3/4.7.13 GROUNDWATER LEVEL-SERVICE WATER RESERVOIR

LIMITING CONDITION FOR OPERATION

3.7.13 The groundwater level of the service water reservoir shall not exceed the elevation at the locations listed in Table 3.7-6. The flow of groundwater from the drains beneath the pumphouse shall not exceed the values given in Table 3.7-6.

APPLICABILITY: All MODES.

ACTION:

With the groundwater level of the service water reservoir or the groundwater flow rate exceeding any of the limits of Table 3.7-6, an engineering evaluation shall be performed by a Licensed Civil Engineer to determine the cause of the high ground water or flow rates and the influence on the stability of the service water reservoir and pumphouse. A Special Report shall be prepared and submitted to the Commission pursuant to Specification 6.9.2 within 90 days, containing the results of the evaluation and any corrective action determined to be necessary.

SURVEILLANCE REQUIREMENTS

4.7.13.1 The groundwater level within the dike of the service water reservoir as determined by monitoring the piezometers shall be within limits presented in Table 3.7-6. Measurements shall be performed at least once per 6 months and shall include reliable measurements from all OPERABLE piezometers listed in Table 3.7-6 including, as a minimum: 1 piezometer located at the Service Water Pump House (Nos. 11, 12, 13 or 14); 1 piezometer located at the South East (SE) end of the reservoir (Nos. 10, 15, 16 or 17); and one piezometer located at the Service Water Valve House (No. 18). The groundwater flow rate shall be determined by measurements at the drain outlet gallery. Flow rate measurements shall be taken at the same frequency as the piezometers (that is once per every 6 months) and the flow rate shall not exceed that established in Table 3.7-6. A visual inspection of the clarity of the outflow from each drain shall be performed in conjunction with the flow monitoring effort.

3/4.7.13 GROUNDWATER LEVEL-SERVICE WATER RESERVOIR

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APPLICABILITY: All MODES.

ACTION:

With the groundwater level of the service water reservoir or the groundwater flow rate exceeding any of the limits of Table 3.7-6, an engineering evaluation shall be performed by a Licensed Civil Engineer to determine the cause of the high ground water or flow rates and the influence on the stability of the service water reservoir and pumphouse. A Special Report shall be prepared and submitted to the Commission pursuant to Specification 6.9.2 within 90 days, containing the results of the evaluation and any corrective action determined to be necessary.

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ATTACHMENT 2

SAFETY EVALUATION

Virginia Electric and Power Company

Change to Units 1 and 2 Technical Specification 4.7.13.1, "Ground Water - Service Water Reservoir."

DISCUSSION

The proposed change to the North Anna 1 and 2 Technical Specifications 4.7.13.1, is to provide needed flexibility in the surveillance requirements. The Technical Specifications require that all of the existing piezometers at the service water reservoir be read every six months. However, it is not necessary to read all of the piezometers in order to detect a high rate of seepage from the reservoir.

An engineering evaluation has been performed showing that reliable readings from at least one piezometer in each of the three areas of the dike (Pump House, Valve House and SE side of Reservoir) is sufficient for detecting leakage from the reservoir. There are also other mechanisms available for identifying abnormally high groundwater levels that might signify increased seepage from the reservoir. There mechanisms are: 1) the horizontal drains which are monitored every six months in accordance with Technical Specification 4.7.13.1, 2) test wells located near the service water pumphouse, and 3) four weirs located at the toe of the reservoir dike. Items 2 and 3 are not currently being monitored but they could be used to provide additional information if abnormal piezometer data were to be obtained in the future.

All OPERABLE piezometers will be monitored in order to obtain as much information as possible.

BASIS FOR NO SIGNIFICANT HAZARDS CONSIDERATION

The proposed change does not involve a significant hazards consideration as defined in 10 CFR 50.92 because operation of North Anna 1 and 2 in accordance with this change would not:

(1) involve a significant increase in the probability or consequences of an accident previously evaluated as sufficient means for detecting high water levels within the dike will still be required by the proposed Technical Specification.

(2) create the possibility of a new or different kind of accident from any accident previously evaluated. The proposed change does not involve any changes to plant design and sufficient means for detecting high water levels within the dike will still be required by the proposed Technical Specification.

(3) involve a significant reduction in the margin of safety. The proposed change would specify that measurements from each of the three main areas of the dike will be obtained to determine that ground water levels within the dike are below allowable elevations. This is sufficient for this purpose and therefore the margin of safety is not reduced.

Therefore, it has been concluded that the proposed change does not involve a significant hazards consideration.

ATTACHMENT 3

TECHNICAL ENGINEERING REVIEW OF CHANGES

TO

UNITS 1 AND 2 TECHNICAL SPECIFICATIONS 4.7.13

Virginia Electric and Power Company

Revision 1
February 5, 1986

REVIEW
OF
TYPE 1 PROJECT TURNOVER NP-895
ON
TECHNICAL SPECIFICATION 3/4.7.13

NORTH ANNA POWER STATION
UNITS 1 AND 2

Background of Technical Specification 3/4.7.13

Technical Specification 3/4.7.13, "Groundwater Level - Service Water Reservoir," currently requires the monitoring at six-month intervals of nine pneumatic piezometers around the Service Water Reservoir (SWR). Should the groundwater level measured at any piezometer exceed the allowable groundwater elevation given in Table 3.7-6, (a) an engineering evaluation must be performed and (b) a special report must be submitted to the Nuclear Regulatory Commission (NRC) containing the results of the evaluation. An understanding of the background of these requirements is necessary to guide current and future interpretations of the monitoring results.

The SWR was originally proportioned to contain a two-week supply of cooling water for the safe shutdown and cooldown of all four nuclear reactor units planned for the station (Reference 1). However, in response to the Atomic Energy Commission Safety Guide entitled "Ultimate Heat Sink" dated May 28, 1971, the SWR was extended to the west to contain a 30-day supply of cooling water for all four units. Not until November 1980 was the decision made that fewer than four units would have to share the supply of cooling water.

From an early date in the licensing of Units 1 and 2 (Reference 2), seepage losses from the SWR were considered "based on a permeability of the liner of 1×10^{-7} cm/sec and...estimated to be about 1.5 gpm." Later (Reference 3), a surveillance program was described "to determine seepage discharge through the dike." A seepage component was recognized in the mass balance of water of the SWR (Reference 4), and this seepage was to be calculated using a coefficient of permeability that "will be measured in a laboratory, using the impervious liner material compacted to field density."

Following the reporting of the settlement of the Units 1 and 2 Service Water Pump House (SWPH) to NRC on April 29, 1975, the NRC Staff became increasingly concerned about the loss of service water by seepage and leakage through the liner. Their position (Reference 5) included the following:

a. "A pond leakage monitoring program to promptly detect large increases in the pond leakage rate should be developed. Periodic checks on pond leakage rates should be included in the Technical Specifications."

b. "Analyses of the consequences of cracks in the piping within the spray pond should be made to determine whether the lining will be eroded sufficiently to significantly affect cooling capability, pond leakage, or spray piping inspections."

The response to this position drew attention to the nine piezometers (P-1 through P-9) installed in trenches beneath the dike during construction and indicated that three additional piezometers (P-10, P-11, and P-12) would be installed in boreholes. It concluded that "these 12 piezometers will adequately detect any changes in the piezometric elevation and, therefore, in the rate of seepage or pond leakage."

To demonstrate that the piezometers could detect the increase in leakage that would be caused by the development of a major crack through the reservoir liner, a series of finite element seepage analyses were performed (Reference 6). The results clearly showed that a major leak would cause the phreatic surface to rise significantly beneath the embankment.

In connection with the commitment to control the groundwater level beneath the SWPH (Reference 7), two deep piezometers were installed in mid-1976, one (P-13) near the SWPH and one (P-14) angled below the SWPH. At about the same time, three test wells (TW-1, TW-2, and TW-3) were installed near the SWPH to provide design parameters for the groundwater-control system (Reference 8).

Also in mid-1976, several borings were made along the southeastern section of the SWR to obtain undisturbed samples, and a trench drain was planned to be installed along the toe of the dike in this area (Reference 7). To permit later evaluation of the toe drain, three piezometers (P-15, P-16, and P-17) were installed in the boreholes.

Finally, a piezometer (P-18) was installed near the Units 3 and 4 Service Water Pump House to monitor any change in piezometric elevation when construction of the pump house was to have resumed.

Thus, a total of 18 piezometers were installed around the SWR for several different purposes. The sensors of the original 9 piezometers (P-1 through P-9) were placed at elevations at or above the groundwater levels as reduced by the two drainage systems, and their monitoring was discontinued at the end of 1977.

In September 1977 (as fuel loading for Unit 1 approached), the NRC Staff required that a technical specification should establish maximum groundwater elevations, as measured by piezometers, that would initiate an engineering investigation of groundwater conditions. Therefore, Technical Specification 3/4.7.13 was issued, listing an "allowable" maximum groundwater elevation for each of the 9 piezometers (P-10 through P-18) being monitored. These maximum groundwater elevations were based on a review of the history of piezometer readings, with allowance for the effects of the drainage systems, to apply values that should be considered abnormally high.

The intent of Technical Specification 3/4.7.14 clearly was to identify an abnormally high groundwater level that might signify (a) increased seepage or leakage from the reservoir (diminishing the 30-day supply of cooling water) or (b) decrease in efficiency of either of the two drainage systems.

The NRC Staff concern over the 30-day of cooling water is also shown in the requirement of Technical Specification 3/4.7.5, "Ultimate Heat Sink," that data for calculating the leakage from the SWR shall be obtained at six-month intervals.

Significance of Inoperative Piezometers

There is a commitment (Reference 8) to monitor the piezometers around the SWR. There are also more piezometers than are needed to satisfy the intent of Technical Specification 3/4.7.13. Most of the piezometers are grouped together either (a) near the SWPH or (b) along the southeastern section of the SWR. One or two operative piezometers at each location could adequately detect an abnormally high groundwater level. Measurements of piezometer P-11 have not been possible since March 1977, due to lowering of the groundwater table, yet this piezometer might possibly provide detection of an abnormally high groundwater level someday.

Type 1 Project Turnover NP-895 explains the inability, despite attempted remedial action, to obtain measurements of groundwater elevations in November 1985 of piezometers P-13 and P-17; satisfactory measurements of these piezometers were made as late as May 1985. However, satisfactory measurements of nearby piezometers clearly show no evidence of abnormally high groundwater levels. Piezometers P-12 would have reflected any change that would have been detected by piezometer P-13; test well TW-1 (monitored through May 1985) would also have reflected a change. Any change in groundwater level at piezometer P-17 would have been detected by nearby piezometer P-16 and also piezometers P-10 and P-15.

Satisfactory measurements of redundant piezometers demonstrate that the "limiting condition for operation" given in Technical Specification 3/4.7.13 has not been exceeded and, therefore, the action requirements of that technical specification are not applicable.

Proposed Revision of Technical Specification 3/4.7.13

Clarification of Technical Specification 3/4.7.13 is needed to acknowledge the redundancy of the groundwater level measurements and to indicate that all of the measurements are not needed to satisfy the intent of the requirements. However, every effort should be made to obtain satisfactory measurements of all piezometers.

Section 3.7.13 of the specification appears to be correct. It clearly states that an evaluation must be made of any abnormally high groundwater level measurement.

Section 4.7.13.1, however, should be revised to account for inaccessible or inoperative piezometers listed in Table 3.7-6. The recommended revision would be to change the second sentence to read as follows:

> "Measurements shall be performed at least once per six months and shall include reliable measurements from at least three of the piezometers listed in Table 3.7-6."

This revision would maintain the intended surveillance requirement of the specification without imposing unnecessary hardships on the monitoring personnel.

Maintenance of Piezometer Monitoring Capabilities

The recommended revision to Technical Specification 3/4.7.13 should not be considered justification for allowing piezometers to become inoperative. The redundancy of groundwater level measurements should remain an important feature of the monitoring program. Either inoperative piezometers should be rejuvenated or new piezometers should be considered.

Many of the piezometers are over 10 years old. Perhaps this is an appropriate point in time to have an evaluation of their current and future reliability. Such an evaluation is only possible by the manufacturer, the Slope Indicator Company.

The recommended action would be to request the Slope Indicator Company to send a field engineer to the Station for the following purposes:

a. Visit each piezometer, make readings, and rejuvenate any inoperative piezometers, if possible.

b. Review monitoring methods and readout instruments.

c. Assess the long-term future performance of the piezometers.

This evaluation might include the piezometers in Lake Anna Dam.

Should the evaluation indicate a potential for future problems with the existing piezometers, consideration might be given to replacing them with a lesser number of more durable instruments placed at sufficiently great depths to be always below the groundwater level.

References

1. Letter NAS-3610 to E. B. Crutchfield (Vepco) from P. W. Riegelhaupt (SWEC), "Service Water Reservoir Expansion," December 16, 1971.

2. Preliminary Safety Analysis Report, Virginia Electric and Power Company, North Anna Power Station, Units 1 and 2 (hereafter, PSAR, North Anna Units 1 and 2), Section 2.3.6, "Service Water Reservoir," March 1, 1969.

3. Final Safety Analysis Report, Virginia Electric and Power Company, North Anna Power Station, Units 1 and 2 (hereafter, FSAR, North Anna Units 1 and 2), Section 3.8.4, "Service Water Reservoir," January 3, 1973.

4. FSAR, North Anna Units 1 and 2, Response to Regulatory Staff Comment D2.4.8, "Cooling Water Canals and Reservoirs," May 18, 1973.

5. FSAR, North Anna Units 1 and 2, Response to Regulatory Staff Position 3.6, "Settlement of Service Water Pump House and Dikes," August 15, 1975.

6. FSAR, North Anna Units 1 and 2, Appendix E, "Report of Geotechnical Investigations of Service Water Reservoir," December 23, 1975.

7. FSAR, North Anna Units 1 and 2, Response to Regulatory Staff Position 3.8, "Service Water Reservoir Ground Water Level Control," June 16, 1976.

8. FSAR, North Anna Units 1 and 2, Section 3.8.4, "Service Water Reservoir," as amended November 3, 1978.

CERTIFICATE

I, the undersigned, certify that I performed the evaluation of groundwater level measurements at the Service Water Reservoir of the North Anna Power Station for Virginia Power and that I prepared this review. I was in charge of and performed the study of background information, interpretation of the significance of inoperative piezometers, recommendations of remedial action, and other parts of the work. This review has my approval.

B. N. MacIver
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