

RAI Volume 2, Chapter 2.1.1.1, First Set, Number 2, Supplemental Question 1:

Clarify the apparent inconsistencies among the three documents: (1) the probable maximum flood inundation map provided as Figure 2 in the response to RAI 2.2.1.1.7-3-001; (2) the geologic repository operations area (GROA) North Portal site plan provided in the response to RAI 2.2.1.1.3-3-006; and (3) the GROA Aging Pad site plan provided as Figure 3 in the supplemental response to RAI 2.2.1.1.1-002.

1. RESPONSE

In the conference call held on December 3, 2009, the NRC identified two openings in the dike system that require further clarification: (1) the opening near the tip of Exile Hill to the southwest of the aging pads, on the *Geologic Repository Operations Area Aging Pad Site Plan* (BSC 2008a (provided in the supplemental response to RAI 2.2.1.1.1-002)), and (2) the opening to the southeast of the aging pads, also on the *Geologic Repository Operations Area Aging Pad Site Plan* (BSC 2008a). Both of these openings are planned as shown on the site plans. The response also clarifies the design and modeling of a third area located at the southern tip of the North Portal facilities area as shown on the *Geologic Repository Operations Area North Portal Site Plan* (BSC 2008b (provided in the response to RAI 2.2.1.1.3-3-006)).

1.1 DESCRIPTION OF FLOW IN CHANNEL SEGMENT 2

Clarification of the treatment of these openings in the dike system is provided by the following description of how the flow was modeled in channel segment 2 on the probable maximum flood inundation map and how it relates to the two site plans (BSC 2008a; 2008b).

On the probable maximum flood inundation map, channel segment 2 starts just north of the aging pads and follows the dike system along the west side of the Aging Facility (labeled Dike System West on *Geologic Repository Operations Area Aging Pad Site Plan* (BSC 2008a)). At the southwest corner of the Aging Facility, guided by topography and elevation changes, channel segment 2 turns east and passes through the opening in the dike system. Although the probable maximum flood inundation map shows this dike as continuous through this area, as explained in Section 1.1.1, the dike at this location is modeled as being at ground elevation. The space between dike segments is correctly shown on the *Geologic Repository Operations Area Aging Pad Site Plan* (BSC 2008a). Channel segment 2 then models the flow of water east between the Aging Facility and the North Portal facilities along the northern side of the dike system that protects the North Portal area and facilities (labeled Dike System South on the *Geologic Repository Operations Area Aging Pad Site Plan* (BSC 2008a)). At the southeast corner of the Aging Facility, channel segment 2 turns southeast, passes through the space between the eastern part of the Aging Facility dike system (labeled Dike System East on *Geologic Repository Operations Area Aging Pad Site Plan* (BSC 2008a)) and the northern part of the North Portal dike system (labeled North Portal Loop East on *Geologic Repository Operations Area North Portal Site Plan* (BSC 2008b)), and drains into the open terrain (labeled “floodway,” as shown on *Geologic Repository Operations Area North Portal Site Plan* (BSC 2008b)). This space between the two dike systems is shown on both of the site plans and on the probable maximum flood inundation map. Channel segment 2 is modeled as generally following the North Portal

Loop East dike until merging with channel segment 1 in the floodway, as shown on the probable maximum flood inundation map.

1.1.1 Opening Southwest of the Aging Facility

The *Geologic Repository Operations Area North Portal Site Plan* (BSC 2008b) and *Geologic Repository Operations Area Aging Pad Site Plan* (BSC 2008a) accurately show the locations of the dikes and the terrain and topography at the openings in the dike system that cause the flood waters to flow as modeled in channel segment 2. Details of the channel segment crossing between the dike segments will be developed during detailed design, as needed, to ensure flood water flows as modeled. The probable maximum flood inundation map (Figure 2 in RAI 2.2.1.1.7-3-001) was provided to show the inundation levels calculated for the probable maximum flood for these flood control features. The flow of water is modeled in the *Yucca Mountain Project Drainage Report and Analysis* (BSC 2007), consistent with the two site plans (BSC 2008a; BSC 2008b).

The dike associated with channel segment 2 upstream of cross-section point 10642 is provided to protect the Aging Facility and is located to the east of the channel, placing it on the left side of the channel looking downstream. The dike associated with channel segment 2 downstream of cross-section point 9676 is provided to protect the North Portal facilities and is, therefore, located to the south of the channel, placing it on the right side of the channel looking downstream. Although no dike is physically required between those two points, the dike is modeled between cross-section points 10642 and 9676 in the *Yucca Mountain Project Drainage Report and Analysis* (BSC 2007) as being at ground elevation. Figure 1 is a color version of page 4 of Attachment D of *Yucca Mountain Project Drainage Report and Analysis* (BSC 2007). This figure includes an annotation identifying cross-section points 10287 and 9909 (which are between the endpoints of the dike system represented by cross-section points 10642 and 9676). Figure 1 shows that cross-section points 10287 and 9909 of channel segment 2 are modeled with the elevation of the dikes (labeled as “Left Levee” and “Right Levee” on Figure 1) as being at the ground surface (i.e., the purple open squares representing the left levee enclose the black solid squares representing the ground). For this reason, the dike is shown as being continuous on the probable maximum flood inundation map even though there is no physical structure between cross-section points 10642 and 9676.

1.1.2 Opening Southeast of the Aging Facility

This space between the two dike systems is to provide drainage eastward away from the Aging Facility. This is shown on both of the site plans and on the probable maximum flood inundation map.

1.2 DESCRIPTION OF FLOW IN CHANNEL SEGMENT 3

The *Yucca Mountain Project Drainage Report and Analysis* (BSC 2007) models channel segment 3 from the southwest of Exile Hill along the North Portal Loop West dike system (shown on the *Geologic Repository Operations Area North Portal Site Plan* (BSC 2008b)) southeast to the southern tip of the North Portal facilities, where channel segment 3 turns toward the northeast.

1.2.1 Southern Tip of the North Portal Facilities Area

The preliminary layout of channel segment 3 in the *Yucca Mountain Project Drainage Report and Analysis* (BSC 2007) differs from the dike system shown on *Geologic Repository Operations Area North Portal Site Plan* (BSC 2008b), which encompasses more of the rail system at the southern tip of the North Portal facilities area. However, due to the location of this feature, there is no expected impact on the overall conclusion in the *Yucca Mountain Project Drainage Report and Analysis* (BSC 2007, p. 22) that the designed drainage dikes and channels along with topography are adequate to protect the GROA nuclear facilities from flooding associated with the probable maximum precipitation event. This is because the important to safety facilities of the surface GROA are to the north of this feature where they are at higher elevations. Additionally, the North Portal Loop West dike system (shown on the *Geologic Repository Operations Area North Portal Site Plan* (BSC 2008b)) has not changed from what is modeled in *Yucca Mountain Project Drainage Report and Analysis* (BSC 2007), and this portion of the dike system provides protection for the important to safety facilities with regard to flow as modeled in channel segment 3. Between cross-sections 11551 and 6374, channel segment 3 is modeled adjacent to the North Portal Loop West dike system and flow is against the dike. The subject feature of the dike system is located downstream of cross-section 6374. As modeled in *Yucca Mountain Project Drainage Report and Analysis* (BSC 2007, p. 23), downstream from cross-section 6374, between cross-sections 6068 and 647, the ground slopes away from the dike and flow is no longer against the dike.

2. COMMITMENTS TO NRC

None.

3. DESCRIPTION OF PROPOSED LA CHANGE

None.

4. REFERENCES

BSC (Bechtel SAIC Company) 2007. *Yucca Mountain Project Drainage Report and Analysis*. 000-CDC-MGR0-00100-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070924.0043.

BSC 2008a. *Geologic Repository Operations Area Aging Pad Site Plan*. 170-C00-AP00-00101-000-00C. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20080129.0005.

BSC 2008b. *Geologic Repository Operations Area North Portal Site Plan*. 100-C00-MGR0-00501-000-00F. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20080125.0007.

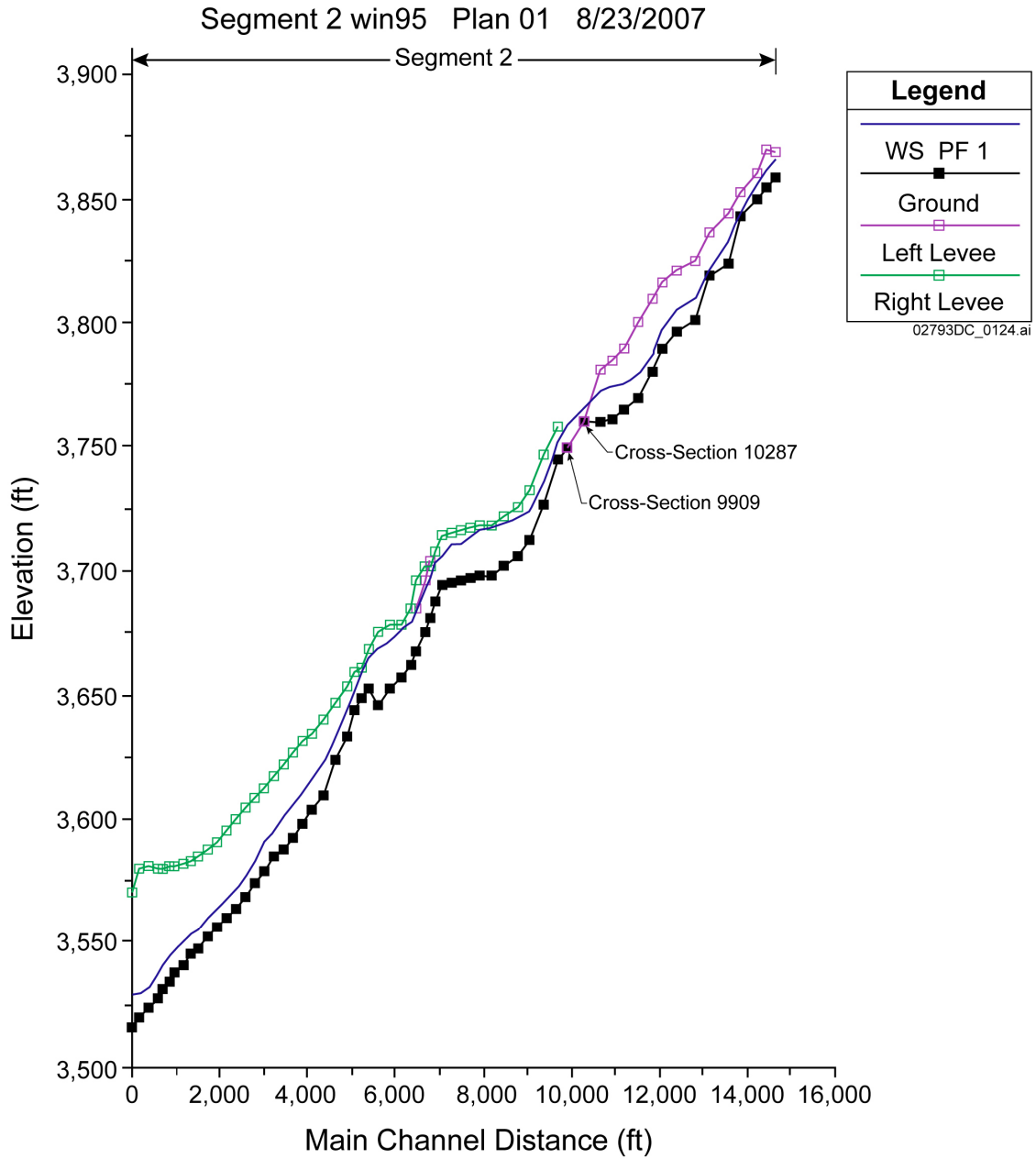


Figure 1. Water Surface Profile of Probable Maximum Flood for Segment 2

Source: BSC 2007.