November 16, 2010

MEMORANDUM TO: Mark Tonacci, Chief
BWR Projects Branch
Division of New Reactor Licensing
Office of New Reactors

FROM: Janelle B. Jessie, Project Manager ***/RA/***
BWR Projects Branch
Division of New Reactor Licensing
Office of New Reactors

SUBJECT: NOVEMBER 30 THRU DECEMBER 3, 2010, AUDIT OF EXELON NUCLEAR TEXAS HOLDINGS, LLC EARLY SITE PERMIT APPLICATION HYDROLOGY ANALYSES

By letter dated March 25, 2010, Exelon Nuclear Texas Holdings, LLC (Exelon) submitted the Victoria County Station Early Site Permit Application (VCS ESP) to the U. S. Nuclear Regulatory Commission (NRC). The Staff has begun reviewing the application and has identified a need to audit the methodology, analysis, calculations and modeling results in support of Section 2.4 (Hydrology) of the VCS ESP application. The audit will take place at the Bechtel Office in Frederick, Maryland from November 30, 2010, to December 3, 2010. A copy of the audit plan is enclosed.

Docket Nos.: 52-042

Enclosure:
As stated

CONTACT: Janelle B. Jessie, NRO/DNRL
301-415-6775

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DATE	11/10/10	11/09/10	11/10/10	11/15/10	11/15/10

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VICTORIA COUNTY STATION EARLY SITE PERMIT APPLICATION
HYDROLOGY AUDIT PLAN

A. Background

Exelon submitted ground and surface water modeling documentation to the NRC as a part of their VCS ESP. The Staff reviewed the documentation within Section 2.4 of the Site Safety Analysis Report and identified information needs that would promote a better understanding of the detailed analyses and bases underlying the formal application.

The purpose of this audit is for the Staff to review the ground and surface water models, supporting modeling documentations, and calculation packages. This audit will allow the Staff to better understand the modeling results in order to make accurate safety conclusions concerning site characteristics and assess the radiological consequences of accidental releases to ground and surface water. It will also assist the Staff in identifying any additional information that the Staff may need during its review of Exelon's VCS ESP application.

B. Regulatory Audit Bases

This regulatory audit is based on the following:

- NUREG 0800, "Standard Review Plan", Section 2.4
- RS002, "Guidance for Processing Applications for Early Site Permits"
- RG 1.206, "Combined License Applications for Nuclear Power Plants"

C. Regulatory Audit Scope or Methodology

- The area of focus for the audit is the Victoria County Station ESP application and supporting documentation.

D. Information and Other Material Necessary for the Regulatory Audit

- Early Site Permit (ESP) Application, Rev. 0, Section 2.4
- Information Needs (*See* Enclosure 1)

E. Audit Team

The following are the audit team members:

Jill Caverly, NRC Audit Team Lead
Janelle Jessie, NRO Licensing Project Manager
Jerry Hale, NRO Licensing Project Manager
Joseph Giacinto, NRC Audit Team
Henry Jones, NRC Audit Team
Jason Chaytor, USGS
Tom Wood, INL
Margaret Sharkey, NRC Audit Team
Pat Lynette, USGS
Wade Ross, COE
Ian Cozens, NRC Audit Team

F. Logistics

Date: November 30, 2010 – December 3, 2010
Time: 8:30 a.m. – 4:30 p.m. (November 30-December 2)
8:30 a.m. – 12:00 p.m. (December 3)

Location: **Bechtel Park**
Office Information
5275 Westview Drive
Frederick, MD 21703-8306
(301) 228-6000

G. Deliverables

The audit team will issue a regulatory audit summary within 90 days after completing the audit.

Victoria County Station - Hydrology (Chapter 2.4) Review
Site Audit Information Needs

Serial No.	FSAR Section	Information Needs
1	**Electronic Datasets**	Provide the following electronic data: • Electronic copy of topography map of the site. • Electronic copy of the topography map of the Guadalupe River watershed. • Digital elevation of the site and surrounding area including watershed • Stream network of the Guadalupe River watershed • Land use/land cover of the Guadalupe River watershed • Soil type of the Guadalupe River watershed • HEC-RAS input/output used in Victoria County simulations. • Meteorological data from the VCS station, Victoria Regional Airport, Corpus Christi and Galveston stations. • Electronic copy of the Guadalupe-San Antonio River Basin Water Authority Model (GSA-WAM). • Electronic copy of the 100-year Low Flow Frequency Analysis for the Guadalupe and San Antonio River. • Electronic copy of the USGS stream flow for the Tivoli, Victoria, and Goliad gaging stations. • Calculation packages
2	**References**	Provide a Subject Matter Expert (SME) to discuss the following references used in Chapter 2.4. • HDR Flood Study of the Rio Bravo Guadalupe Channel Diversion and Saltwater Barrier Project. • White, W. A., and Calnan,T. R., Sedimentation in Fluvial-Deltaic Wetlands and Estuarine Areas, Texas Gulf Coast, Literature Synthesis, (prepared for the Texas Parks and Wildlife Development, Resources Protection Division), Bureau of Economic Geology, The University of Texas at Austin, 1990.
3	**2.4.1**	Provide a SME to discuss existing and with-project floodplain characteristics
4	**2.4.2**	Provide a SME to discuss the assumptions and approaches used in calculating local runoff and flood, including topics such as on-site water surface elevations during the local intense precipitation
5	**2.4.3**	Please provide a SME to discuss the following references: 2.4.3-1 U.S. Army Corps of Engineers, *Dam Assurance Study on*

Serial No.	FSAR Section	Information Needs
		Canyon Lake, *Guadalupe Basin, Fort Worth District*, with input and output data files for Watershed Run-off Computer Model (WRCM), June 2005. 2.4.3-7 U.S. Army Corps of Engineers, *Canyon Dam Flood Emergency Plan*, Fort Worth District, February 1998. 2.4.3-8 Federal Emergency Management Agency, *Flood Insurance Study, Victoria* *County, Texas*, Unincorporated Area, November 20, 1998. 2.4.3-5 Albert H. Halff Associates, Inc., *Dam Break Analysis for Coleto Creek Dam, for* *Guadalupe-Blanco River Authority*, March 1989.
6	**2.4.3**	Provide a SME to discuss HEC-HMS PMF modeling efforts and PMF attributes in the San Antonio River, Guadalupe River, and Coleto Ck. Watersheds as related to the VCS site. Provide a SME to discuss HEC-RAS PMF modeling for the Guadalupe River as related to the VCS site.
7	**2.4.3**	Please provide the VCS HEC-HMS calibration and PMF models, and the HEC-HMR model. Please provide the VCS HEC-RAS model. Please provide the Digital Terrain Map for the Guadalupe River
8	**2.4.3**	Please provide annual peak discharge data for USGS gage no. 0818850, San Antonio R. at Goliad, TX and attendant discharge-frequency computations.
9	**2.4.4**	Please provide a SME to discuss the following references: 2.4.4-17 URS Corporation, *Bi-Annual Dam Inspection of Coleto Creek Dam*, submitted to Guadalupe-Blanco River Authority, August 21, 2003.
10	**2.4.4**	Please provide a SME to discuss HEC-RAS dam breach modeling.
11	**2.4.4**	Please provide HEC-RAS dam failure models for Canyon Cam and Coleto Ck. Dam.
12	**2.4.4**	Please provide SME to discuss the cooling basin dam breach modeling.

Serial No.	FSAR Section	Information Needs
13	**2.4.4**	Please provide a SME to discuss the potential use of small scale figures that show in detail the cooling basin dam breach model bathymetry (a) over the entire modeling domain and (b) in the vicinity of the power block and west and east breach locations.
14	**2.4.4**	Please provide a SME to discuss the stage and discharge hydrographs at the west cooling basin breach, at the east cooling basin breach, and representative power block locations for the entire duration of each of the following breach width scenarios: 210 meters, 360 meters, and 620 meters.
15	**2.4.4**	Provide a SME to discuss the method, data availability, and assumptions used to derive the 100-year lake level of Linn Lake.
16	**2.4.6.1** (2nd Paragraph)	Caribbean Landslides • Provide a SME to discuss why far-field landslides in the Caribbean region were intentionally excluded as potential tsunamigenic sources for the PMT.
17	**2.4.6.1** (2nd Paragraph)	Tsunami Dissipation through the Florida Strait • Provide a SME to explain the basis for the statement that the shallow shelf of the Florida Strait would dissipate tsunamis originating from the U.S. Atlantic Margin and Puerto Rico Trench.
18	**2.4.6.1** (3rd Paragraph)	Gulf of Mexico Landslides • Provide a SME to discuss why Gulf of Mexico landslides other than the East Breaks slump were intentionally excluded as potential tsunamigenic sources for the PMT, particularly those landslides along the Mississippi Canyon, west Florida Slope/Escarpment, and Campeche Escarpment.
19	**2.4.6.1** (7th Paragraph)	Gulf of Mexico Earthquakes • Provide a SME to supply a more detailed evaluation of potential earthquakes in the Gulf of Mexico in terms of tsunami source parameters. Also provide a SME to discuss the characterization of Gulf of Mexico seismic sources in FSAR Section 2.4.6.1 differs from that of FSAR Section 2.5.2, specifically FSAR Section 2.5.2.4.3.1 and a M_{max}=7.2 contained in FSAR Table 2.5.2-19.
20	**2.4.6.1** (9th Paragraph)	Middle-Central America Volcanoes • Provide a SME to discuss whether Middle and Central America volcanoes near the coast were intentionally excluded as potential tsunamigenic sources for the PMT and if so, why.

Serial No.	FSAR Section	Information Needs
21	**2.4.6.2** (Historical Tsunami Record): Paleotsunami deposits	<u>Paleotsunami deposits</u> • Early RAI submitted. **** ADD DETAILS*****
22	**2.4.6.3** (Tsunami Source Generator Characteristics)	<u>Cessation of Mississippi Canyon Landslide Activity (FSAR 2.4.6.3 2nd Paragraph)</u> • Provide a SME to discuss evidence supporting the conclusion that Mississippi Canyon Landslide Activity ceased by mid-Holocene time. If this conclusion is erroneous, provide information regarding the tsunami source dimensions and parameters for a Mississippi Canyon landslide event. <u>East Breaks Slump Source Parameters (FSAR 2.4.6.3 3rd Paragraph)</u> • Provide a SME to verify that other source parameters for the East Breaks slump are contained in FSAR Reference 2.4.6-1 and supply any independent estimates of the source parameters that the applicant has determined.
23	**2.4.6.3** (Tsunami Source Generator Characteristics)	<u>East Breaks Slump Source Parameters (FSAR 2.4.6.3 3rd Paragraph)</u> • Provide a SME to verify that other source parameters for the East Breaks slump are contained in FSAR Reference 2.4.6-1 and supply any independent estimates of the source parameters that the applicant has determined.
24	**2.4.6.4** (Tsunami Analysis) and **2.4.6.5** (Tsunami Water Levels)	<u>Applicability of Currituck Landslide Tsunami/Qualitative Analysis</u> • Provide a SME to justify the use of the Currituck landslide scenario with reference to use a conservative slide velocity for PMT determination and specific propagation characteristics for the Gulf of Mexico. In addition, provide justification for a qualitative tsunami analysis that is not specific to the local geology and tsunami source characteristics, regional bathymetry, and onshore topography/morphology for the Victoria county site.
25	**2.4.6.4** (Tsunami Analysis) and 2.4.6.5 (Tsunami Water Levels)	<u>Elevation Data Near Site</u> • Provide a SME to discuss the availability of high-resolution topography and bathymetry (e.g., lidar) near the proposed site for tsunami wave modeling.
26	**2.4.6.4** (Tsunami Analysis) and	Saltwater Barrier Response Time • Provide a SME to discuss inflation time of the saltwater barrier dam relative to the water-level draw down time

Serial No.	FSAR Section	Information Needs
	2.4.6.5 (Tsunami Water Levels)	associated with the PMT.
27	**2.4.7**	Provide a SME to discuss an assessment of ice effects and snow melts on floods along Guadalupe River.
28	**2.4.8**	Provide a SME to discuss the cooling basin water budget analysis, including determination of the cooling basin evaporation rates, supporting meteorological data, and drought conditions.
29	**2.4.8**	Please provide a SME to discuss the cooling basin level pool routing inflow, outflow, and elevation time series results for the PMP event routing.
30	**2.4.8**	Please provide a SME to discuss the drawings of the cooling basin intake channels and the cooling basin discharge structure and discharge structure outlet channel.
31	**2.4.8**	Please provide a SME to discuss the run-up calculations.
32	**2.4.8**	Provide a SME to discuss the assumptions, and calculations for sizing of the Cooling Water Reservoir, RWMU requirements, normal maximum operating level, fetch, embankment design, and freeboard.
33	**2.4.8**	Provide a SME to discuss assumptions, and calculations for determination of the Raw Water Makeup System capacity and required diversion from the Guadalupe River.
34	**2.4.9**	Provide a SME to discuss site geomorphology and the possibility of channel diversion or avulsions on Guadalupe River.
35	**2.4.11**	Provide a SME to discuss minimum safe shut down.
36	**2.4.11**	Provide a SME to discuss assumptions, input, and output of the low flow frequency analysis and supply adequacy during a 100-year drought.
37	**2.4.11**	Provide a SME to discuss the debris conditions near the entrance of the intake canal and water flow into the canal.
38	**2.4.11**	Provide a SME to discuss assumptions associated with water rights and available water supply on the Guadalupe River as necessary for VCS.
39	**2.4.11**	Provide a SME to discuss assumptions for determining that safety related cooling systems for Victoria Station will not rely upon river or stream flow rates or water levels.

Serial No.	FSAR Section	Information Needs
40	**2.4.11**	Please provide calculations in support of the n-day, 100-year low flow determinations.
41	**2.4.12**	Please provide a SME that can detail development of the groundwater flow model, the integration of the previous site model, existing regional (e.g., TWDB GAM) studies and site specific parameters and data, and discuss the model simulations and calibration.
42	**2.4.12.3** (Page 2.4.12-C-2)	Please provide a SME to discuss the assumptions used for conservative modeling of flow such as the assumptions extending to the hydraulic conductivity (Section 2.4.12-C-3.5) and the assumption of a maximum K for clay layers with respect to basin seepage and ground water mounding.
43	**2.4.12** (Page 2.4.12-C-5)	Please provide a SME to discuss the apparent spatial correlation of residuals and specifically the tendency for the model to under estimate higher observed heads and over estimate lower observed heads.
44	**2.4.12** (Page 2.4.12-C-7)	Please provide a SME to discuss vertical conductivities from Reference 2.4.12-C-9 used for groundwater flow modeling.
45	**2.4.12** (Page 2.4.12-C-8)	Please provide a SME to discuss the horizontal and vertical model grid cell sizing and numerical accuracy of the model simulations.
46	**2.4.12** (Page 2.4.12-C-38)	Please provide a SME to discuss how the elevations of the canal, river, creeks and seeps determined as mentioned in Table 2.4.12-C-6 for specification of drains, constant head, and river cells were determined, and the impact of elevation estimates on calibration and postulated pathways.
47	**2.4.12** (Page 2.4.12-C-44)	Please provide a figure of the model grid with rows and columns clearly numbered. Figure 2.4.12-C-3 is identified as a cross section through “Model Row 92” with no cross section location information. Also, provide elevation contour maps of the layer surfaces used in the model that delineate data point locations used to derive the surfaces.
48	**2.4.12** (Page 2.4.12-C-70) **2.4.12** (Figure 2.4.12-C28)	Please provide a SME to discuss areas where the predicted water levels are above land surface for pre- and post- construction the impacts on calibration and simulations.
49	**2.4.12** (Page 2.4.1-1)	Please provide a SME for discussion of well abandonment and the potential of oil and gas wells that are not properly abandoned may provide a pathway for ground water contamination after filling the

Serial No.	FSAR Section	Information Needs
		basin. Please provide a SME for to discuss efforts to be undertaken to ensure proper well abandonment of all known and unknown wells encountered during basin construction.
50	**2.4.12** (Page 2.4.12-2)	Please provide a SME to discuss the hydraulic properties of the construction fill.
51	**2.4.12** (Page 2.4.12-4)	Please provide a SME to discuss the confining role or lack thereof for the Burkeville unit and the details required to identify the Burkeville confining unit in the bullets listed on this page regarding the major hydrogeologic units. Also, please provide a SME to discuss the basis of Figure 2.4.12-7 and details of where it appears that the Burkeville confining unit is regionally extensive and may have implications for vertical groundwater movement.
52	**2.4.12** (Page 2.4.12-8 2.4.12-23)	Please provide a SME to discuss, compare and contrast the differences in well drilling techniques and well testing including slug tests, pumping tests and borehole permeable tests. Also, please provide a SME to discuss the role of well construction on the test results, the many orders of magnitude difference in aquifer properties as listed on page 2.4-12-28, the measurement approaches and best values for the site conceptual model, and the impact on the results due to the well construction and aquifer testing procedures.
53	**2.4.12** (Page 2.4.12-9)	Please provide a SME to discuss how various site specific hydro-lithologic units are defined, particularly the distinction between the upper shallow and lower shallow aquifer units, and the importance/influence of holes in confining units beneath the footprint of the site and cooling basin.
54	**2.4.12** (Page 2.4.12-10)	Please provide two site specific, orthogonal cross-sections across the site with the hydro-lithologic units labeled per the table on this page. Also, as applicable, indicate the vertical direction of ground water flow and the potentiometric surface for the hydrologic layers.
55	**2.4.12** (Page 2.4.12-12)	Please provide a SME to discuss the ground water/surface water interactions in the drainage ditches around the outside of the embankment as described in paragraph 4.
56	**2.4.12** (Page 2.4.12-21)	Please provide a SME to discuss the connection between river hydrographs, the level in Linn Lake and the water levels measured in wells on the eastern side of the site (OW2348 U/L) and the hydraulic communication postulated on page 2.4.12-22 second paragraph. Also discuss the causal mechanisms for pervasive downward trend in well hydrographs (Figure 2.4.12-17) and if the model is in agreement with the observed vertical gradients.
57	**2.4.12** (Page 2.4.12-34)	Model set up includes the use of a 2-foot thick sediment sand layer across basin (does the layer extend beneath the perimeter dike?)

Serial No.	FSAR Section	Information Needs
58	**2.4.12** (Page 2.4.12-35)	Please provide a SME to discuss cooling basin seepage particularly the need to "add additional structures (such as drainage ditches, sand drains, and relief wells) if lowering of the groundwater table is required at areas adjacent to the cooling basin". Also, please provide a SME to discuss the impact of cooling basin relief wells and sand drains on groundwater flow direction, and the adequacy of simulations without berm wells and drains.
59	**2.4.12** (Page 2.4.12-35)	Please provide two orthogonal cross sections (replace or add to Figure 2.4.12-26) of the model grid that approximate the two hydro-stratigraphic cross-sections requested previously for Section 2.4.12, page 2.4.12-9). Please provide simulated post-construction potentiometric surfaces maps at a scale similar to the water table maps presented in Figure 2.4.12-15.
60	**2.4.12** (Page 2.4.12-34/35)	Please provide a SME to discuss the hydraulic conductivity zones used for model layer 1, cooling basin leakage, the bottom of the cooling basin with respect to hydrogeologic strata, and the basin sensitivity simulations. Also provide figure(s) illustrating the conductivity zones used for each model layer utilizing spatially variable values of conductivity for pre- and/or post- construction simulations.
61	**2.4.12**	Please provide a SME to discuss the monitoring equipment, data analysis procedures and documentation of data quality objectives for all stations monitoring groundwater.
62	**2.4.12**	Please provide a SME to discuss the proposed potable water supply wells to be drilled in the Evangeline aquifer and the potential impact of pumping from this well on vertical gradients and groundwater pathways.
63	**2.4.13** (Page 2.4.13 -3 thru -5)	Section 2.4.13 is missing a subsection (2.4.13.3.3) and/or is mis-numbered. Please correct.
64	**2.4.13** (Page 02.4.13-7)	Please provide a SME to discuss the development of the groundwater transport model, parameters and conservatism.
65	**2.4.13**	Please provide the following calculation packages: • Digital copies of groundwater flow model input and output files in native formats with explanations of data and formats. • Digital copies of files used for radionuclide transport analysis in native formats with explanations of data and formats. • Digital copies of input and output files used for the aquifer test analysis in native formats with explanations of data and formats. • Digital copies of laboratory distribution coefficient analysis

Serial No.	FSAR Section	Information Needs
		results and a map showing site locations of samples submitted for analysis. • Provide access to a (preferably electronic) copy of Reference 2.4.13-1.
66	**2.4.14**	• Provide a SME to discuss the details concerning technical specifications and emergency operation requirements for NUREG Section 2.4.14.

cc:

Ms. Michele Boyd
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