UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

SUPPLEMENTARY SAFETY EVALUATION

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

EVALUATION OF SYSTEMATIC EVALUATION PROGRAM TOPIC III-3.A

SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 1

DOCKET NO. 50-206

1.0 INTRODUCTION

Groundwater (Section 4.6.1)

While reviewing Systematic Evaluation Program (SEP) topic II-3.A, II-3.B, II-3.B.1, and II-3.C for the acceptability of the original design basis high water level including dynamic effects on the plant structures, the NRC staff suggested that the design basis groundwater level of 10 ft. above mean lower low water (MLLW) level should be considered (Ref. 5). In response to the staff's recommendation (Ref. 6), the licensee provided additional data to show that the design basis groundwater level of 5 ft. above MLLW should be adequate. The staff accepted the licensee proposal of the design basis groundwater level (Ref. 7). However, in a separate review of SCE's evaluation of SEP Topic III-3.A, "Effects of High Water Level on Structures" (Ref. 8), the staff concluded that "Topic III-3.A is resolved" except that the capability of plant structures to withstand a short-term hydrostatic load from groundwater at plant grade should be further determined (Ref. 3). The licensee submitted its response to demonstrate such capability (Ref. 1).

Roof Loadings (Section 4.6.2)

The licensee submitted its response (Ref. 2) to NRC's recommendation to either demonstrate the adequacy of the rooftop loading capabilities of the ventilation equipment building and the fuel storage building or improve drainage for the rooftops (Ref. 9). The licensee agreed with the staff's conclusion and elected to modify the roof scuppers to provide adequate drainage of the building roofs with the staff's value for the scupper orifice coefficient.

The evaluation of these two issues is described in the following paragraphs.

2.0 EVALUATION

Groundwater

The normal groundwater level for SONGS 1 varies from 5.5 ft to 5.7 ft above MLLW calculated from the long term ground water monitoring (about 23 years) and short-term well water level measurements (Ref. 7). NRC accepted the 5 ft

above MLLW as the design basis. The highest observed groundwater level is 7 ft above MLLW. The plant grade for SONGS 1 is between 14 ft and 21 ft above MLLW. The licensee claimed that the groundwater table to be at plant grade is an extreme event because such an event is more severe than normal design basis groundwater elevation. This is an acceptable statement because the level difference between the plant grade and design basis groundwater is from 9 ft to 16 ft. Also, the licensee assumed that only normal condition loadings could be concurrent with loads resulting from groundwater table at plant grade, because the probability of such an extreme event is very low (taken to be of the same order as DBE) and the probable duration would be short. This licensee position is acceptable considering the extreme case with short-term groundwater level at plant grade.

The licensee combined the normal load with hydrostatic loads resulting from groundwater table at plant grade and used the same acceptance criteria as those adopted for the combined normal and DBE loads (i.e., ultimate strength criteria of ACI 349-76) for evaluation. The licensee selected four buildings for the assessment of flotation effects based on average embedment depth, foundation type and configuration. Also eleven sub-grade building components (e.g. base slabs, footings, and external walls below grade) from four buildings were selected for the assessment of their structural adequacy against short-term hydrostatic loads having deeper embedment, larger span, and smaller design margin under existing design loads. The minimum safety factor against flotation for those four buildings is calculated as 1.25 for the circulating water intake structure. This is acceptable because the minimum allowable safety factor against flotation is 1.1 as per subsection II.5 of standard review plan (SRP) section 3.8.5. Eleven sub-grade building components were evaluated using the UFSAR acceptance criteria and the most critical component is found to be the north pumpwell wall located at elevation between -7.75 ft. and +15 ft. in circulating water intake structure. Its safety factors (defined as the ratio of the allowable value to the computed value) are reported as 1.56 for positive moment, 1.48 for negative moment, and 1.35 for shear force. This is acceptable. The staff accepts the licensee's evaluation of the structures subjected to the postulated high groundwater level; thus, the issue of the capacity of plant structures to withstand a short-term hydrostatic load from groundwater at plant grade is resolved.

Roof Loadings

The NRC staff had some disagreements with the licensee regarding the depth of ponding for the ventilation equipment building and the fuel storage building and the value of the scupper orifice coefficient used in evaluation by the licensee. The licensee accepted the staff's conclusion for the depth of ponding and elected to modify the roof scuppers with the staff's value for the scupper orifice coefficient rather than perform testing to demonstrate the validity of their assumptions. The modification was reported as completed (Ref. 10). This modification provides the basis for resolving the roof ponding issue of the above noted buildings.

3.0 CONCLUSION

Based on NRC review of the responses provided by the licensee regarding groundwater, the staff concluded that the assumptions, procedures, acceptance criteria, and analyses used to resolve these issues are acceptable as they met the relevant SRP provisions and UFSAR commitments. Regarding the roof ponding issue, the licensee agreed with the staff's recommendation regarding the ponding depth and the value of the scupper orifice coefficient and modified the roof scuppers to improve drainage for the ventilation equipment building and the fuel storage building. Thus, this item is considered resolved.

4.0 REFERENCES

1. Letter, M. O. Medford, SCE, to G. E. Lear, NRC, dated August 22, 1986, regarding Docket No. 50-206, Systematic Evaluation Program, Topic III-3.A, Effects of High Water Level on Structures, SONGS 1.

2. Letter, M. O. Medford, SCE, to NRC dated September 14, 1988, regarding Docket No. 50-206, IPSAR, Section 4.6.2, Roof Loadings, SONGS 1.

3. Letter, J. A. Zwolinski, NRC, to K. P. Baskin, SCE, dated December 13, 1984, on SEP Topic III-3.A, Effects of High Water Level on Structures, SONGS 1.

4. "Effects of High Water Level on Structures," SEP TOPIC III-3.A, Section 4.6, NUREG-0829, December 1986.

5. Letter from W. A. Paulson, NRC, to R. Dietch, SCE, dated January 31, 1983, on SEP Hydrology Topic II-3.B, II-3.B.1, and II-3.C, SONGS 1, January 31, 1983.

6. Letter, M. O. Medford, SCE, to D. M. Crutchfield, NRC, dated May 7, 1984, on Docket 50-206 Systematic Evaluation Program Integrated Assessment, SONGS 1.

7. Letter, W. A. Paulson, NRC, to K. P. Baskin, SCE, dated August 27, 1984, on SEP Hydrology Topics (II-3.A, II-3.B, II-3.B.1, and II-3.C).

8. Letter, R. W. Krieger, SCE, to D. M. Crutchfield, NRC, dated October 20, 1983, on Docket No. 50-206, SEP, Topic III-3.A, SONGS 1.

9. Letter, C. M. Trammell, NRC, to K. P. Baskin, SCE, dated July 28, 1988, on Roof Loadings, IPSAR Section 4.6.2 (TAC No. 62998).

10. Letter, C. Towsen, NRC Region V Resident Inspector, to G. Kalman, NRC, dated April 24, 1991, on FTOL ITEM ROOF PONDING SCUPPER.

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