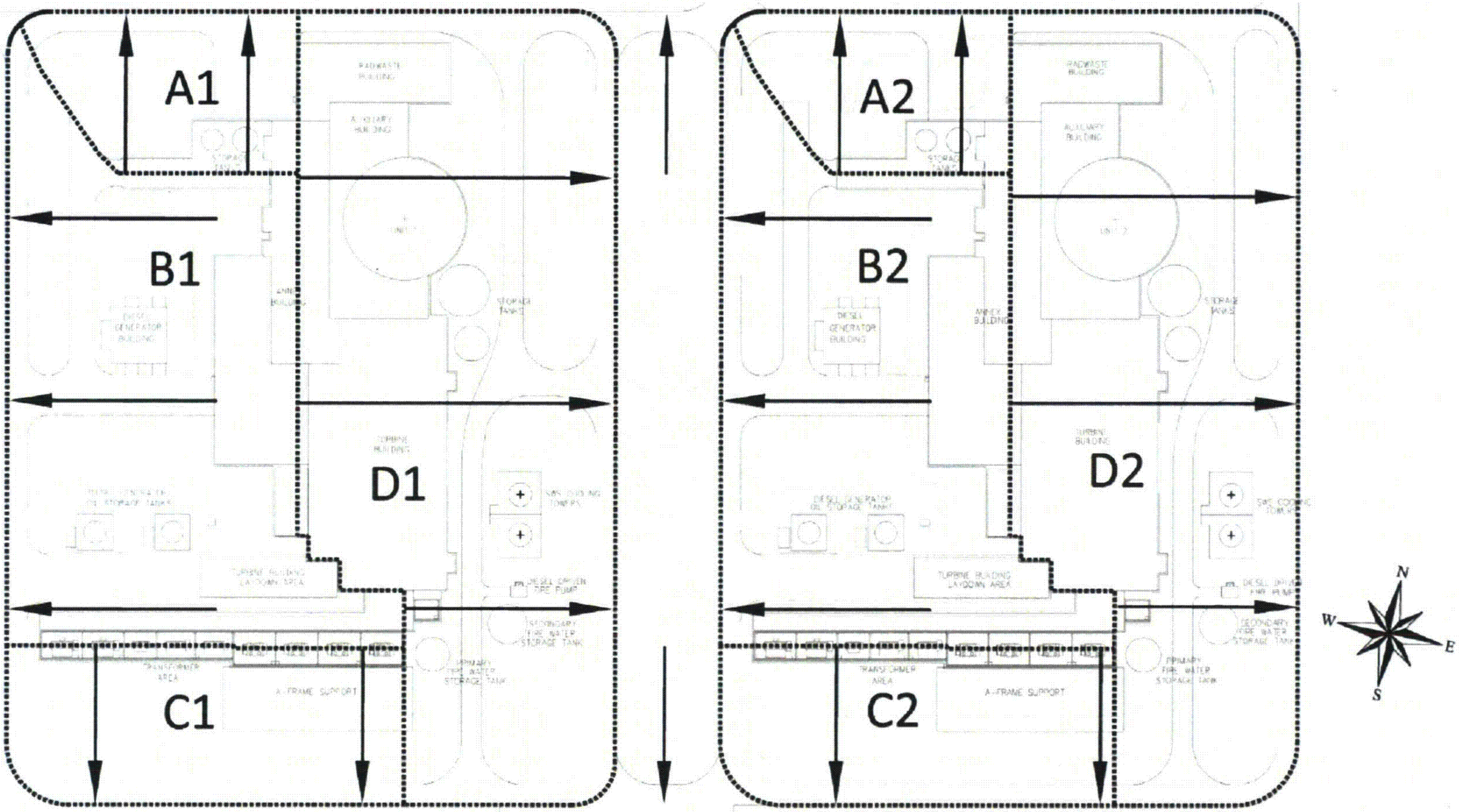
WLS COL 2.4-2

WILLIAM STATES LEE III NUCLEAR STATION UNITS 1 & 2

Grading and Drainage Plan

FIGURE 2.4.2-202

5) COLA Part 2, FSAR Figure 2.4.2-204 is revised as shown:



WLS COL 2.4-2

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Site Analysis Drainage Areas

FIGURE 2.4.2-204

Attachment 4

Lee Nuclear Station Supplemental Response to Request for Additional Information

RAI 10.04.05-02

Revisions to FSAR Chapter 2, Section 2.4.3

Subsection 2.4.3
Subsection 2.4.3.1
Subsection 2.4.3.3
Subsection 2.4.3.4
Subsection 2.4.3.5
Subsection 2.4.3.6
Table 2.4.3-208
New Table 2.4.3-209
Figure 2.4.3-201
Figure 2.4.3-227
Figure 2.4.3-228
Figure 2.4.3-230
Figure 2.4.3-231
Figure 2.4.3-233
Figure 2.4.3-234
Figure 2.4.3-237
New Figure 2.4.3-246
New Figure 2.4.3-247
New Figure 2.4.3-248
New Figure 2.4.3-249

1) COLA Part 2, FSAR Chapter 2, Subsection 2.4.3 is revised, under the sub-heading 'McKowns Creek/Make-Up Pond B,' to read:

   The PMF for McKowns Creek and Make-Up Pond B is determined from the PMP for the 2.233~~55~~-sq. mi. drainage basin of Make-Up Pond B and the 0.283 sq. mi drainage basin of the Upper Arm. The Make-Up Pond B drainage basin, including the Upper Arm, is shown in Figure 2.4.3-201.

2) COLA Part 2, FSAR Chapter 2, Subsection 2.4.3.1 is revised, under the sub-heading 'McKowns Creek /Make-Up Pond B,' as follows:

   The PMP for McKowns Creek, ~~and~~ Make-Up Pond B, and the Upper Arm, is defined in Subsection 2.4.2.3. Two storms were modeled on the basis of the PMP curve detailed in Table 2.4.2-203 and Figure 2.4.2-203. The total PMP depth of the 72-hr. duration storm is 46.8 in. A 6-hr. storm with a 5-min. precipitation interval was examined to capture the effect of the short-term, high intensity on the peak flow. In addition, a 72-hr. storm with a 1-hr. precipitation interval was examined to identify the total runoff volume of a PMP event.

   Several time distributions were examined for both modeled events. For Make-Up Pond B, for a 72-hr. storm, a~~n~~ tail end peaking storm event was found to provide the greatest ~~total~~ runoff and the peak water surface elevation. For the 6-hr. storm, a two-thirds peaking storm event was found to provide the greatest runoff and peak water surface elevation for the short term event. ~~However, an end peaking storm event was found to provide the controlling water surface elevation~~

   For the Upper Arm to Make-Up Pond B, for a 72-hr. storm, a tail end peaking storm event was found to provide the greatest runoff and the peak water surface elevation. For the 6-hr. storm, the two-thirds peaking storm was found to provide the greatest runoff, though the tail-end peaking storm provides the peak water surface elevation. The 6-hr and 72-hr. storm events are ~~as~~ discussed in Subsection 2.4.3.5. Hyetographs are provided in Figure 2.4.3-204 and Figure 2.4.3-205 for the two-thirds peaking storm events. Hyetographs are provided in Figure 2.4.3-235 and Figure 2.4.3-236 for the tail end peaking storm events.

3) COLA Part 2, FSAR Chapter 2, Subsection 2.4.3.1 is revised, under the sub-heading 'London Creek /Make-Up Pond C,' third paragraph to read:

   Several time distributions were examined for the PMP event using a 1-hr. precipitation interval. A tail ~~n~~ end peaking storm event was found to provide the greatest discharge and water surface elevation at Make-Up Pond C. The hyetograph is provided in Figure 2.4.3-240.

4) COLA Part 2, FSAR Chapter 2, Subsection 2.4.3.3 is revised, under the sub-heading 'McKowns Creek /Make-Up Pond B,' to read:

   For McKowns Creek/Make-Up Pond B and the Upper Arm, HEC-HMS modeling software was used for rainfall runoff and storage routing calculations. The watershed is shown in Figure 2.4.3-201. Methods adopted to account for nonlinear basin response at high rainfall rates include increasing the peak of the unit hydrograph by 20 percent and reducing the time to peak by approximately 33 percent. Topographic characteristics of the site and watershed are described in Subsection 2.4.1.2.1.

   The Soil Conservation Service (SCS) unit hydrograph method was used as a basis for a modified unit hydrograph to transform rainfall to runoff. An equivalent SCS unit hydrograph was first determined using the equations and ratios of the SCS dimensionless unit

hydrograph. The equivalent SCS unit hydrograph was then modified by increasing the peak of the unit hydrograph by 20 percent and reducing the time to peak by approximately 33 percent. The remaining ordinates of the modified unit hydrograph were adjusted to maintain a smooth unit hydrograph with the standard characteristic of 1 in. of runoff.

The best calibration of the modified SCS unit hydrograph with the initial SCS unit hydrograph was found using a 10-min. computational time step in Make-Up Pond B in the HEC-HMS modeling software. Therefore, the time step used to define the ordinates of the modified SCS unit hydrograph is also 10 min. The Make-Up Pond B subbasin has a lag time of 77 min. The initial SCS unit hydrograph and modified unit hydrograph to account for the effects of nonlinear basin response are provided in Figure 2.4.3-237. The modified SCS unit hydrograph is tabulated in Table 2.4.3-208.

The best calibration of the modified SCS unit hydrograph with the initial SCS unit hydrograph was found using a 2-min. computational time step in the Upper Arm watershed in the HEC-HMS modeling software. Therefore, the time step used to define the ordinates of the modified SCS unit hydrograph is also 2 min. The Upper Arm subbasin has a lag time of 16 min. The initial SCS unit hydrograph and modified unit hydrograph to account for the effects of nonlinear basin response are provided in Figure 2.4.3-246. The modified SCS unit hydrograph is tabulated in Table 2.4.3-209.

The drainage area, length of watercourse, and average slope of the Make-Up Pond B and Upper Arm watershed wasere determined from aerial topography created for the area. The lag time was determined using the standard SCS curve number regression equation:

$T_{lag} = (L^{0.8} * (S+1)^{0.7}) / (1900 * Y^{0.5})$

Where

T_{lag}	lag time (hr.)
L	hydraulic length of the watershed (ft.)
S	maximum potential storage of the watershed (in.);
	where S = 1000/CN -10 and CN = average curve number for the watershed
Y	average watershed land slope (percent)

The resulting characteristic parameters for the Make-Up Pond B watershed are as follows:

Drainage Area (sq. mi.)	L (ft.)	CN	S (in.)	Y (%)	T_{lag} (hr.)
2.22355	10,320	87	1.49	1.60	1.28

The resulting characteristic parameters for the Upper Arm watershed are as follows:

Drainage Area (sq. mi.)	L (ft.)	CN	S (in.)	Y (%)	T_{lag} (hr.)
0.283	3138	85	1.76	6.04	0.27

The curve number is used to determine the lag time only. During rainfall routing, the model does not use the curve number loss method, under the conservative assumption that precipitation losses do not occur. The curve number was developed using the NRCS Web Soil Survey (Reference 278) to determine the soil types in the watershed. About 95 percent of the soil belongs to Hydrologic Soil Group B, and the remaining 5 percent to Hydrologic Soil Group C. The land use is predominately wooded. Make-Up Pond B and the Upper Arm watersheds is are modeled as impervious cover. Wet antecedent moisture conditions (AMC III) were also assumed.

Base flow was determined using the minimum average monthly flow of the Gaffney and Ninety-Nine Island gauges (USGS No. 02153500 and 02153551). The flow was then corrected on the basis of a ratio of drainage basin areas. Base flow was estimated to be 1.812.07 cfs for the Make-Up Pond B watershed and 0.23 cfs for the Upper Arm watershed. Baseflow andis applied to the model as a constant rate.

Make-Up Pond B outflow structure rating curve was developed using standard weir and orifice flow equations with coefficients of 3.5 and 0.8 respectively. The structure is a 35 ft. wide concrete ogee spillway with a crest elevation of 570 ft. The road along Make-Up Pond B crest restricts the opening of the structure to a height of 13.5 ft. The outlet empties into backwaters of the Broad River. The Make-Up Pond B rating curve is provided in Figure 2.4.3-222. Available storage was determined based on aerial topography. Figure 2.4.3-223 provides the storage capacity curve. Full pond elevation of 570 ft. was assumed for antecedent conditions.

The Upper Arm Dam outlet structures consist of a 54 in. steel pipe with headwalls at both the upstream and downstream inverts. The upstream invert within the Upper Arm Dam is placed at an elevation of 575.0 ft., which is the normal full pond elevation. The downstream invert emptying into Make-Up Pond B is placed at an elevation of 570.0 ft. Figure 2.4.3-249 shows a schematic of the Upper Arm culvert structure.

The access road separating the Upper Arm Dam from Make-Up Pond B is at elevation 590.0 ft. and acts as a broad-crested weir with a crest length of 375 ft. with a crest breadth of 8 ft. The maximum height of the dam is 15 ft. from the normal full pond elevation of 575 ft. up to the crest embankment. Water volume below 575 ft. is not considered due to nearly equivalent hydrostatic forces on both sides of the dam embankment during the PMF event. Overtopping of the Upper Arm dam crest is evaluated using the standard weir flow equation with a coefficient of 2.65. The Upper Arm Dam discharge rating curve is provided in Figure

2.4.3-247 and is presented as a combination of culvert flow and weir flow. Available storage was determined based on aerial topography. Figure 2.4.3-248 provides the storage capacity curve. Antecedent conditions for the normal full pond elevation were assumed to be 575.4 ft. based on historical observation.

5) COLA Part 2, FSAR Chapter 2, Subsection 2.4.3.4 is revised under the sub-heading 'McKowns Creek/Make-Up Pond B' and forward to read:

Applying the precipitation, described in Subsection 2.4.3.1, with no precipitation losses, described in Subsection 2.4.3.2 without considering Upper Arm Dam failure, to the runoff model, described in Subsection 2.4.3.3, the McKowns Creek and Make-Up Pond B peak PMF runoff was determined to be 19,99320,784 cfs resulting from the 6-hr. two-thirds peaking storm event. The routed peak discharge is 64047457 cfs.

However, the 72-hr. tail end peaking storm event resulting in a peak PMF runoff of 18,81349,376 cfs and a routed discharge of 8219430 cfs provided the controlling water surface elevation. The peak runoff in the Upper Arm Dam during the 72–hr. tail end peaking storm event will be 3446 cfs with a peak discharge of 3381 cfs. The resulting Make-Up Pond B flow hydrograph for the 72-hr. tail end peaking storm event is shown in Figure 2.4.3-227. Temporal distribution of the PMP is discussed in Subsection 2.4.3.1.

Because the Make-Up Pond B and Upper Arm Dam watersheds areis small, the position of the PMP is considered point rainfall affecting the entire watershed equally. There are no upstream structures. No credit is taken for the lowering of flood levels at the site due to downstream dam failure.

Intermittent Stream/Make-Up Pond A

Applying the precipitation, described in Subsection 2.4.3.1, with no precipitation losses, described in Subsection 2.4.3.2, to the runoff model, described in Subsection 2.4.3.3, the intermittent stream and Make-Up Pond A peak PMF runoff was determined to be 10,72103 cfs resulting from the 6-hr. storm event. The routed peak discharge is 9108079 cfs. The resulting flow hydrograph is shown in Figure 2.4.3-228. Temporal distribution of the PMP is discussed in Subsection 2.4.3.1. Because the watershed is small, the position of the PMP is considered point rainfall affecting the entire watershed equally. There are no upstream structures. No credit is taken for the lowering of flood levels at the site due to downstream dam failure.

London Creek/Make-Up Pond C

Applying the precipitation, described in Subsection 2.4.3.1, and the precipitation losses, described in Subsection 2.4.3.2, to the runoff model, described in Subsection 2.4.3.3, the London Creek and Make-Up Pond C peak PMF runoff providing the highest water surface elevation from the 72-hr. tail end peaking storm event was determined to be 29,167 cfs. The routed peak discharge is 10,577 cfs. Temporal distribution of the PMP is discussed in Subsection 2.4.3.1. Because the watershed is small, the position of the PMP is considered point rainfall affecting the entire watershed equally. The upstream Lake Cherokee watershed was incorporated into the Make-Up Pond C watershed. Therefore, Lake Cherokee was assumed to pass runoff flow without any detention. No credit is taken for the lowering of flood levels at the Lee Nuclear Station due to downstream dam failure.

6) COLA Part 2, FSAR Chapter 2, Subsection 2.4.3.5 is revised under the sub-heading 'McKowns Creek/Make-Up Pond B,' first paragraph to read:

Subsection 2.4.4.3~~3.6~~ addresses coincident wind wave activity for Make-Up Pond B. The maximum water surface elevation of Make-Up Pond B without considering Upper Arm Dam failure, resulting from the 6-hr. two-thirds peaking storm event modeled with a 5-min. time step, was found to be 583.27~~70~~ ft. The elevation hydrograph is provided in Figure 2.4.3-230. The maximum water surface elevation of Make-Up Pond B resulting from the 72-hr. tail end peaking storm event modeled with a 10-min. time step was found to be 584.09~~48~~ ft., including discharge from the Upper Arm. The peak water surface elevation in the Upper Arm Dam for the 72-hr. tail end, peaking storm will be 592.13 ft. The ridge on the east side of the Upper Arm Dam separates the Upper Arm and the site, as illustrated in Figure 2.4.3-201. At elevations above 590.0 ft., discharge across the dam embankment flows directly into Make-Up Pond B. Therefore, water surface elevations for the Upper Arm will not encroach upon site SSC's. The elevation hydrograph for Make-Up Pond B is provided in Figure 2.4.3-231. ~~Subsection 2.4.3.3 describes the models used to translate the PMP discharge to the elevation hydrographs.~~

7) COLA Part 2, FSAR Chapter 2, Subsection 2.4.3.6 is revised under, the sub-heading 'McKowns Creek/Make-Up Pond B,' as follows:

Coincident wind wave activity for Make-Up Pond B is addressed in Subsection 2.4.4.3.

~~Wind wave activity on Make-Up Pond B is evaluated coincident with the maximum water surface elevation of the PMF as discussed in Subsection 2.4.3.5. The determined critical fetch length of 1.47 mi. is shown in Figure 2.4.3-234. The 2-year annual extreme mile wind speed is adjusted based on the factors of fetch length, level overland or over water, critical duration, and stability. The critical duration is approximately 35 min. The adjusted wind speed is 50.33 mph.~~

~~Significant wave height (average height of the maximum one-third of waves) is estimated to be 2.07 ft., crest to trough. The maximum wave height (average height of the maximum 1 percent of waves) is estimated to be 3.44 ft., crest to trough. The corresponding wave period is 2.2 sec.~~

~~The slopes approaching the units are not constant. The slopes above the PMF elevation are steep up to elevation 585.5 ft., then level out to an average of 0.36 percent. To represent a conservative approach, runup is calculated using the higher base elevation of 585.5 ft. instead of the PMF elevation. The 0.36 percent slopes along the banks of Make-Up Pond B adjacent to the site are used to determine the wave setup and runup. The maximum runup, including wave setup, is estimated to be 0.16 ft. The maximum wind setup is estimated to be 0.08 ft. Therefore, the total wind wave activity is estimated to be 0.24 ft. The PMF and the coincident wind wave activity results in a flood elevation of 585.7 ft. msl. The Lee Nuclear Station safety-related plant elevation is 590 ft. msl and is unaffected by flood conditions and coincident wind wave activity.~~

8) COLA Part 2, FSAR Table 2.4.3-208 is revised as follows:

TABLE 2.4.3-208
MAKE-UP POND B SUBBASIN UNIT HYDROGRAPH

Time (min.)	Discharge (cfs)	Time (min.)	Discharge (cfs)	Time (min.)	Discharge (cfs)
10	71~~81~~	150	198~~220~~	290	12~~14~~
20	219~~251~~	160	162~~180~~	300	10~~11~~
30	486~~556~~	170	133~~150~~	310	8~~9~~
40	849~~971~~	180	110~~123~~	320	7~~8~~
50	947~~1082~~	190	90~~102~~	330	6~~6~~
60	896~~1050~~	200	73~~82~~	340	5~~5~~
70	804~~930~~	210	60~~68~~	350	4~~5~~
80	713~~820~~	220	50~~56~~	360	3~~4~~
90	625~~714~~	230	40~~45~~	370	3~~3~~
100	543~~621~~	240	33~~37~~	380	2
110	465~~523~~	250	27~~30~~	390	1~~2~~
120	386~~435~~	260	22~~25~~	400	1
130	308~~352~~	270	18~~21~~	410	0
140	242~~277~~	280	15~~17~~	420	0

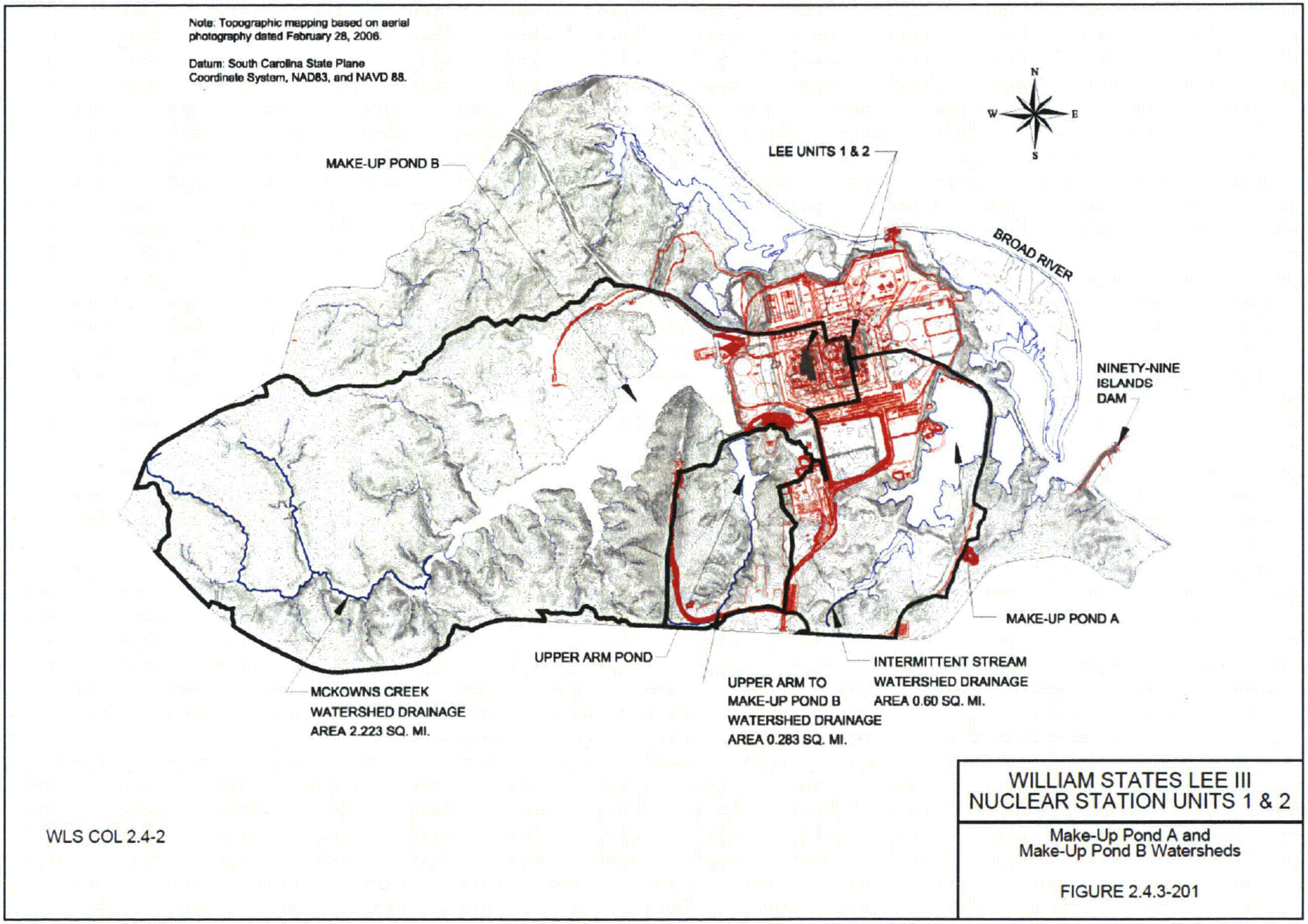
9) COLA Part 2, FSAR Table 2.4.3-209 is added as follows:

TABLE 2.4.3-209

UPPER ARM SUBBASIN UNIT HYDROGRAPH

Time (min.)	Discharge (cfs)	Time (min.)	Discharge (cfs)	Time (min.)	Discharge (cfs)
2	38	32	106	62	6
4	126	34	87	64	5
6	259	36	73	66	4
8	522	38	61	68	4
10	554	40	51	70	3
12	557	42	42	72	3
14	538	44	35	74	2
16	492	46	29	76	2
18	420	48	24	78	2
20	354	50	20	80	1
22	293	52	16	82	1
24	241	54	14	84	1
26	198	56	11	86	0
28	158	58	9	88	0
30	128	60	8		

10) COLA Part 2, FSAR Figure 2.4.3-201 is revised as shown:

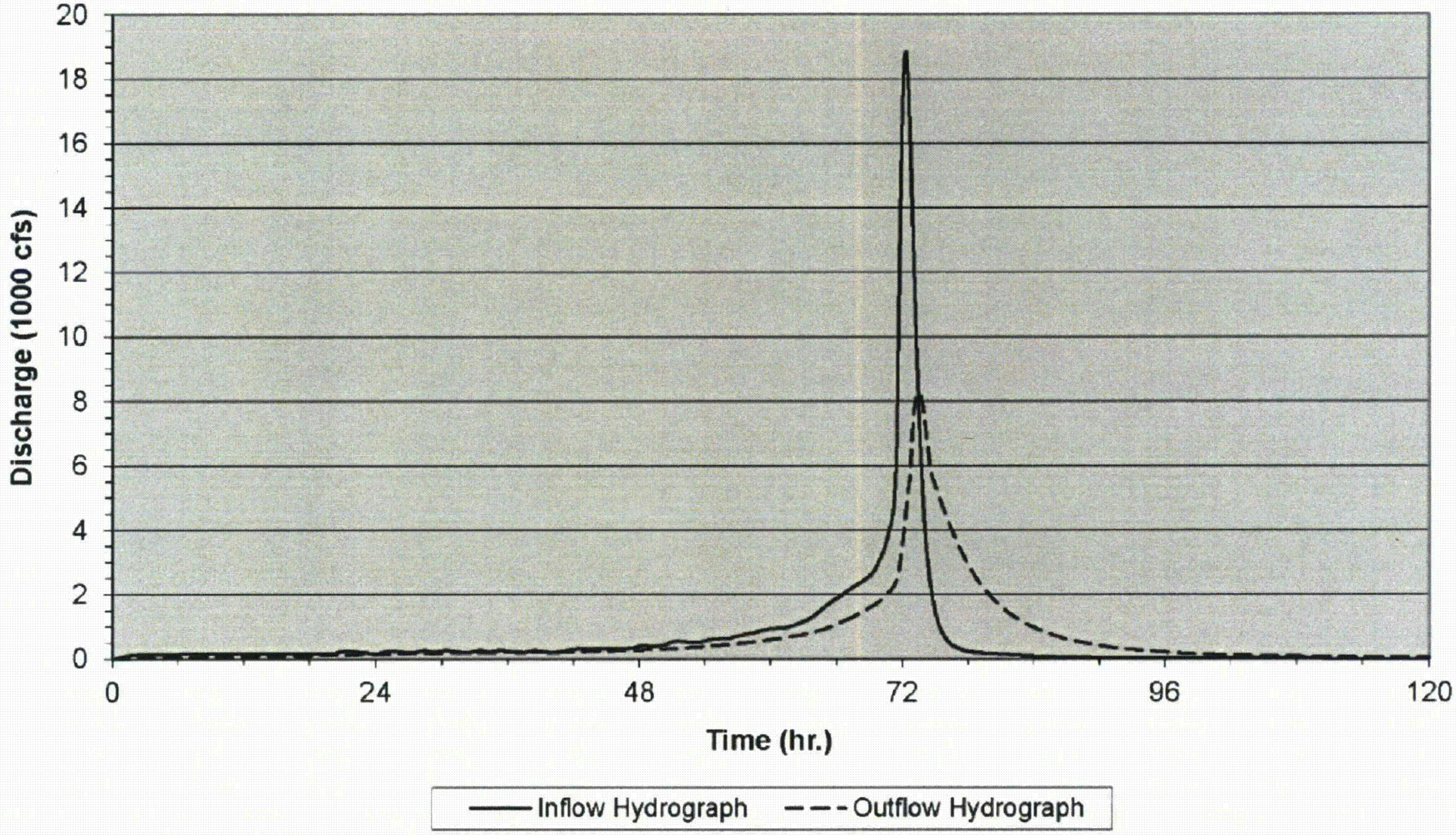


WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Make-Up Pond A and
Make-Up Pond B Watersheds

FIGURE 2.4.3-201

11) COLA Part 2, FSAR Figure 2.4.3-227 is revised as shown:

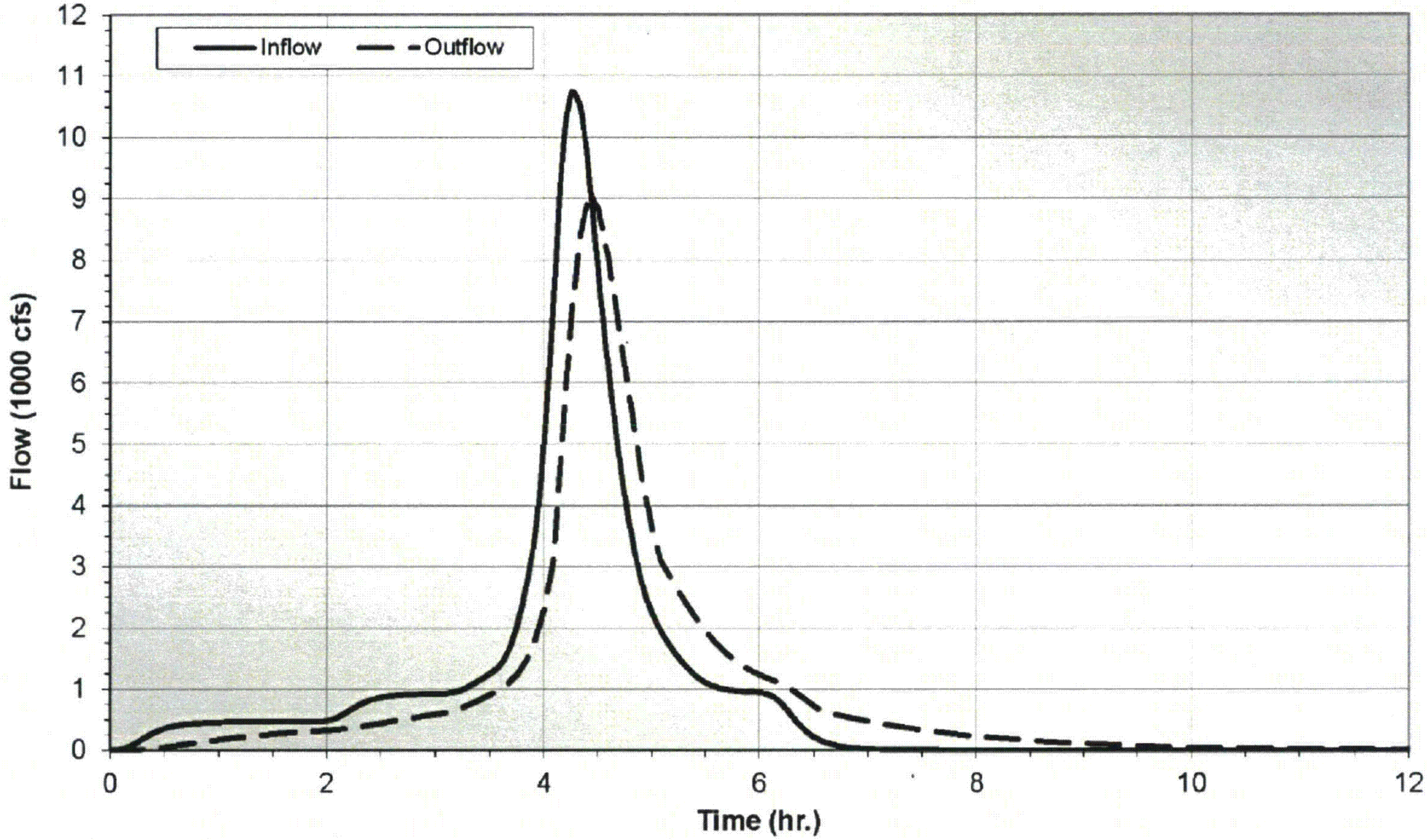


WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

PMF Hydrograph Without Upper Arm Dam Failure, Make-Up Pond B

FIGURE 2.4.3-227

12) COLA Part 2, FSAR Figure 2.4.3-228 is revised as shown:

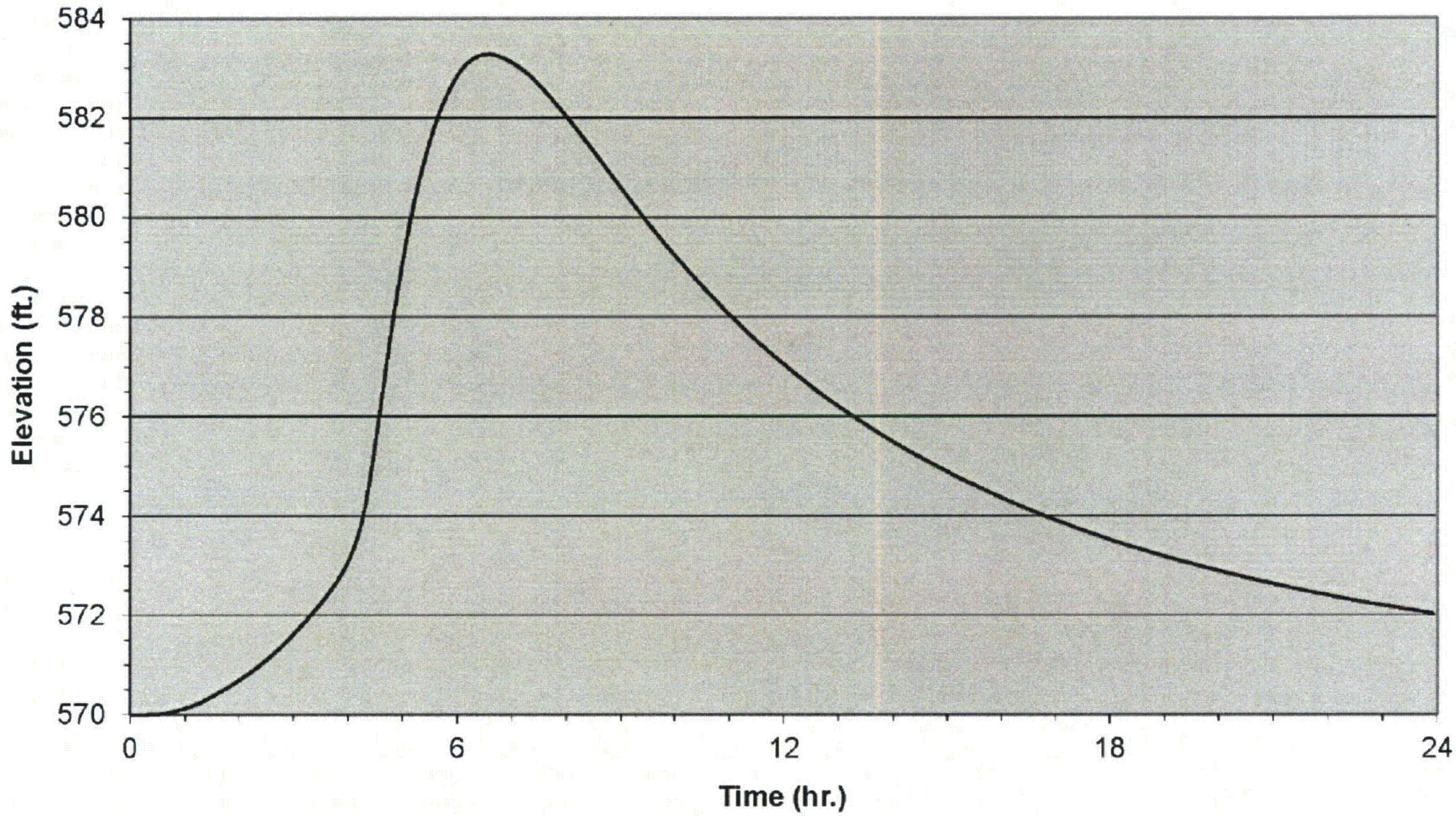


WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

PMF Hydrograph
Make-Up Pond A

FIGURE 2.4.3-228

13) COLA Part 2, FSAR Figure 2.4.3-230 is revised as shown:

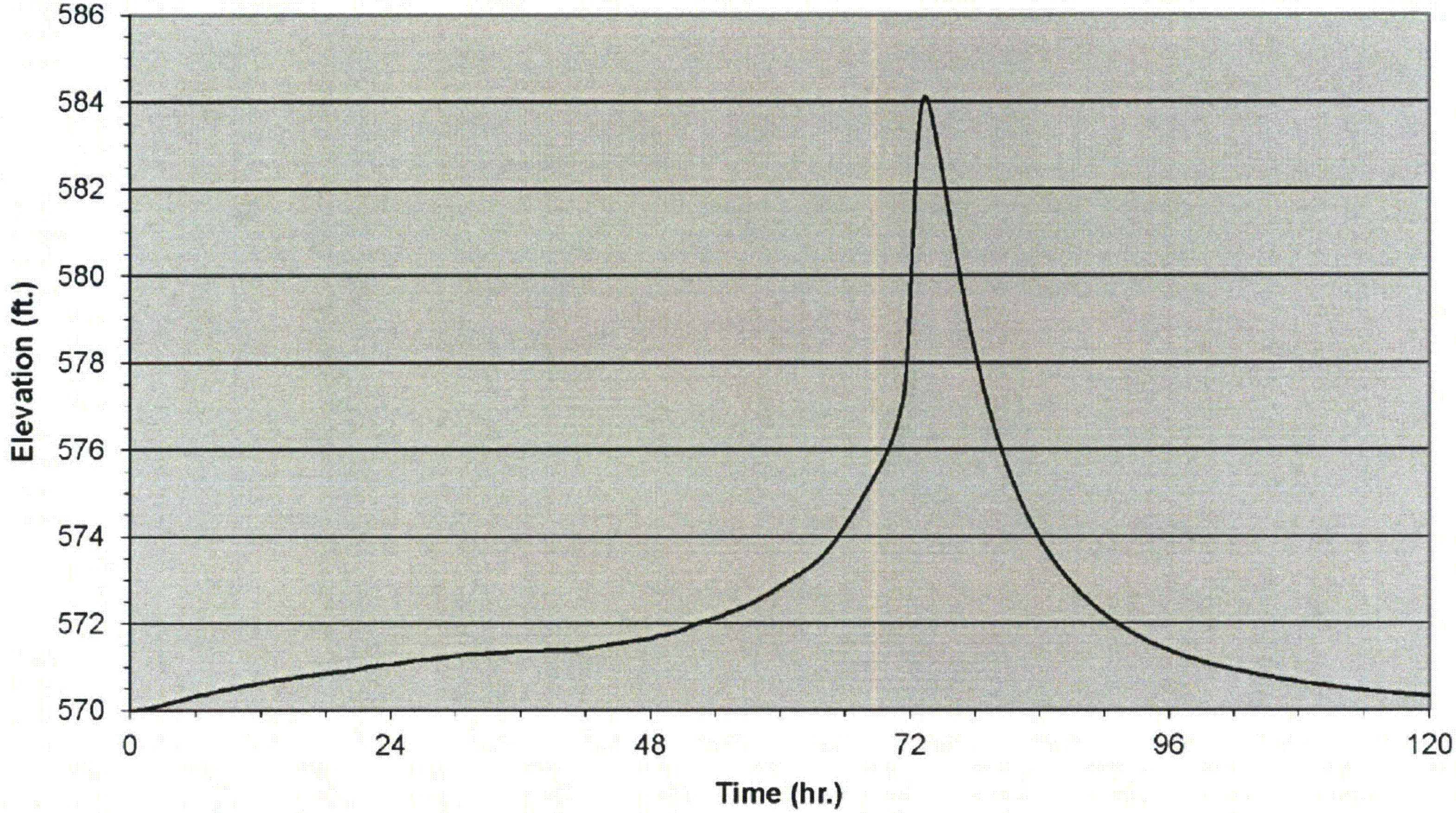


WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Flood El. Hydrograph Make-Up Pond B
Without Upper Arm Dam Failure,
6-hr. Local Intense Precipitation

FIGURE 2.4.3-230

14) COLA Part 2, FSAR Figure 2.4.3-231 is revised as shown:

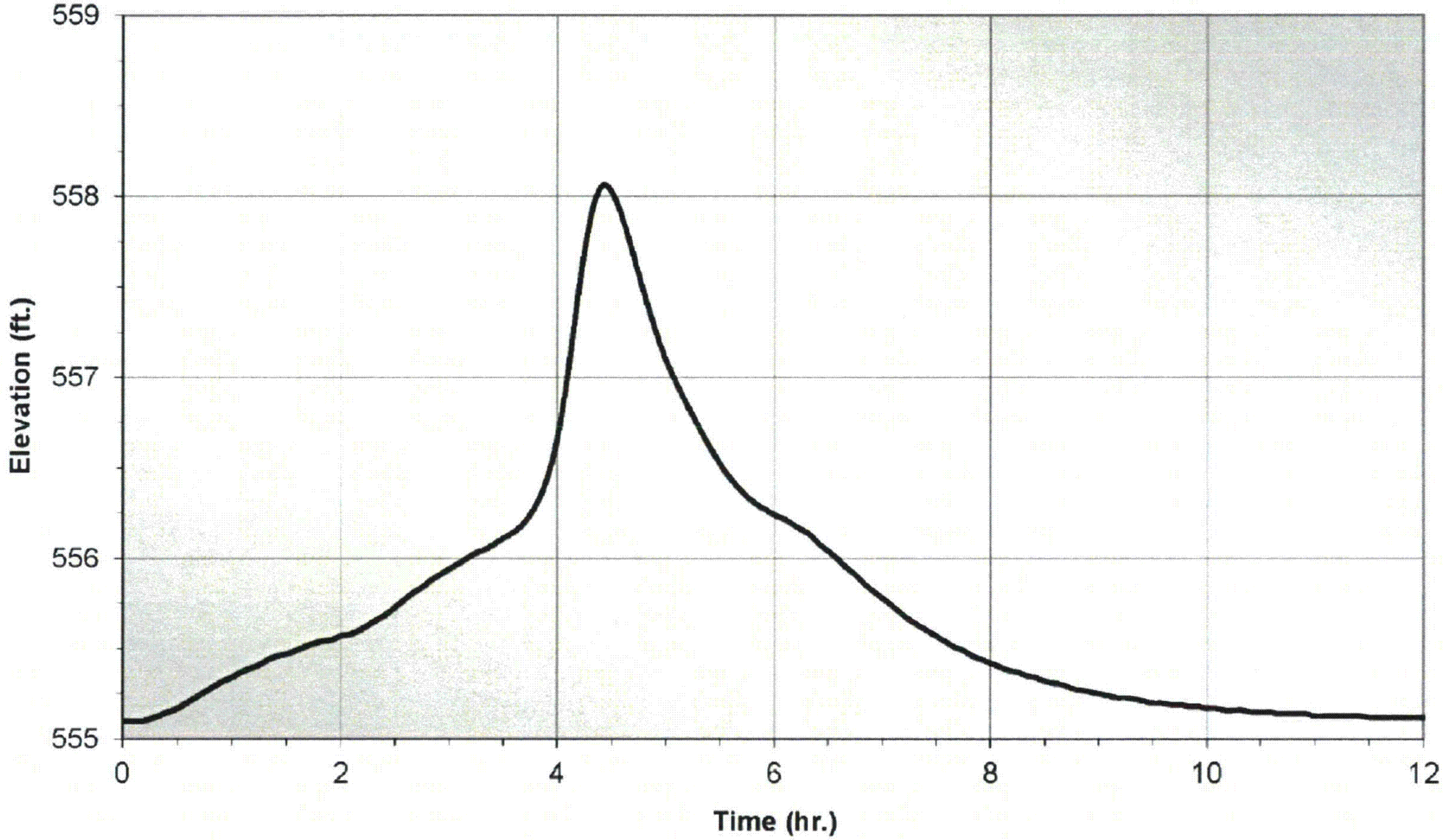


WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Flood El. Hydrograph Make-Up Pond B
Without Upper Arm Dam Failure,
72-hr. Local Intense Precipitation

FIGURE 2.4.3-231

15) COLA Part 2, FSAR Figure 2.4.3-233 is revised as shown:

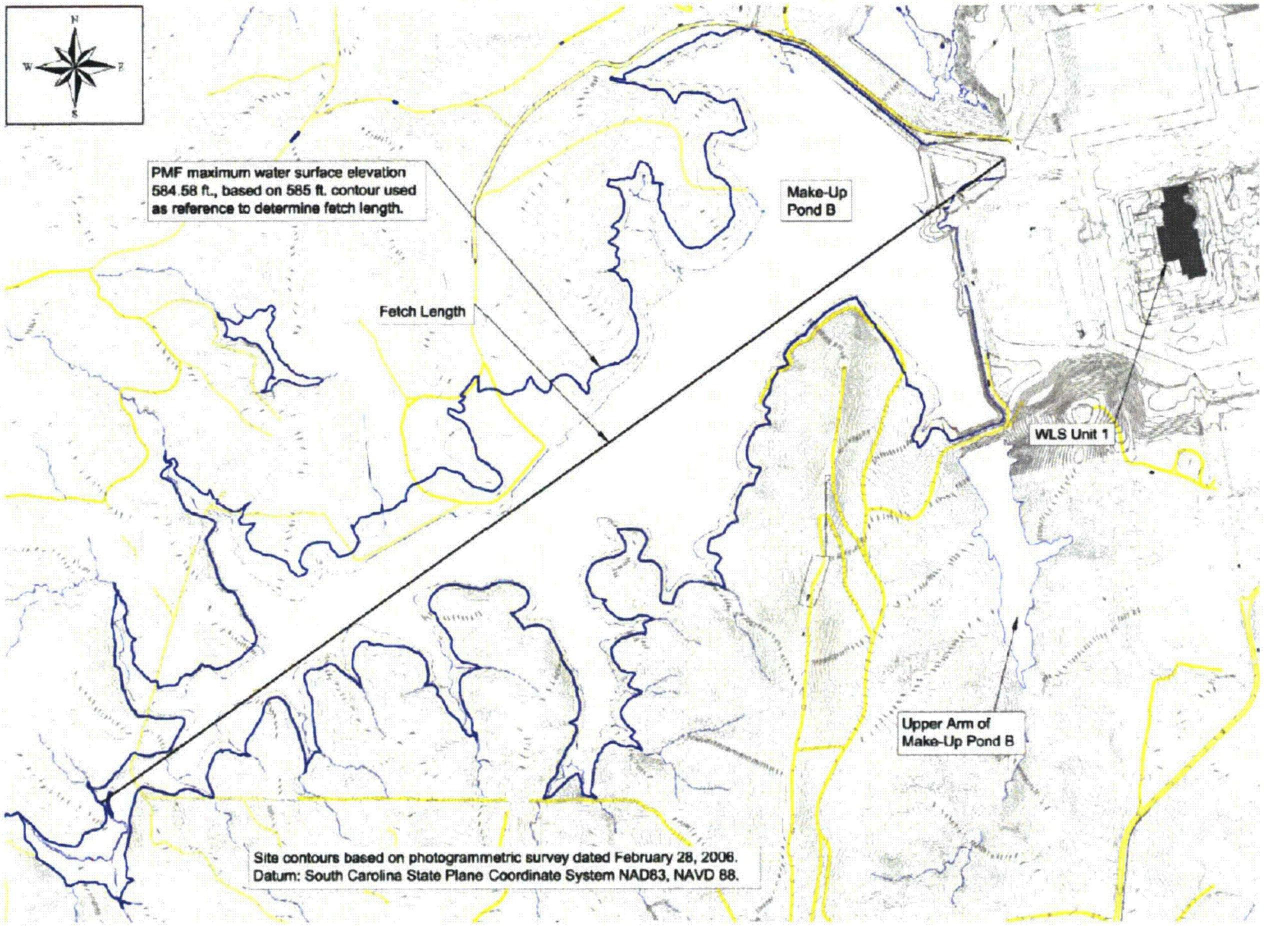


WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Flood Elevation Hydrograph
Make-Up Pond A
6-Hour Local Intense Precipitation

FIGURE 2.4.3-233

16) COLA Part 2, FSAR Figure 2.4.3-234 is revised as shown:

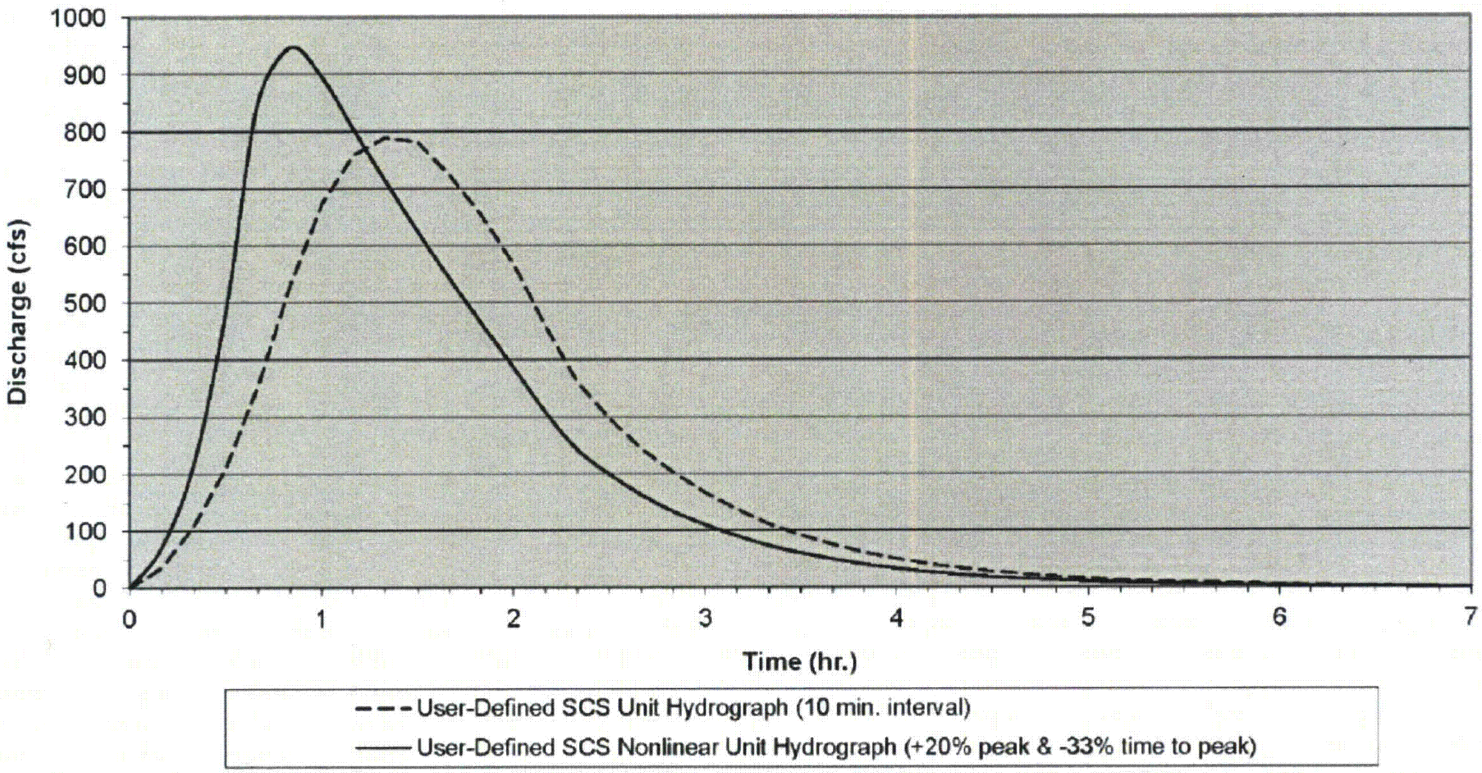


WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Make-Up Pond B Coincident Wind Wave Fetch Length

FIGURE 2.4.3-234

17) COLA Part 2, FSAR Figure 2.4.3-237 is revised as shown:

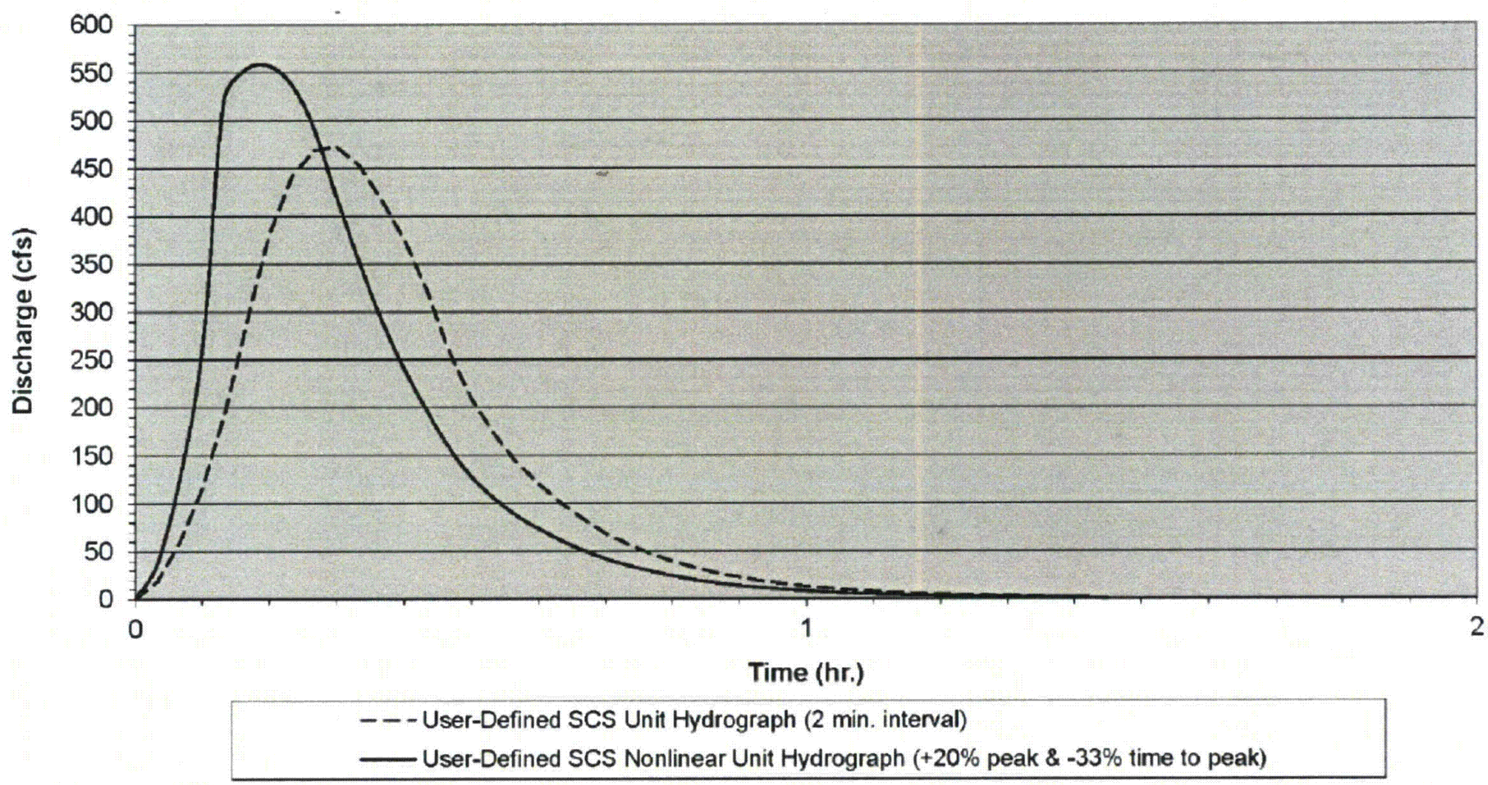


WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Make-Up Pond B
Unit Hydrographs

FIGURE 2.4.3-237

18) COLA Part 2, FSAR Figure 2.4.3-246 is added as follows:

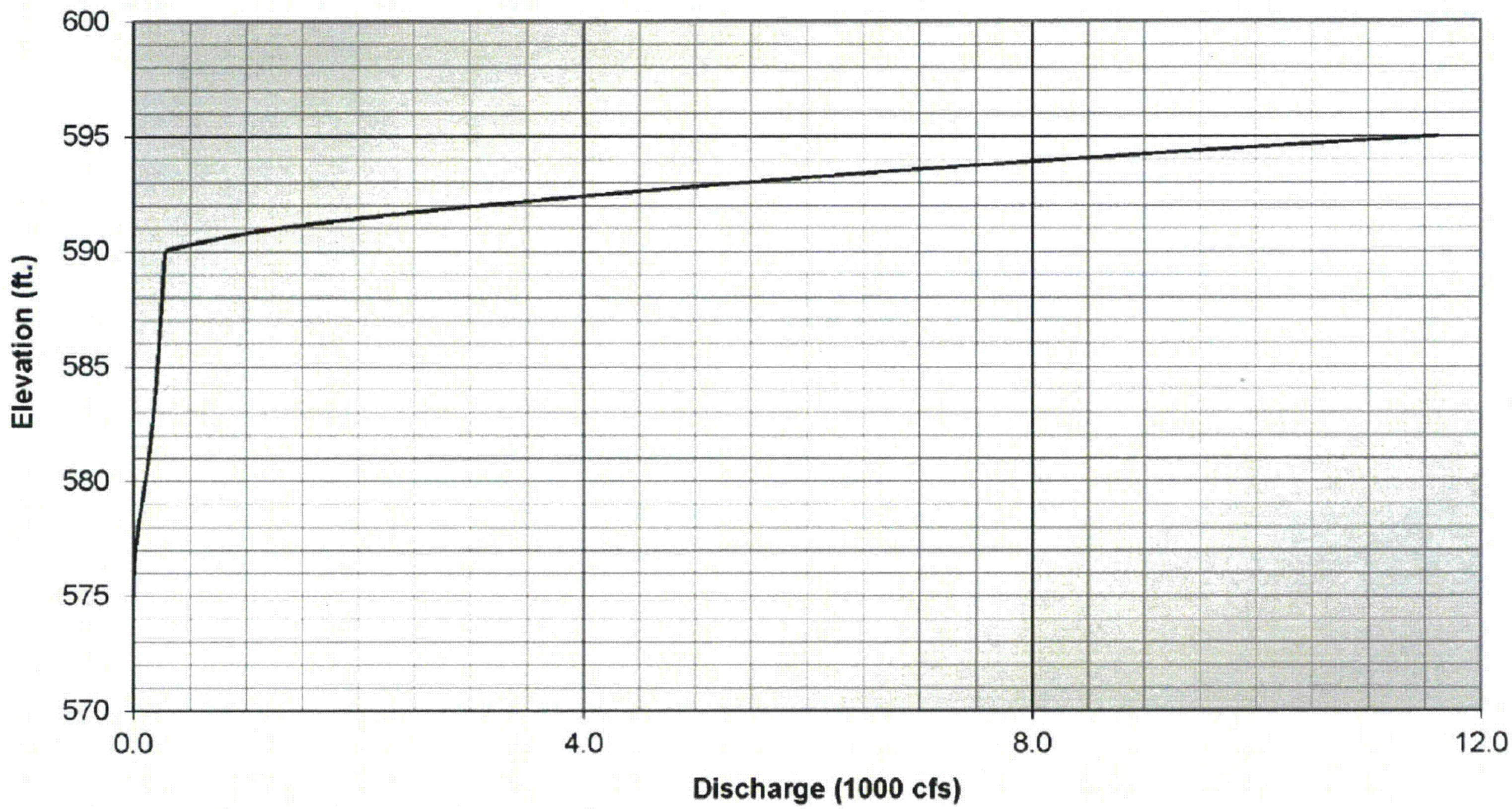


WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Upper Arm Dam Unit Hydrographs

FIGURE 2.4.3-246

19) COLA Part 2, FSAR Figure 2.4.3-247 is added as follows:

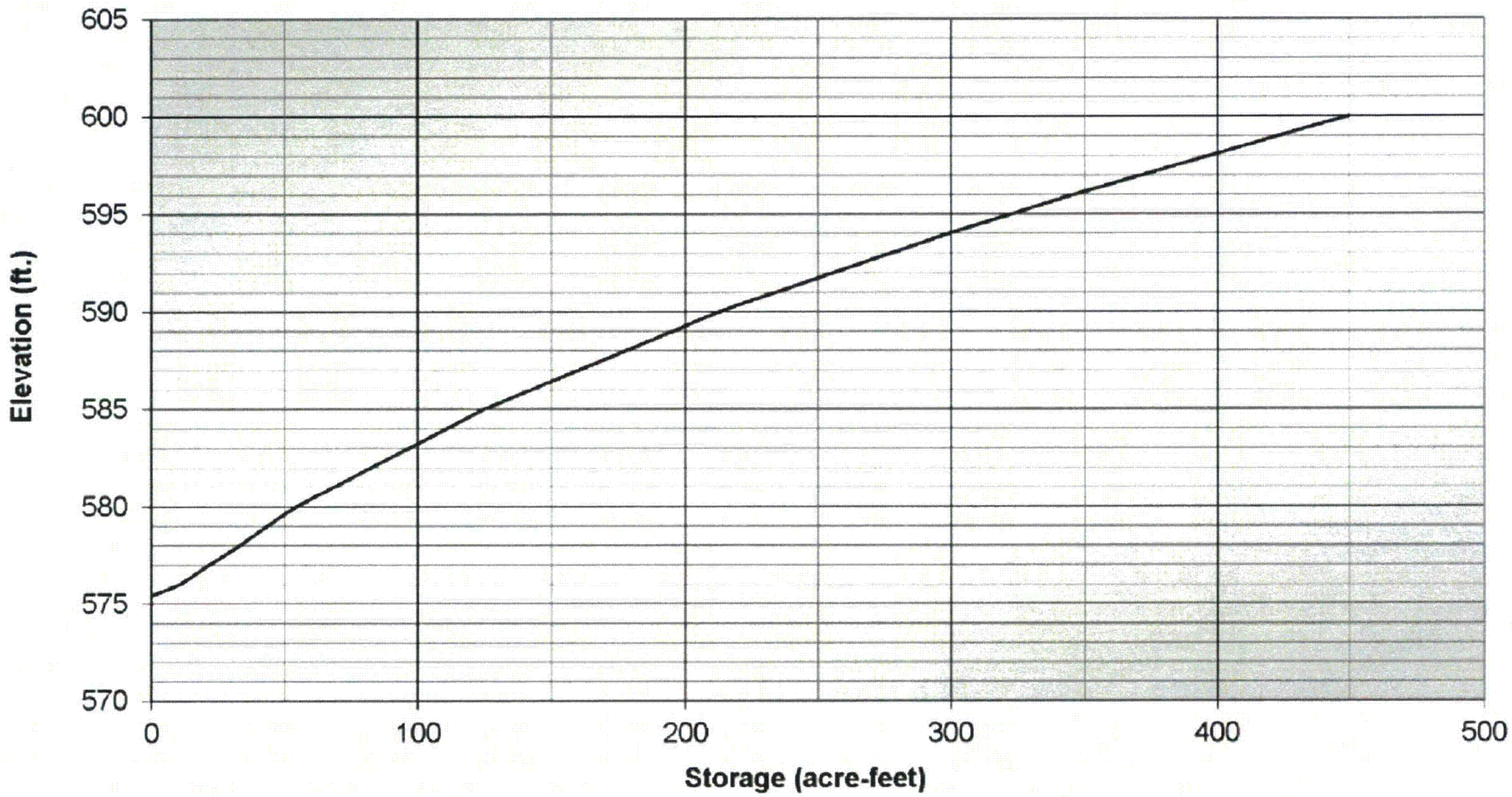


WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Discharge Rating Curve,
Upper Arm Dam

FIGURE 2.4.3-247

20) COLA Part 2, FSAR Figure 2.4.3-248 is added as follows:

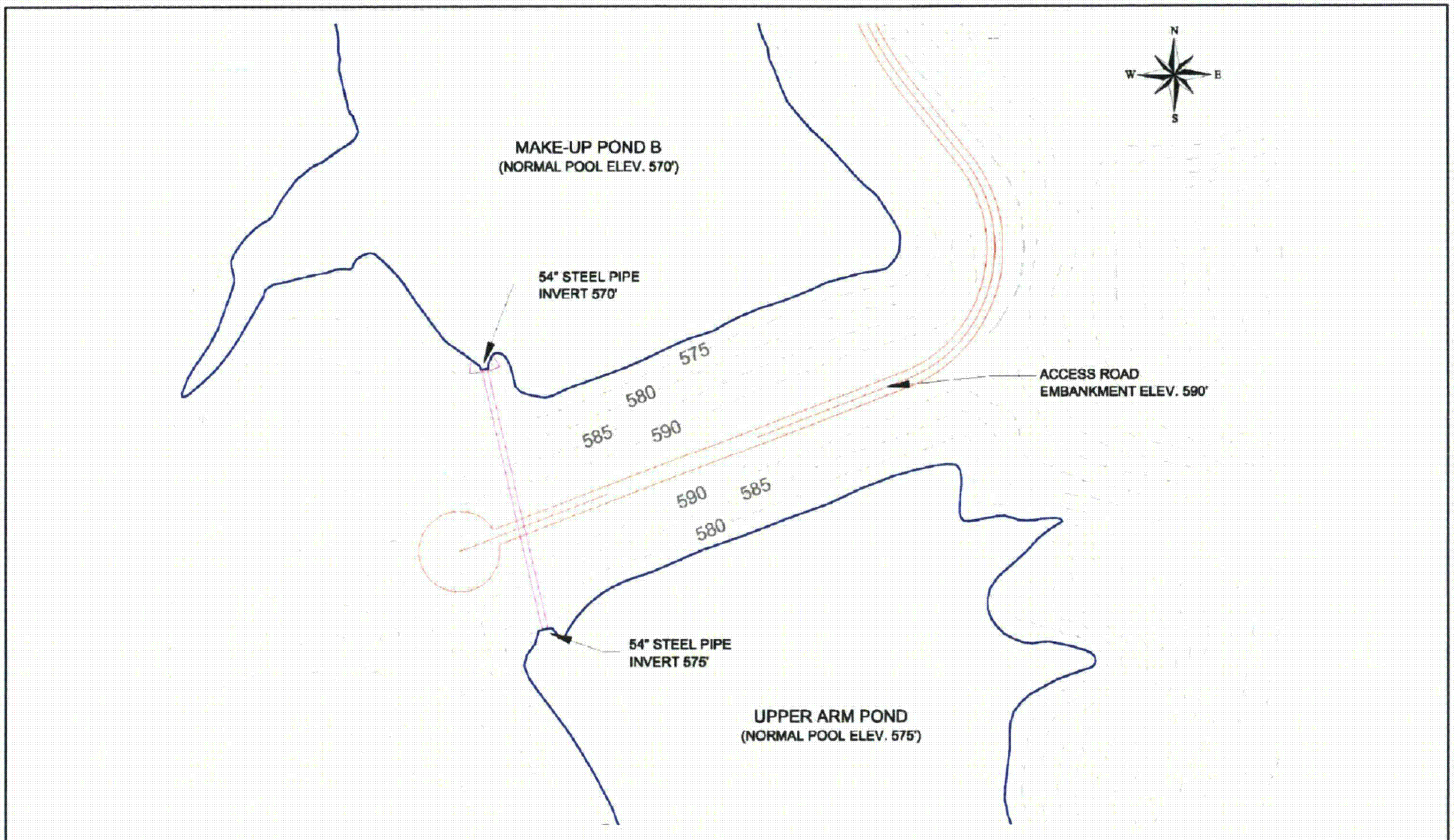


WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Storage Rating Curve,
Upper Arm Dam

FIGURE 2.4.3-248

21) COLA Part 2, FSAR Figure 2.4.3-249 is added as follows:



WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Drainage Culvert Schematic,
Upper Arm Dam

FIGURE 2.4.3-249

Attachment 5

Lee Nuclear Station Supplemental Response to Request for Additional Information

RAI 10.04.05-02

Revisions to FSAR Chapter 2, Section 2.4.4

Subsection 2.4.4
Subsection 2.4.4.1
Subsection 2.4.4.3
New Figure 2.4.4-203
New Figure 2.4.4-204
New Figure 2.4.4-205

1) COLA Part 2, FSAR Chapter 2, Subsection 2.4.4 is revised at the first sentence of the second paragraph as follows:

The Upper Broad River drainage basin upstream of~~above~~ Ninety-Nine Islands Dam derives water from several tributaries that contain a considerable number of dams.

2) COLA Part 2, FSAR Chapter 2, Subsection 2.4.4 is revised with the addition of a new fourth paragraph as follows:

The Upper Arm Dam is located upstream of Make-Up Pond B southwest of the nuclear island. Failure of this dam would result in discharges directly to Make-Up Pond B. The resulting rapid increase of water volume would increase the peak water surface levels and discharge rates in Make-Up Pond B. The volume of discharge from the Upper Arm Dam is small compared to the volume of Make-Up Pond B. Failure of this reservoir will not affect the safety-related facilities.

3) COLA Part 2, FSAR Chapter 2, Subsection 2.4.4.1 is revised with the addition of a new sub-heading following the first paragraph to read:

Broad River

The considered upstream structures are described below. Reservoirs were modeled using normal water surface elevations with no turbine discharges. Additionally, the gates at Lake Lure were assumed to be closed. Antecedent conditions are discussed in Subsection 2.4.3.

Failure of the downstream structure, Ninety-Nine Islands Dam, would result in lowering the water surface elevation at the Lee Nuclear Station to some degree. Conservatively, Ninety-Nine Islands Dam has not been considered to fail during any of the dam failure scenarios. However, failure of the flashboards has been incorporated into the rating curve.

4) COLA Part 2, FSAR Chapter 2, Subsection 2.4.4.1, is revised following the text under the subheading 'Major Upstream Structures' as follows:

McKowns Creek/ Make-Up Pond B

As described earlier in Subsection 2.4.4, the failure of the Upper Arm Dam would directly impact Make-Up Pond B. The dam crest is at 590 ft. Simulation of dam failure was performed in HEC-HMS. Embankment breach parameters were selected based on the USACE RD-13 (Reference 250) document. Failure development time for embankment sections is estimated to occur at 0.5 hr. from the onset of dam breach. Breach width for embankment sections is estimated to be 3 times the height of the Upper Arm Dam as described in Subsection 2.4.3.3. Side slopes for the embankment breach facing the Make-Up Pond B are set at 1:1. Dam breach parameters were selected to maximize the peak outflow.

The maximum peak PMF runoff from Make-Up Pond B, considering Upper Arm Dam failure, resulting from the 6-hr. two-thirds peaking storm event modeled with a 5-min. time step, was found to be 21,889 cfs. However, the controlling water surface elevation resulted from the 72-hr. tail end peaking storm event modeled with a 10-minute time step. The maximum peak runoff was found to be 21,163 cfs. The peak runoff hydrograph is provided in Figure 2.4.4-203. The peak runoff in the Upper Arm Dam resulting from the 72-hr. tail end peaking storm is 3446 cfs with a dam failure peak discharge of 4309 cfs.

5) COLA Part 2, FSAR Chapter 2, Subsection 2.4.4.3 is revised as follows:

The methods and models used to determine the resulting water surface elevation are described above and in Subsection 2.4.3. Model verification and reliability is also discussed above and in Subsection 2.4.3. ~~The HEC-RAS model, as described above, was used to model a resulting steady state flow of 1,720,000 cfs to determine the water surface elevation at the station.~~

Broad River

The HEC-RAS model, as described above, was used to model a resulting steady state flow of 1,720,000 cfs to determine the water surface elevation at the station.

The resulting water surface elevation at the Lee Nuclear Station is 573.26 ft. The maximum flood elevation is well below the station's safety-related plant elevation of 590 ft. The resulting water surface elevation of the dam failure analysis using HEC-HMS and HEC-RAS was compared with the resulting water surface elevations of the PMF analysis using HEC-HMS and HEC-RAS. The comparison is provided in Table 2.4.4-201. Given the significant freeboard remaining at the site, a full unsteady-flow analysis to determine dam breach flows and resulting water surface elevations with greater precision was determined to be unnecessary.

McKowns Creek/Make-Up Pond B

Using the HEC-HMS model, the maximum water surface elevation of Make-Up Pond B, considering Upper Arm Dam failure, resulting from the 6-hr. two-thirds peaking storm event modeled with a 5-min. time step, was found to be 583.67 ft. The elevation hydrograph is provided in Figure 2.4.4-204. The maximum water surface elevation of Make-Up Pond B resulting from the 72-hr. tail end peaking storm event modeled with a 10-min. time step was found to be 584.58 ft. The elevation hydrograph is provided in Figure 2.4.4-205. The peak water surface in the Upper Arm Dam resulting from the 72-hr. tail end peaking storm is 592.13 ft. The ridge on the east side of the Upper Arm separates the Upper Arm and the site, as illustrated in Figure 2.4.3-201. At elevations above 590.0 ft., discharge across the dam embankment flows directly into Make-Up Pond B. Therefore, water surface elevations for the Upper Arm will not encroach upon site SSC's.

6) COLA Part 2, FSAR Chapter 2, Subsection 2.4.4.3 is revised under the sub-heading, 'McKowns Creek/Make-Up Pond B,' to read:

McKowns Creek/Make-Up Pond B

~~Coincident wind wave activity for Make-Up Pond B is addressed in Subsection 2.4.3.6.~~

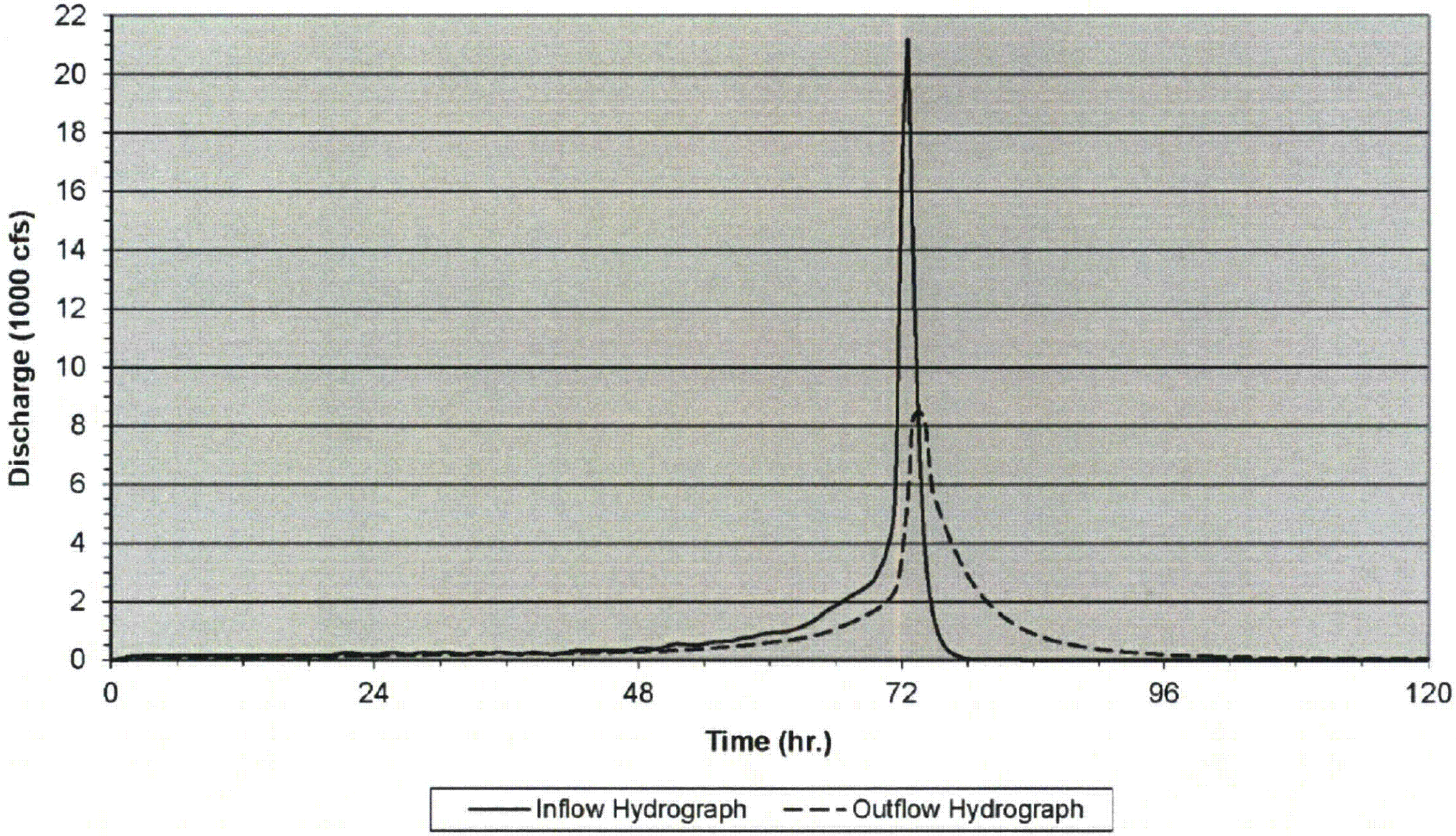
Wind wave activity on Make-Up Pond B is evaluated coincident with the maximum water surface elevation of the PMF including the effects of dam failure, as discussed above. The determined critical fetch length of 1.47 mi. is shown in Figure 2.4.3-234. The 2-year annual extreme mile wind speed is adjusted based on the factors of fetch length, level overland or over water, critical duration, and stability. The critical duration is approximately 35 min. The adjusted wind speed is 50.33 mph.

Significant wave height (average height of the maximum one-third of waves) is estimated to be 2.07 ft., crest to trough. The maximum wave height (average height of the maximum 1 percent of waves) is estimated to be 3.44 ft., crest to trough. The corresponding wave period is 2.2 sec.

The slopes approaching the units are not constant. The slopes above the PMF elevation are steep up to elevation 585.5 ft., then level out to an average of 0.40 percent. To represent a conservative approach, runup is calculated using the higher base elevation of 585.5 ft. instead of the PMF elevation. The 0.40 percent slopes along the banks of Make-Up Pond B adjacent to the site are used to determine the wave setup and runup. The maximum runup, including wave

setup, is estimated to be 0.20 ft. The maximum wind setup is estimated to be 0.08 ft. Therefore, the total wind wave activity is estimated to be 0.28 ft. The PMF and the coincident wind wave activity results in a flood elevation of 585.8 ft. msl. The Lee Nuclear Station safety-related plant elevation is 590 ft. msl and is unaffected by flood conditions and coincident wind wave activity.

7) COLA Part 2, FSAR Figure 2.4.4-203 is added as follows:

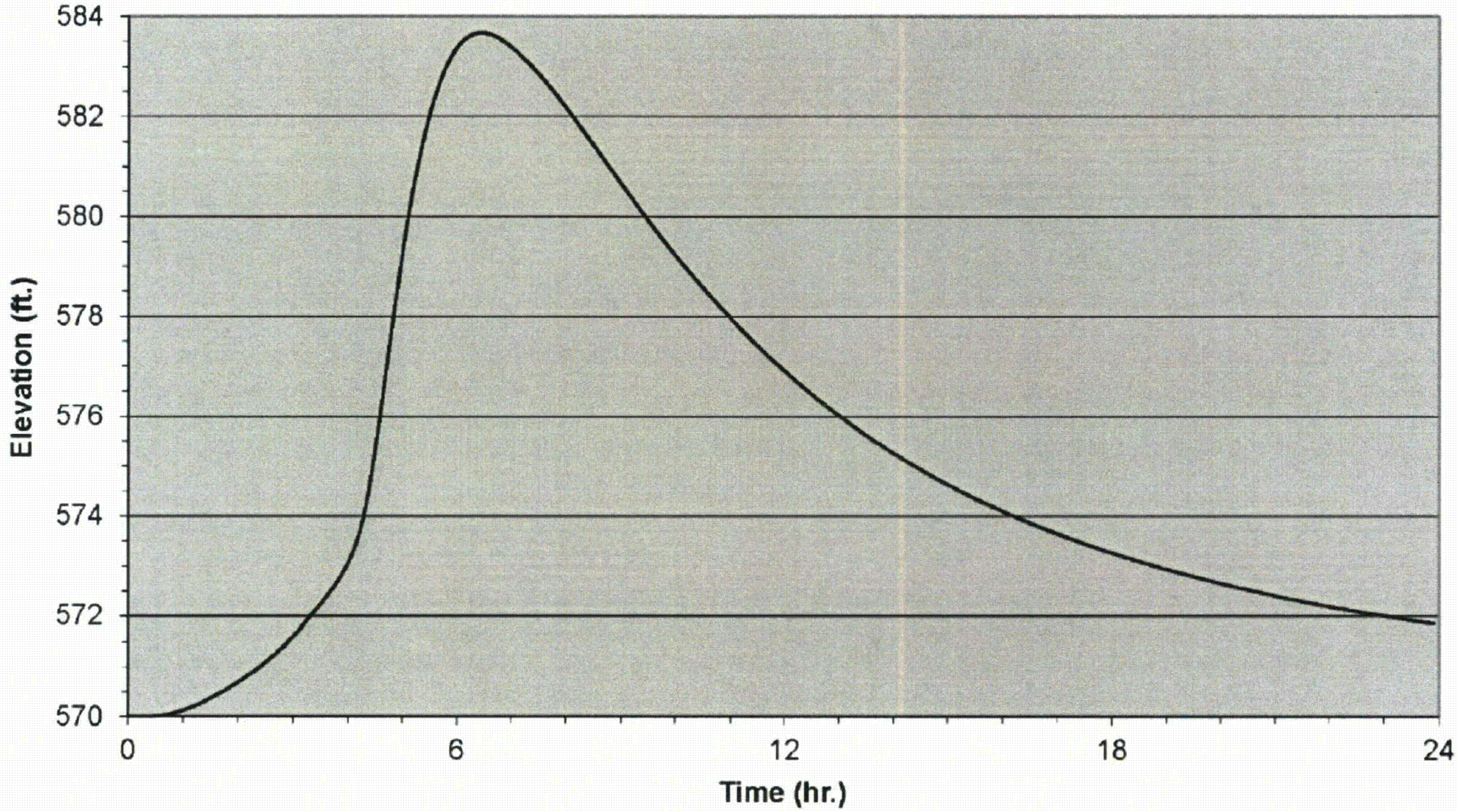


WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

PMF Hydrograph With Upper Arm Dam Failure, Make-Up Pond B

FIGURE 2.4.4-203

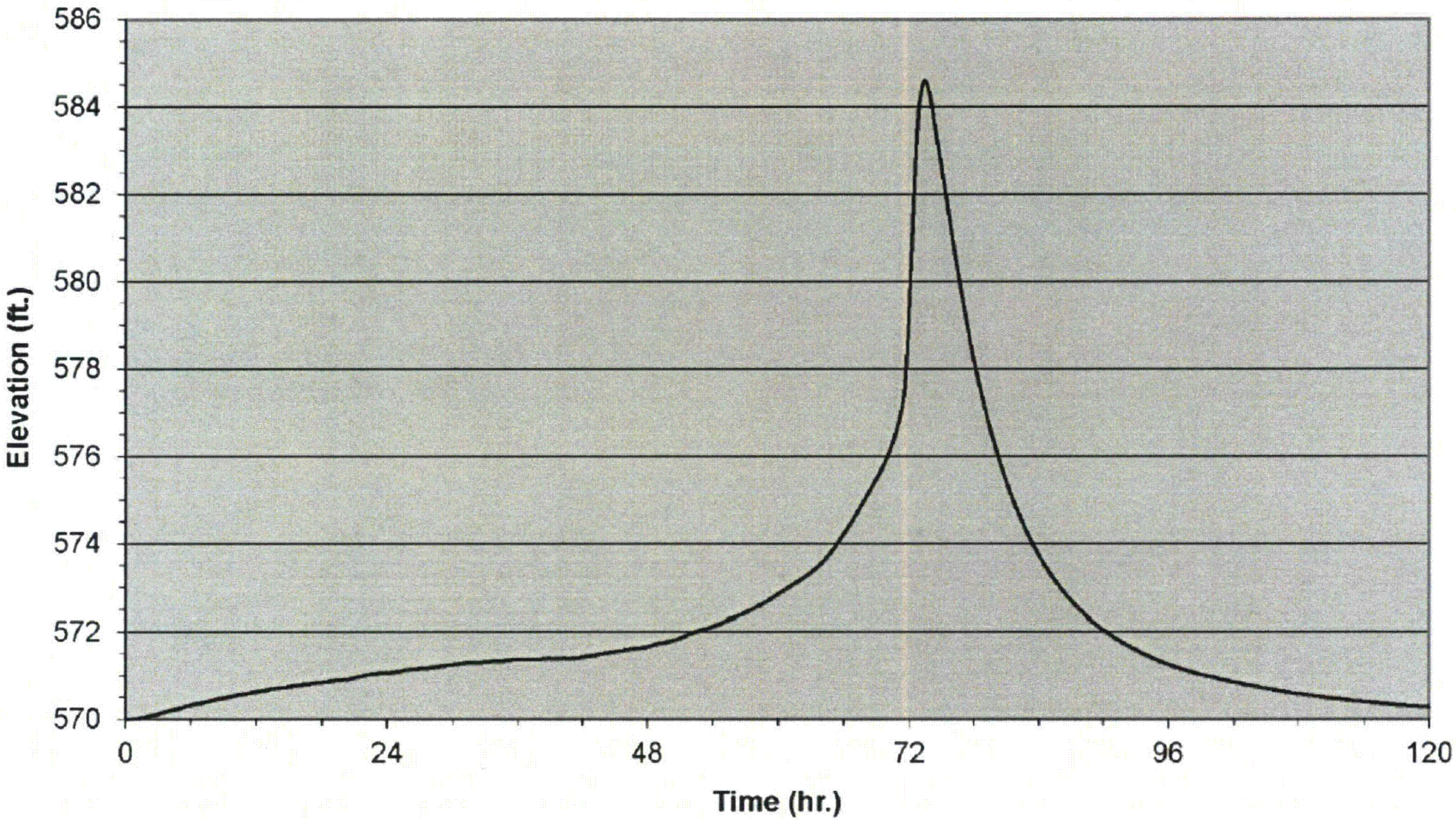
8) COLA Part 2, FSAR Figure 2.4.4-204 is added as follows:



WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Flood El. Hydrograph Make-Up Pond B
With Upper Arm Dam Failure,
6-hr. Local Intense Precipitation
FIGURE 2.4.4-204

9) COLA Part 2, FSAR Figure 2.4.4-205 is added as follows:



WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Flood El. Hydrograph Make-Up Pond B
With Upper Arm Dam Failure,
72-hr. Local Intense Precipitation
FIGURE 2.4.4-205

Attachment 6

Lee Nuclear Station Supplemental Response to Request for Additional Information

RAI 10.04.05-02

Revisions to FSAR Chapter 2, Section 2.4.5

Subsection 2.4.5
FSAR Figure 2.4.5-201
FSAR Figure 2.4.5-202

1) COLA Part 2, FSAR Chapter 2, Subsection 2.4.5 is revised under the sub-heading 'Make-Up Pond A' as follows:

   Make-Up Pond A surge flooding is evaluated coincident with the 100-yr. water surface elevation of 556.07 ft. The critical fetch length is 0.36~~7~~ mi. as shown in Figure 2.4.5-201. The wind speed is adjusted based on the factors of fetch length, level overland or over water, critical duration, and stability using U.S. Army Corps of Engineers guidance (Reference 295). The critical duration is 10 min. The adjusted wind speed is 97.4 mph.

   Significant wave height (average height of the maximum 33-1/3 percent of waves) is estimated to be 2.33~~6~~ ft., crest to trough. The maximum wave height (average height of the maximum 1 percent of waves) is estimated to be 3.90~~4~~ ft., crest to trough. The corresponding wave period is 1.8 sec.

   The slopes along the banks of Make-Up Pond A adjacent to the site area are approximately 67~~52~~ percent at most and are used to determine the wave setup and runup. The maximum runup, including wave setup, is estimated to be 7.35~~6.40~~ ft. The maximum wind setup is estimated to be 0.08 ft. Therefore, the total water surface elevation increase due to high speed wind wave activity is estimated to be 7.43~~6.48~~ ft. The resulting flood elevation is 563.50~~2.55~~ ft. The Lee Nuclear Station safety-related plant elevation is 590 ft. and is unaffected by high speed wind wave activity flooding conditions.

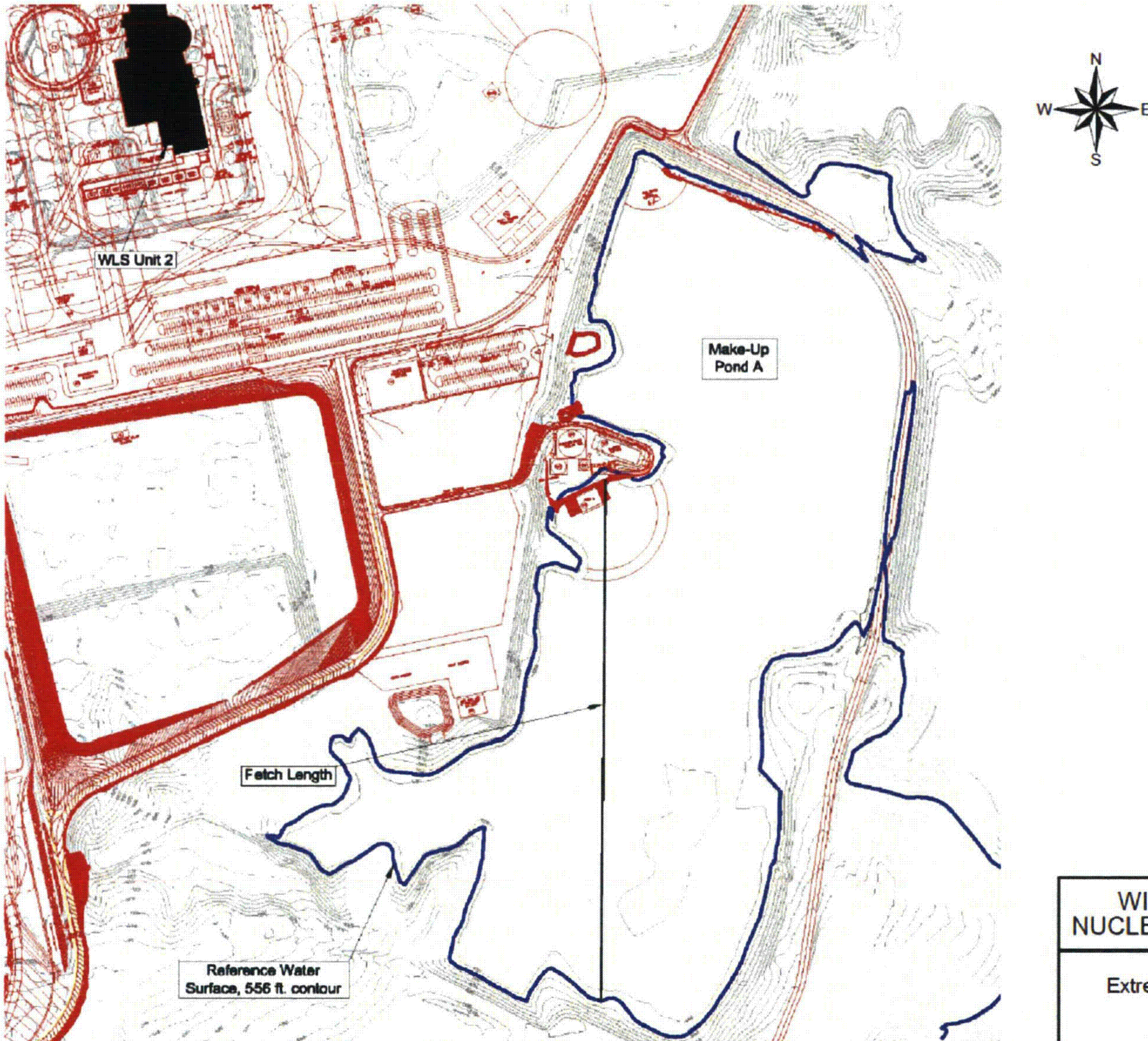
2) COLA Part 2, FSAR Chapter 2, Subsection 2.4.5 is revised, under the sub-heading 'Make-Up Pond B,' first paragraph as follows:

   The slopes along the banks of Make-Up Pond B adjacent to the site area are approximately ~~9~~ 5 percent and are used to determine the wave setup and runup. The maximum runup, including wave setup, is estimated to be 2.13~~3.35~~ ft. The maximum wind setup is estimated to be 0.25 ft. Therefore, the total water surface elevation increase due to high speed wind wave activity is estimated to be 2.38~~3.60~~ ft. The resulting flood elevation is 578.60~~9.82~~ ft. The Lee Nuclear Station safety-related plant elevation is 590 ft. and is unaffected by high speed wind wave flooding conditions.

3) COLA Part 2, FSAR Chapter 2, Subsection 2.4.5 is revised, under the sub-heading 'Make-Up Pond B,' fifth paragraph as follows:

   Based on bathymetry mapping, an average depth of 29.81 ft. is determined for Make-Up Pond A and used as the depth of water. The resulting natural fundamental period is 2.0~~1~~ min. The Make-Up Pond B average depth is 30.44 ft. The resulting natural fundamental period is 7.3 min. The wave periods determined above (1.8 sec. and 2.6 sec.) are much shorter than the natural fundamental period for both water bodies (2.0~~1~~ min. and 7.3 min.). Furthermore, natural fundamental periods are significantly shorter than meteorologically induced wave periods (e.g., synoptic storm pattern frequency and dramatic reversals in steady wind direction necessary for wind setup). Since the natural periods of Make-Up Pond A and Make-Up Pond B are significantly different than the period of the excitations, they are not susceptible to meteorologically induced seiche waves. Seismically induced waves are discussed in Subsection 2.4.6.

4) COLA Part 2, FSAR Figure 2.4.5-201 is revised as shown:

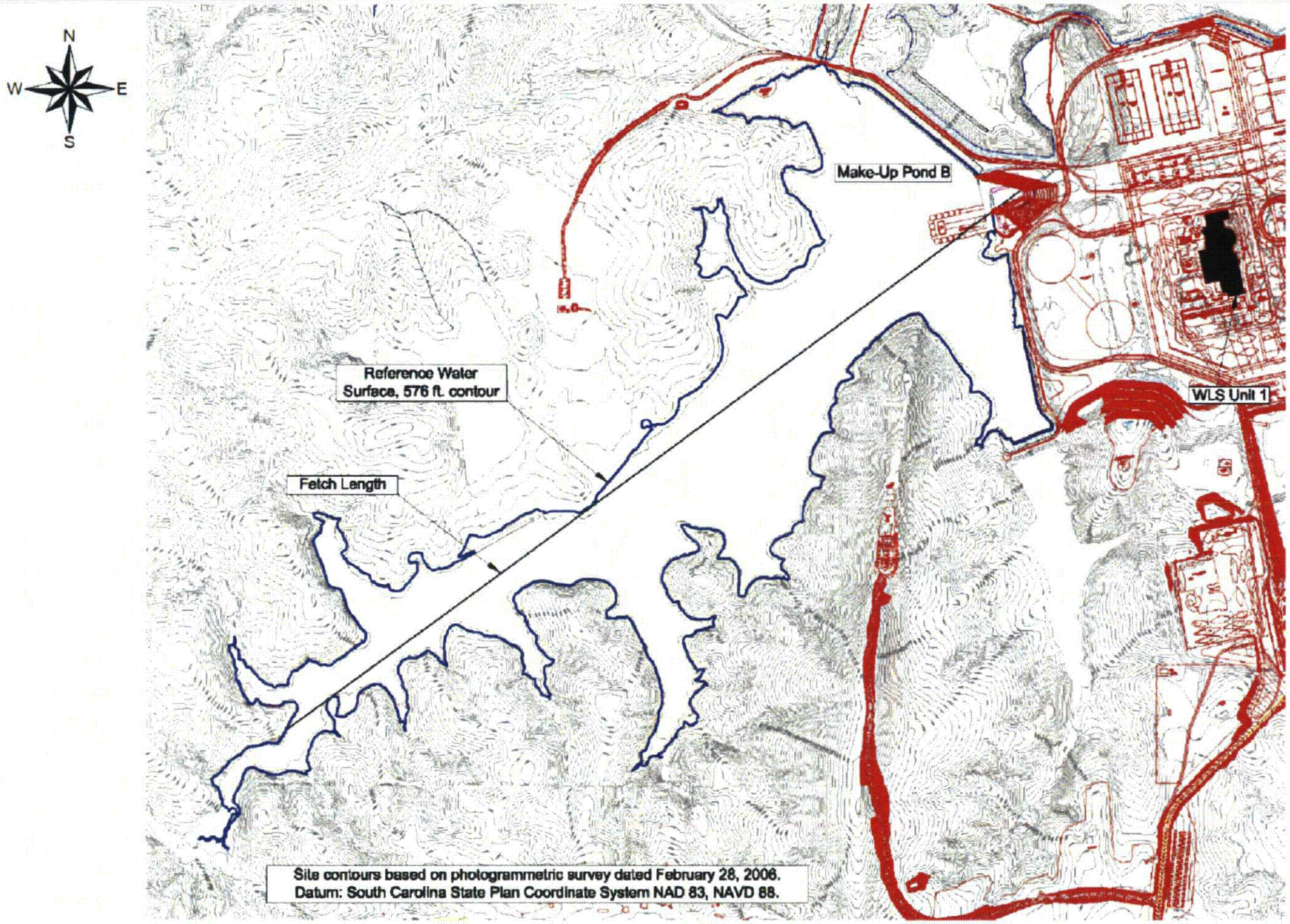


WILLIAM STATES LEE III NUCLEAR STATION UNITS 1 & 2

Make-Up Pond A
Extreme Wind Speed Fetch Length

FIGURE 2.4.5-201

5) COLA Part 2, FSAR Figure 2.4.5-202 is revised as shown:



WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Make-Up Pond B
Extreme Wind Speed Fetch Length

FIGURE 2.4.5-202

Attachment 7

Lee Nuclear Station Supplemental Response to Request for Additional Information

RAI 10.04.05-02

Revisions to FSAR Chapter 2, Section 2.4.14

Subsection 2.4.14

1) COLA Part 2, Subsection 2.4.14, first paragraph is revised to read:

   The maximum flood level at the Lee Nuclear Station is established as the maximum of calculated results from flooding events analyzed in Section 2.4. That maximum flood level is elevation 589.5962 ft. msl. This elevation would result from a PMP event on the Lee Nuclear Station site (local intense precipitation) as described in Subsection 2.4.2.3. The Lee Nuclear Station safety-related structures have a plant elevation of 590 ft. msl. This maximum flood level is identified as a site characteristic in Table 2.0-201. Also, Subsection 2.4.12.5 describes plant elevation relative to the maximum anticipated groundwater level. The hydrostatic loading is not expected to exceed design criteria.

Attachment 8

Lee Nuclear Station Supplemental Response to Request for Additional Information

RAI 10.04.05-02

Revisions to FSAR Chapter 19

Table 19.58-201 Sheets 3 and 4

1) COLA Part 2, FSAR Table 19.58-201, Sheets 3 and 4 are revised as follows:

TABLE 19.58-201 (Sheet 3 of 12)
EXTERNAL EVENT FREQUENCIES FOR WLS

Category	Event	Evaluation Criteria (See Notes)	Applicable to Site? (Y/N)[1]	Explanation of Applicability Evaluation	Event Frequency (Events/yr)
				These event frequencies are bounded by the limiting initiating event frequencies given in Table 3.0-1 of APP-GW-GLR-101. Therefore, the safety features of the AP1000 are unaffected and the CDFs given in APP-GW-GLR-101 Table 3.0-1 for these events are applicable to WLS Units 1 and 2. Winds below 74 mph (storms) are not considered to have an adverse impact of WLS Units 1 and 2 as the switchyard and non-safety buildings will be designed to function at a higher wind speed (96 mph). Therefore, no additional PRA considerations are required for winds below hurricane force.	
External Flood	External Flood	D	Y	As discussed in Subsection~~s~~ 2.4.2.2 specific analysis of Broad River flood levels resulting from surges, seiches, snowmelt, ice effects, flood-waves from landslides, and tsunamis is not required for the Lee Nuclear Station. As discussed in Subsections 2.4.2.2 and 2.4.2.3, the Probable Maximum Precipitation (PMP) event for the site (local intense precipitation) results in a flood elevation of 589.~~62~~ 59 ft. The Lee Nuclear Station safety-related plant elevation is 590 ft. As discussed in Subsection 2.4.4, failure of the on-site reservoirs would not affect the safety-related facilities. As discussed in Subsections 2.4.1.2.2.6 and 2.4.4.3~~2.4.3.6~~, the Probable Maximum Flood (PMF) event on the Make-Up Pond B watershed with the added effects	N/A

TABLE 19.58-201 (Sheet 4 of 12)
External Event Frequencies for WLS

Category	Event	Evaluation Criteria (See Notes)	Applicable to Site? (Y/N)[1]	Explanation of Applicability Evaluation	Event Frequency (Events/yr)
				of dam failure and coincident wind wave activity results in a flood elevation of 585.87 ft. The Lee Nuclear Station safety-related plant elevation is 590 ft. This result shows a margin exceeding 4 ft. between the calculated flood elevation and the point where safety-related SSCs could be impacted. As discussed in Subsection 2.4.4.3, the PMF event on the Broad River, including effects of dam failures and the coincident wind wave activity, results in a flood elevation of 582.01582.35 ft. Thus, the Make-Up Pond B event described above remains the bounding event for external flooding and provides reasonable assurance that the plant has adequate protection from external flooding. As discussed in Subsection 2.4.4.1, the Make-Up Pond C peak dam failure outflow was combined with the maximum historical flow recorded on the Broad River. The resulting combined peak outflow does not exceed the critical dam failure event for the Broad River watershed, and, even if routed to the Lee Nuclear Station without attenuation, the resulting water surface elevation would not exceed the elevation determined from the critical multiple dam failure scenario coincident with the Broad River watershed PMF. Thus, the consequences of the Make-Up Pond C failure event are bounded and would not adversely affect safety related structures.	

HEC-HMS Input-Output Files Related to Analysis of Site Local Intense Precipitation

Listing of files provided on CD-ROM disc (Attachment 1)

HEC-HMS / HEC-RAS Input-Output Files Related to Analysis of Site Local Intense Precipitation
HEC-HMS MUPA & MUPB <u>Input/Output File List</u> 6_hr_storm.control – control specifications data file 6_hr_storm.met – meteorologic model configuration file 72_hr_storm.control – control specifications data file 72_hr_storm.met – meteorologic model configuration file Basins_Dam_Failure_6hr.basin – basin model file Basins_Dam_Failure_6hrNL.basin – basin model file Basins_ Dam_Failure_72hr.basin – basin model file Basins_ Dam_Failure_72hrNL.basin – basin model file Basins_NonLinear.basin – basin model file Duke_Site_Basins.access – project control file Duke_Site_Basins.dsc – catalog file Duke_Site_Basins.dss – HEC data storage system file Duke_Site_Basins.gage – time series data file Duke_Site_Basins.hms – project definition file Duke_Site_Basins.out – list of data read or written from DSS file Duke_Site_Basins.pdata – paired data file Duke_Site_Basins.run – simulation run file
HEC-HMS Site Model (Analysis of Local Intense Precipitation Event) <u>Input/Output File List</u> Basin_6hr_.basin – basin model file Basin_72hr_.basin – basin model file Control_6hr_.control – control specifications data file Control_72hr_.control – control specifications data file Met_1.met – meteorologic model configuration file WLS_Site_Analysis.access – project control file WLS_Site_Analysis.dsc – catalog file WLS_Site_Analysis.dss – HEC data storage system file WLS_Site_Analysis.gage – time series data file WLS_Site_Analysis.hms – project definition file WLS_Site_Analysis.out – list of data read or written from DSS file WLS_Site_Analysis.pdata – paired data file WLS_Site_Analysis.run – simulation run file

HEC-HMS / HEC-RAS Input-Output Files Related to Analysis of Site Local Intense Precipitation
HEC-RAS Site Boundary Model (Analysis of Local Intense Precipitation Event) Input/Output File List WLSsite.f01 – flow data input file WLSsite.g01 – geometry input file WLSsite.O01 – raw data output file WLSsite.p01 – plan data input file WLSsite.prj – main project input file WLSsite.r01 – run data input file
HEC-RAS Site Unit 1 Model (Analysis of Local Intense Precipitation Event) Input/Output File List WLSsite.f01 – flow data input file WLSsite.g01 – geometry input file WLSsite.O01 – raw data output file WLSsite.p01 – plan data input file WLSsite.prj – main project input file WLSsite.r01 – run data input file
HEC-RAS Site Unit 2 Model (Analysis of Local Intense Precipitation Event) Input/Output File List WLSsite.f01 – flow data input file WLSsite.g01 – geometry input file WLSsite.O01 – raw data output file WLSsite.p01 – plan data input file WLSsite.prj – main project input file WLSsite.r01 – run data input file

References:

None

Associated Revision to the Lee Nuclear Station Combined License Application:

None

Attachment:

1. Lee Nuclear Station Supplemental Response to Request for Additional Information, RAI 10.04.05-02, CD-ROM Disc Containing HEC-HMS Input-Output Files Related to Analysis of Site Local Intense Precipitation

Attachment 1

Lee Nuclear Station Supplemental Response to Request for Additional Information

RAI 10.04.05-02

CD-ROM Disc Containing HEC-HMS Input-Output Files

Related to Analysis of Site Local Intense Precipitation