

2.5S.5 Stability of Slopes

The following site-specific supplement addresses COL License Information Item 2.40.

The stability of permanent constructed and natural slopes at STP 3 & 4 is addressed. Constructed slopes at the site consist of the existing Main Cooling Reservoir (MCR) embankment slopes, which were constructed as a part of the original STP development.

Overall, the site is relatively flat with no natural slopes.

2.5S.5.1 Slope Characteristics

The characteristics of the constructed slope is described below.

2.5S.5.1.1 MCR Embankment

The MCR is located to the south of both STP 1 & 2 and STP 3 & 4. The northern limits of the MCR are shown on Figure 2.5S.4-1. The following MCR description summarizes information from the STP 1 & 2 UFSAR (Reference 2.5S.4-3).

The MCR occupies an area of approximately 3 miles by 4 miles in plan dimensions, or approximately 7000 acres. It includes approximately 65,500 feet of embankment. The top of the embankment varies, ranging from elevation (El.) 65.75 feet to El. 67 feet. Its normal operating reservoir water level is at El. 49 feet, and its minimum operating reservoir water level is at El. 25.5 feet.

The MCR embankment was constructed mainly using compacted clay soils. Interior embankment slopes are 2.5 horizontal : 1 vertical (2.5:1 H/V). Exterior embankment slopes are 3:1 H/V. All interior slopes are protected with a 2.5-foot-thick layer of soil-cement.

2.5S.5.1.2 Exploration Programs and Geotechnical Conditions

The STP 1 & 2 UFSAR (Reference 2.5S.4-3) describes a detailed subsurface investigation, performed prior to construction of the MCR, and within the planned MCR footprint. Borings were performed at 500-foot intervals along the MCR embankment, extending to depths of 30 feet to 80 feet below original ground surface. Along the planned interior dikes of the MCR, borings were performed at 1000-foot intervals. Additional borings were completed at planned MCR structures and within the reservoir area. Generally, the MCR embankment subgrade soils were found to consist of stiff to hard clays and medium dense to dense sands.

2.5S.5.2 Design Criteria and Analysis

2.5S.5.2.1 MCR Embankment Slopes

Stability analyses for the MCR embankment are described fully in the STP 1 & 2 UFSAR (Reference 2.5S.4-3). The following descriptions summarize information from that reference.

Long-term MCR embankment stability was evaluated with reservoir water level set at maximum operating level, El. 49 feet, and applying effective stress (drained) soil parameters. Calculated factors of safety ranged from 1.7 to 1.8 at the exterior slopes, and from 1.8 to 1.9 at the interior slopes. Reservoir rapid drawdown analyses were completed with reservoir level falling from El. 49 feet to El. 39 feet. Resultant factors of safety ranged from 1.4 to 1.5. The results from Newmark-type permanent deformation analysis indicated that MCR embankment slopes could safely withstand the Safe Shutdown Earthquake (SSE) acceleration of 0.10g. Pseudo-static dynamic slope stability analyses yielded factors of safety ranging from 1.3 to 1.5. Liquefaction potential analyses yielded factors of safety ranging from 1.1 to 1.6 for Operating Basis Earthquake (OBE) conditions, and from 1.7 to 4.7 for SSE conditions.

While the MCR embankment was evaluated for SSE conditions, it was not considered a Seismic Category I structure. STP 1 & 2 Seismic Category I structures are designed to withstand the potential failure of an MCR embankment section, considering up to a 2000-foot-long embankment breach adjacent to the STP 1 & 2 Power Block (Reference 2.5S.4-3, Section 2.4.4.1.1.3). The selection of this breach length was based on sensitivity analyses, with greater breach lengths not significantly increasing the resulting flood level at the STP 1 & 2 Power Block. The resulting flood level that STP 1 & 2 Seismic Category I structures are designed to withstand is El. 50.8 feet (Reference 2.5S.4-3, Table 2.4-1).

STP 3 & 4 Seismic Category I structures are to have flood protection mechanisms to withstand a possible breach in the MCR embankment. Based on a postulated credible MCR embankment breach (see Subsection 2.4S.4), the design basis flood level at STP 3 & 4 is El. 40.0 feet.

The STP 3 & 4 intake structure is approximately 1000 feet south and slightly west of the STP 1 & 2 intake structure. The STP 3 & 4 discharge structure is approximately 1000 feet west of the STP 1 & 2 discharge structure. During the detailed design of STP 3 & 4, the stability of the areas of the MCR embankment impacted by the construction of STP 3 & 4 intake/ discharge structures is checked. A site-specific subsurface investigation is performed in these two areas to support the check analyses.

2.5S.5.3 Logs of Borings

The logs of borings and associated references for the MCR embankment are provided in Reference 2.5S.4-3. The logs of borings and associated field testing for work related to the STP 3 & 4 subsurface investigation are provided in Reference 2.5S.4-2.

2.5S.5.4 Compacted Fill

Compacted fill requirements and associated references are addressed in Subsection 2.5S.4.5.