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SCE&G®
A SCANA COMPANY

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

ATTN: Document Control Desk

Subject: V. C. Summer Nuclear Station Units 2 and 3
Docket Numbers 52-027 and 52-028
Combined License Application – Response to NRC Environmental Report (ER) Requests for Additional Information (RAI): BenCost-1 and GW-2 Supplemental Response

Reference:
1. Letter from Ronald B. Clary to Document Control Desk, Submittal of Revision 1 to Part 3 (Environmental Report) of the Combined License Application for the V. C. Summer Nuclear Station Units 2 and 3, dated February 13, 2009.
2. Letter from Patricia J. Vokoun to Ronald B. Clary, Requests for Additional Information Related to the Environmental Review for the Combined License Application for the V. C. Summer Nuclear Station, Units 2 and 3, dated June 22, 2009.

By letter dated March 27, 2008, South Carolina Electric & Gas Company (SCE&G) submitted a combined license application (COLA) for V.C. Summer Nuclear Station (VCSNS) Units 2 and 3, to be located at the existing VCSNS site in Fairfield County, South Carolina. Subsequently the Environmental Report (ER), Part 3 of the application, was revised and submitted to the NRC (reference 1).

The enclosure to this letter provides supplemental information to the SCE&G response to RAI items BenCost-1 and GW-2 transmitted by the NRC via reference 2.

Please address any questions to Mr. Alfred M. Paglia, Manager, Nuclear Licensing, New Nuclear Deployment, P. O. Box 88, Jenkinsville, S.C. 29065; by telephone at 803-345-4191; or by email at apaglia@scana.com.

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NRO

I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 8TH day of OCTOBER 2009

Stephen A. Byrne
Executive Vice President
Generation and CNO

ARR/RBC/ar

Enclosures

c (with Enclosures):
Patricia Vokoun
Carl Berkowitz
FileNet

c (without Enclosures):
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John Zeiler
Chandu Patel
Stephen A. Byrne
Ronald B. Clary
Bill McCall
William M. Cherry
Randolph R. Mahan
Kathryn M. Sutton
Rich Louie
John J. DeBlasio
April Rice

VCSNS UNITS 2 and 3
Environmental Report Review
Response to NRC Requests for Additional Information

NRC RAI Letter Dated June 22, 2009

NRC RAI Number: GW-2 **Revision:** 1

Reference ER Information Needs Item: GW-3

Question Summary (RAI):

Describe the selection and uncertainties in the conservative hydraulic conductivity values used in the groundwater pathline analysis for the saprolite/shallow bedrock zone and deep bedrock zone.

Full Text (supporting information):

None

VCSNS Response (Revised):

The original response to this RAI was provided to the NRC in SCE&G letter NND-09-0203, dated July 20, 2009. That response indicated that RAI GW-2 was addressed in the response to FSAR RAI 02.04.13-2, which had been provided to the NRC in letter NND-09-0171, dated June 24, 2009. However, the response to RAI GW-2 was only partially addressed in the response to FSAR RAI 02.04.13-2. Subsequent discussions during a conference call between the NRC and SCE&G on September 8, 2009 indicated a need to provide additional information not provided in the original FSAR RAI response. As a result of those discussions, the response provided herein revises the original response to this RAI.

See SCE&G letter NND-09-0139 dated May 21, 2009 for the response to the related ER Information Needs Item GW-3. (Reference ML091480009)

The hydraulic conductivity value of the bedrock used in the radionuclide transport calculations is the highest estimated conductivity from all the slug tests conducted in the bedrock (0.4 ft/day). This is the most conservative choice for the transport analysis as it produces the fastest travel time and therefore the highest concentrations in the analysis of accidental effluent releases through the bedrock.

The hydraulic conductivity value for the saprolite/shallow bedrock used in the VCSNS FSAR 2.4.13 as representative of the area around Units 2 and 3 and along the potential pathways of accidental effluent releases from these units towards nearby creeks was 1.7 feet/day. This is the 75th percentile hydraulic conductivity value from all slug test data in the saprolite saprolite/shallow bedrock zone. This value is conservative because it is 2.8 times higher than the geometric mean of estimated hydraulic conductivities from all the slug tests.

The choice of this value is supported by water balance considerations for this area. Using a higher hydraulic conductivity value would lead to violation of the water balance principle for the site, i.e. that under steady state conditions the flow into the subsurface system must be equal to the flow out of the system (no long-term change in storage).

To demonstrate the validity of the choice of 1.7 ft/day as the representative average conductivity for the site it is necessary to consider water balance for a control volume below the top of the ridge at the site of Units 2 and 3, specifically within area ABCDEFGA in Figure 1, and extending to the upper 10 ft of the deep bedrock. The contours shown in this Figure are reproduced from the VCSNS FSAR Figure 2.4-240. It is assumed that there is no flow to any deeper zones in the bedrock. Figure 2 shows the control volume and the potentiometric level contours in the deep bedrock. The contours shown in this Figure are reproduced from the VCSNS FSAR Figure 2.4-244. The potentiometric levels shown in both Figure 1 and Figure 2 are based on data collected in March 2007 (see VCSNS FSAR Table 2.4-221). The water balance analysis accounts for two materials, the saprolite and the shallow part of the bedrock (partially weathered rock) treated as one unit and the top 10 ft of the deep bedrock treated as the second unit. As can be seen in Figures 1 and 2, the flow direction across the boundary of the control volume in each of the two materials is not exactly the same.

The total groundwater recharge over this area must be equal to the flow out of the control volume through the saprolite/shallow bedrock and through the deep bedrock. This can be expressed as:

$$Q_S + Q_B = R \qquad (1)$$

where

Q_S is the total flow through the saprolite/shallow bedrock out of the control volume passing through segments AB and CDEF in Figure 1. (It is noted that there is no flow through the segment FGA and in the segment BC the water table is in the deep bedrock zone, i.e. the saprolite and shallow bedrock are in the unsaturated zone.)

Q_B is the total flow through the deep bedrock out of the control volume passing through the boundary line ABCDEFGA.

R is the total recharge over the area ABCDEFGA.

The total flow out of the control volume through the saprolite can be estimated as:

$$Q_S = K_S i_S D_S L_S \qquad (2)$$

where

K_S is the average hydraulic conductivity of the saprolite/shallow bedrock.

i_S is the average hydraulic gradient in the saprolite/shallow bedrock.

D_S is the average saturated thickness of the saprolite/shallow bedrock.

L_S is the length of the segments AB and CDEF through which groundwater flows out of the control volume through the saprolite/shallow bedrock. It is noted that there is no flow through the line segments FGA and BC.

The total flow out of the control volume through the deep bedrock can be estimated as:

$$Q_B = K_B i_B D_B L_B \qquad (3)$$

where

K_B is the average hydraulic conductivity of the deep bedrock

i_B is the average hydraulic gradient in the deep bedrock

D_B is the average saturated thickness the deep bedrock
L_B is the length of the lateral boundary of the control volume in the deep bedrock (see Figure 2).

The total recharge over the area under consideration is:

$$R = rA \tag{4}$$

where

r is the mean annual recharge rate per unit area.
A is the surface area enclosed by the line ABCDEFGA.

Combining Equations (1), (2), (3), and (4) we obtain:

$$K_S i_S D_S L_S + K_B i_B D_B L_B = rA \tag{5}$$

The average hydraulic conductivity of the saprolite/shallow bedrock, K_S, required to satisfy the water balance equation (5) can be estimated as:

$$K_S = \frac{rA - K_B i_B D_B L_B}{i_S D_S L_S} \tag{6}$$

In Equation (6), the parameters i_S, i_B, L_S, L_B and A can be estimated directly from Figure 1 and Figure 2. The average saturated thickness of the saprolite/shallow bedrock D_S can also be estimated from the available data. The average thickness of the deep bedrock through which there is groundwater flow, D_B, is assumed to be 10 ft. The mean annual recharge rate can be estimated as a fraction of the mean annual precipitation, which is approximately 45 inches (see VCSNS FSAR Section 2.4-1). The average annual recharge over the continental U.S. is about 10% of the mean annual precipitation (Singh, 1992).

The following values are used for the parameters on the right hand side of Equation (6), assuming that the groundwater recharge rate is 10 percent of the mean annual precipitation:

i_S = 0.03
D_S = 17 ft
L_S = 2,700 ft

K_B = 0.4 ft/day
i_B = 0.04
D_B = 10 ft
L_B = 4,300 ft

r = 0.10 x 45 = 4.50 inches/year
A = 1,783,400 ft^2

Using these values in Equation (6) yields:

K_S = 0.8 ft/day

The hydraulic gradient in the saprolite/shallow bedrock (0.03) was calculated as the average along the part of the boundary of the control volume through which there is flow. The hydraulic gradient in the bedrock (0.04) was calculated as the average of two values, 0.06 to the west of Units 2 and 3, which was obtained from the contours shown in Figure 2, and 0.02 to the east of Units 2 and 3. The latter was obtained by dividing the potentiometric level difference between Units 2 and 3 and Mayo Creek by the corresponding distance.

The average saturated thickness of the saprolite/shallow bedrock (17 ft) was calculated as the weighted average along the part of the boundary of the control volume through which there is flow. This calculation used the available data on the bottom of the saprolite/shallow bedrock, i.e. the top of the sound rock, (see VCSNS FSAR Table 2.5-202) and the data on potentiometric levels (see VCSNS FSAR Table 2.4-221).

If the groundwater recharge is assumed to be 15 percent of the mean annual precipitation, i.e. r = 0.15 x 45 = 6.75 inches/year, then K_S = 1.5 ft/day. Similarly, if the groundwater recharge is 20 percent of mean annual precipitation, then K_S = 2.2 ft/day. Considering the site of Units 2 and 3 was covered with trees, it is reasonable to expect that a good portion of the infiltrating water becomes evapotranspired, and that the rate of groundwater recharge would be relatively low.

This confirms that the value 1.7 ft/day used in the FSAR is representative of the site conditions. Using a higher conductivity for the saprolite would produce much higher horizontal flow, which could exist only if groundwater recharge were much higher. For example, if we assume that the hydraulic conductivity in the area of Units 2 and 3 is equal to the highest measured conductivity value from the slug tests (18 ft/day), then keeping all other parameters the same the total horizontal flow out of area ABCDEFGA would be 18x0.03x2700x17 + 0.4x0.04x4300x10 = 25,474 ft^3/day. The groundwater recharge rate required to produce this flow would have been about 62.6 in/yr, i.e. 39 percent higher than the total mean annual precipitation of 45 in/year, which is impossible. This shows that it is unrealistic to assume that the highest measured hydraulic conductivity values are representative of the entire site of Units 2 and 3.

To put the recharge estimates in perspective, we can use as reference various studies of groundwater recharge rates for the Savannah River Site (SRS), located about 75 miles to the south-southwest of VCSNS. Even though SRS is located in the Coastal Plain physiographic province, while VCSNS is in the Piedmont, there are similarities between the two sites in terms of precipitation, ground surface relief and slope, vegetation types, and other features. Mean annual precipitation at SRS is 49 inches compared with 45 inches at Parr Hydro. Recharge estimates at SRS are in the range of 8 to 17 inches per year (Geotrans 1997; Fogle and Brewer 2001; Brewer and Sochor 2002; INTERA 2003). This is between 16 and 35 percent of the mean annual precipitation at SRS. The higher end of these recharge estimates is for lower lying flat areas and the lower end corresponds to sloping areas. Because of the steeper ground surface slope, it is expected that recharge rates at the site of the VCSNS Units 2 and 3 will be closer to the lower end of the range of values estimated at SRS, or even lower.

References:

Brewer, K.E. and C.S. Sochor, 2002: "Flow and Transport Modeling for D-Area Groundwater", report number WSRC-RP-2002-4166 prepared by Washington Savannah River Corporation for the Department of Energy.

Fogle, T.L. and K.E. Brewer 2001: "Groundwater Transport Modeling for Southern TCE and Tritium Plumes in the C-Area Groundwater Operable Unit", report number WSRC-TR-2001-00206 prepared by Washington Savannah River Corporation for the Department of Energy.

Geotrans 1997: "Groundwater Flow and Solute Transport Modeling Report K-Area Burning Rubble Pit and Rubble Pile", report number WSRC-RP-98-5052 prepared by Washington Savannah River Corporation for the Department of Energy.

INTERA 2003: "Groundwater Flow and Contaminant Transport Modeling in Support of the RRSB Operable Unit", report number WSRC-RP-2002-4081 prepared by Washington Savannah River Corporation for the Department of Energy.

Singh, V.P., 1992 "Elementary Hydrology", Prentice-Hall.

Associated COLA Revisions:

No COLA revisions are required

Associated Attachments:

None

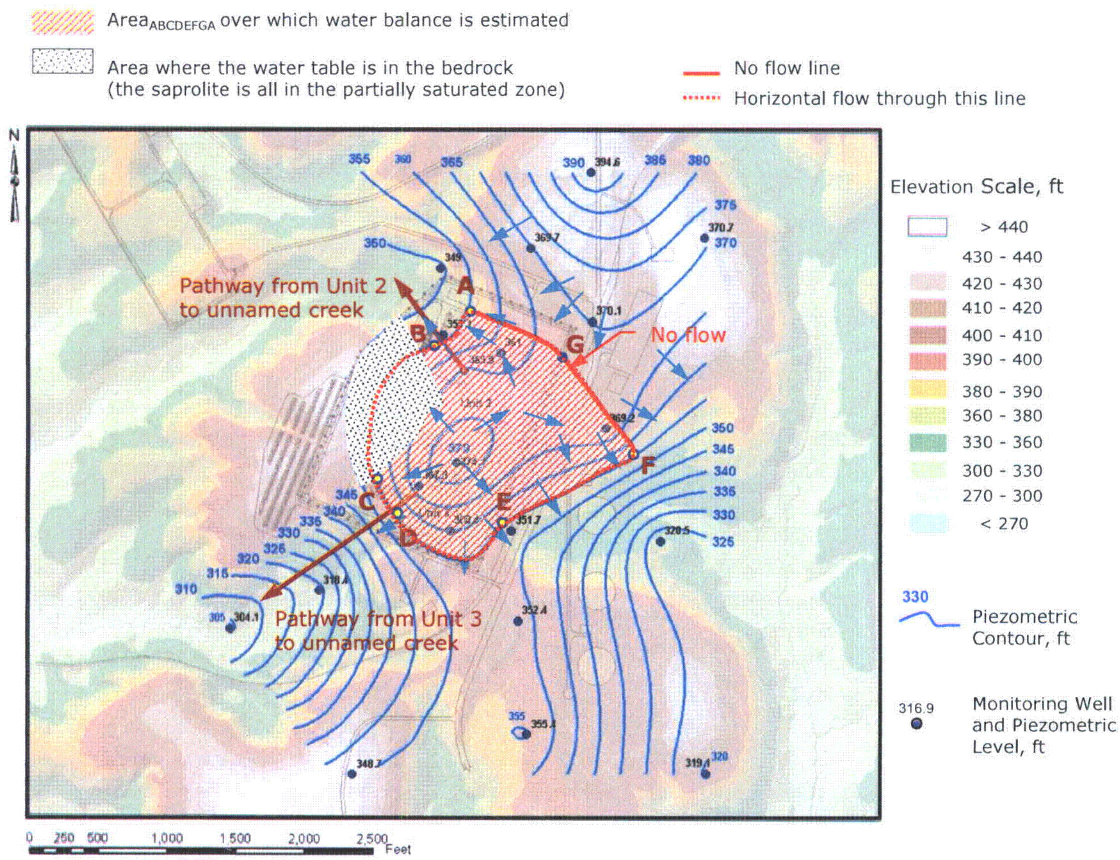

Figure 1. Control volume and potentiometric level contours in the saprolite/shallow bedrock for March 2007.

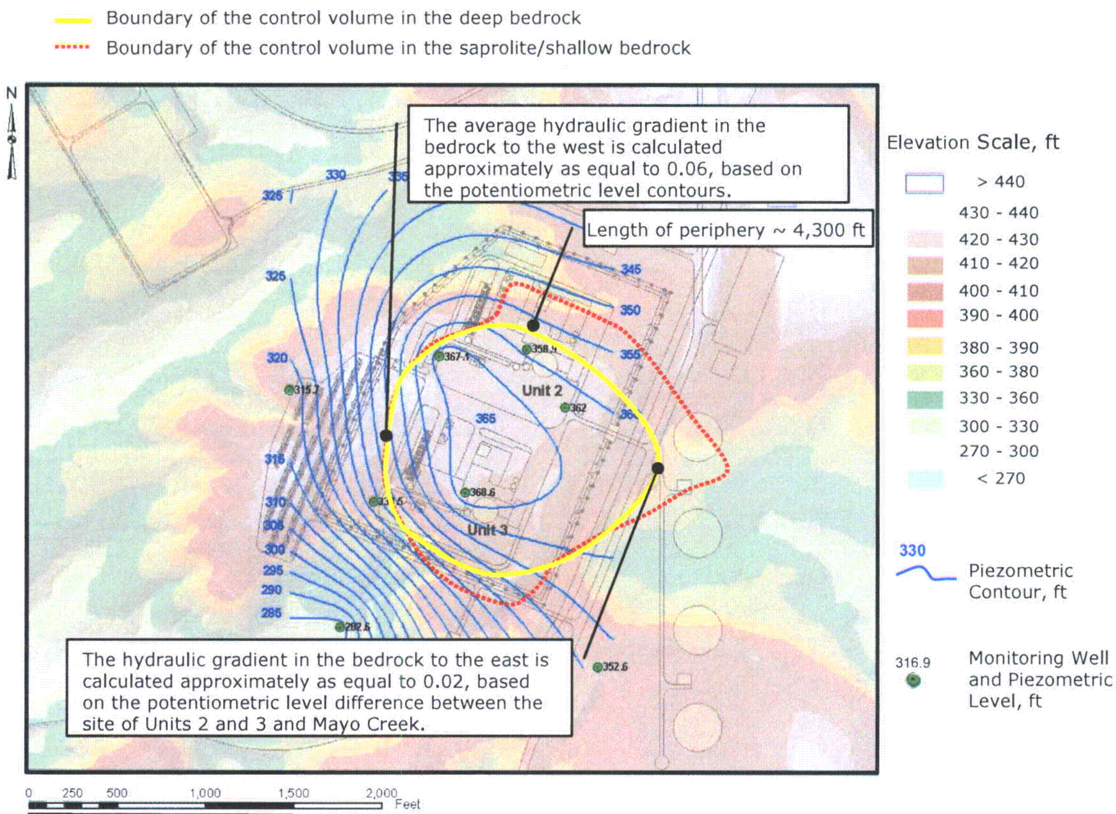

Figure 2. Control volume and potentiometric level contours in the deep bedrock for March 2007.

NRC RAI Letter Dated June 22, 2009

NRC RAI Number: RAI BenCost-1 Supplement **Revision:** 0

Reference ER Information Needs Item: none

Question Summary (RAI):

Provide estimates of the annual taxes expected to be paid as a result of constructing and operating two new operating units at the VCSNS over the lifetime of the new plants. Include expected property taxes paid to Fairfield County, expected annual sales taxes paid to the State of South Carolina, and any expected corporate taxes paid to jurisdictions affected by the VCSNS, that would be attributable to the new units.

Full Text (supporting information):

No quantitative discussion of this information appears in the ER.

NRC Requested Supplemental Information:

Under BenCost-1 response section 2 (NND-09-0237) the following statement is made:

"In addition, the state would collect sales tax on some purchases by SCE&G during the construction and operations of Units 2 and 3. SCE&G is responsible for operating Units 2 and 3."

No other information about projected sales taxes is provided. It is necessary for us to have a projection of the magnitude of SC sales tax payments expected from local or in-state purchases during construction and operations and whether that amount annually would exceed the provided estimates of tax revenues generated from additional workforce incomes.

VCSNS Supplemental Response:

Construction:

Based on projected expenditures from Shaw and Westinghouse, SCE&G estimates that $11 million dollars (2007 dollars) could be paid in South Carolina sales and use taxes during construction. This estimate is based on the following assumptions:

- Current SC laws and regulations, including sales tax exemptions and tax rates, will continue to apply throughout the construction period.
- The SC Department of Revenue will continue to participate in the "Special 19" sales tax audit with SCE&G throughout the construction period.
- Contractors and subcontractors will properly extend the "Special 19" sales tax exemption and provide necessary information in a timely manner to assist in those audits.

- Contracts and invoices from contractors and subcontractors (particularly for equipment rental) will contain favorable language to take full advantage of all existing sales tax exemptions/exclusions.

Operation:

The only available information to estimate sales and use taxes during operation of the new units is the existing VCSNS Unit 1 data. The most recent sales and use tax data was $367,084 in 2007 and $477,006 in 2008. These years include the local option sales tax instituted by Fairfield County. Using the 2008 amount twice to represent two outage years and the 2007 amount once to represent a non-outage year would give a rolling three year average of approximately $440,000 per year.

Associated COLA Revisions:

None

Associated Attachments:

None