Chapter 2 Site Characteristics

2.0 Introduction

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

SSAR Sections 1.3 and 1.9 are incorporated by reference for historical purposes only.

Replace the last two paragraphs with the following paragraphs.

NAPS COL 2.0-1-A

DCD site parameter values for the ESBWR standard plant are identified in DCD Table 2.0-1 and DCD Tier 1, Table 5.1-1.

ESP site characteristic values are identified in Appendix A of the ESP (Reference 2.0-203). The ESP design parameter values are identified as controlling values of parameters and design basis accident source term plant parameters in Appendix B of the ESP.

Table 2.0-201 provides several evaluations:

- Part 1 of Table 2.0-201 identifies each DCD site parameter value and the corresponding ESP and Unit 3 site characteristic values. In accordance with 10 CFR 52.79(b) and (d); and SRP Section 2.0, Part 1 of Table 2.0-201 evaluates, as applicable, whether:
  - ESP site characteristic values fall within DCD site parameter values
  - Unit 3 site characteristic values fall within DCD site parameter values
  - Unit 3 site characteristic values fall within ESP site characteristic values

NAPS SUP 2.0-1

- Part 2 of Table 2.0-201 identifies those ESP site characteristics and design parameters for which there is no corresponding DCD site parameter value. In accordance with 10 CFR 52.79(b) and SRP Section 2.0, Part 2 of Table 2.0-201 evaluates whether the Unit 3 site characteristic or facility design value falls within the ESP site characteristic or ESP design parameter value.

NAPS SUP 2.0-2

- Part 3 of Table 2.0-201 identifies those site characteristics and design parameters listed in SSAR Table 1.9-1 for which there is not already a comparison to a corresponding DCD or ESP value in the first two parts of Table 2.0-201. In accordance with the commitment in

SSAR Section 1.3, Part 3 of Table 2.0-201 evaluates whether the Unit 3 site characteristic or facility design value falls within the SSAR Table 1.9-1 site characteristic or design parameter value. (Some site characteristic and design parameter values listed in SSAR Table 1.9-1 are included in the evaluation in Parts 1 and 2 of Table 2.0-201.)

Appendix 2A provides site-specific input values used in ARCON96 analyses of on-site χ/Q values. Appendix 2B identifies the information on gaseous effluent release pathways for the ventilation stacks used in calculating the site-specific long term χ/Q values.

NAPS COL 2.0-2-A through 2.0-30-A

Information on Unit 3 site characteristics is provided in Sections 2.1 through 2.5, which incorporate by reference the corresponding SSAR sections with appropriate supplements or variances. This information addresses NRC guidance in NUREG-0800 as identified in Table 2.0-2R. The "FSAR Section" column identifies the FSAR section which addresses the SRP section invoked by the COL Item.

2.0.1 COL Information

2.0-1-A Site Characteristics Demonstration

NAPS COL 2.0-1-A

This COL item is addressed in Section 2.0.

2.0-2-A through 2.0-30-A Standard Review Plan Conformance

NAPS COL 2.0-2-A through 2.0-30-A

These COL items are addressed in Section 2.0.

2.0.2 References

2.0-201 [Deleted]

2.0-202 NUREG-1835, Safety Evaluation Report for an Early Site Permit (ESP) at the North Anna ESP Site, U.S. Nuclear Regulatory Commission, September 2005.

2.0-203 Early Site Permit (ESP) for the North Anna ESP Site, No. ESP-003, Amendment No. 3, U.S. Nuclear Regulatory Commission, January 2013.

2.0-204 DC/COL-ISG-013, Assessing the Radiological Consequences of Accidental Releases of Radioactive Materials from Liquid Waste Tanks for Combined License Applications, U.S. Nuclear Regulatory Commission, January 2013.

BASIS: ESBWR COLA

NAPS COL 2.0-2-A through 2.0-30-A

Table 2.0-2R Limits Imposed on Acceptance Criteria in Section II of SRP by ESBWR Design

	Subsection	Subject	ESBWR DCD Parameters, Considerations and/or Limits	COL Information	FSAR Section
NAPS COL 2.0-2-A	2.1.1	Site Location and Description	None	COL Applicant to supply site-specific information in accordance with SRP 2.1.1 (COL 2.0-2-A).	COL Item 2.0-2-A is addressed in Section 2.1.1.
NAPS COL 2.0-3-A	2.1.2	Exclusion Area Authority and Control	None	COL Applicant to supply site-specific information in accordance with SRP 2.1.2 (COL 2.0-3-A).	COL Item 2.0-3-A is addressed in Section 2.1.2.
NAPS COL 2.0-4-A	2.1.3	Population Distribution	ESBWR Probabilistic Risk Assessment offsite consequence analysis in DCD Reference 2.0-1 considers a population density of 305 people per square kilometer (790 per square mile), but that is not a limitation for plant siting considerations.	COL Applicant to describe the population distribution in accordance with SRP 2.1.3. (COL 2.0-4-A).	COL Item 2.0-4-A is addressed in Section 2.1.3. The population density for offsite analysis provided in Section 2.1.3 falls within (is less than) the density used in DCD Reference 2.0-1.
NAPS COL 2.0-5-A	2.2.1–2.2.2	Identification of Potential Hazards in Site Vicinity	Per DCD Table 2.0-1	COL Applicant to identify and evaluate potential hazards in the site vicinity, in accordance with SRP 2.2.1 – 2.2.2. Potential hazards include manufacturing plants, chemical plants, refineries, storage facilities, mining and quarrying operations, military bases, missile sites, transportation routes (air, land and water), transportation facilities (docks, anchorages, airports), oil and gas pipelines, drilling operations and wells, and underground gas storage facilities. See also Subsection 9.4.1.6 (COL 2.0-5-A).	COL Item 2.0-5-A is addressed in Section 2.2.
NAPS COL 2.0-6-A	2.2.3	Evaluation of Potential Accidents	None considered in vicinity of plant	COL Applicant to identify and evaluate potential accidents emanating from those potential hazards identified in SRP 2.2.1 -2.2.2 above, that have a probability of occurrence > 10^{-7} per year which involve: (1) missiles more energetic than the tornado missile spectrum, or (2) pressure effects in excess of the design basis tornado, or (3) explosions, or (4) fires, or (5) aircraft impacts, or (6) release of flammable vapor clouds, or (7) release of toxic chemicals (COL 2.0-6-A).	COL Item 2.0-6-A is addressed in Section 2.2.3.
NAPS COL 2.0-7-A	2.3.1	Regional Climatology	Per DCD Table 2.0-1	COL Applicant to supply site-specific information in accordance with SRP 2.3.1 (COL 2.0-7-A).	COL Item 2.0-7-A is addressed in Section 2.3.1.
NAPS COL 2.0-8-A	2.3.2	Local Meteorology	None	COL Applicant to supply site-specific information in accordance with SRP 2.3.2 (COL 2.0-8-A).	COL Item 2.0-8-A is addressed in Section 2.3.2.
NAPS COL 2.0-9-A	2.3.3	Onsite Meteorological Measurements Programs	None	COL Applicant to supply site-specific information in accordance with the SRP 2.3.3 (COL 2.0-9-A).	COL Item 2.0-9-A is addressed in Section 2.3.3.
NAPS COL 2.0-10-A	2.3.4	Short-Term Dispersion Estimates for Accidental Atmospheric Releases	Per DCD Table 2.0-1. See also DCD Chapter 15.	COL Applicant to supply site-specific information in accordance with the SRP 2.3.4 to show that the site meteorological dispersion values as calculated in accordance with Regulatory Guides 1.145 and 1.194, and compared to dispersion values given in Chapter 15, result in doses less than stipulated in 10 CFR 52.79(a)(1)(vi) and the applicable portions of SRP Sections 11 and 15 (COL 2.0-10-A).	The portion of COL Item 2.0-10-A to supply information in accordance with SRP 2.3.4 is addressed in Section 2.3.4. Information provided in Table 2.0-201 shows that the site characteristic short-term meteorological dispersion values, as calculated in accordance with RGs 1.145 and 1.194, fall within the site parameter values. This means that atmospheric dispersion values given in DCD Chapter 15 remain bounding for this FSAR and result in doses less than stipulated in 10 CFR 52.79(a)(1)(vi) and the applicable portions of SRP Sections 11 and 15.

BASIS: ESBWR COLA

NAPS COL 2.0-2-A through 2.0-30-A

Table 2.0-2R Limits Imposed on Acceptance Criteria in Section II of SRP by ESBWR Design

	Subsection	Subject	ESBWR DCD Parameters, Considerations and/or Limits	COL Information	FSAR Section
NAPS COL 2.0-11-A	2.3.5	Long-Term Diffusion Estimates	Per DCD Table 2.0-1. See DCD Subsection 12.2.2.1 for a discussion of the generation of these values.	COL Applicant to supply site-specific information in accordance with the SRP 2.3.5 (COL 2.0-11-A).	COL Item 2.0-11-A is addressed in Section 2.3.5.
NAPS COL 2.0-12-A	2.4.1	Hydraulic Description Maximum Ground Water Level	Per DCD Table 2.0-1	COL Applicant to supply site-specific information in accordance with SRP 2.4.1 (COL 2.0-12-A)	COL Item 2.0-12-A is addressed in Section 2.4.1. Maximum groundwater level is addressed in Section 2.4.12.
NAPS COL 2.0-13-A	2.4.2	Floods	Per DCD Table 2.0-1	COL Applicant to supply site-specific information in accordance with SRP 2.4.2 (COL 2.0-13-A).	COL Item 2.0-13-A is addressed in Section 2.4.2.
NAPS COL 2.0-14-A	2.4.3	Probable Maximum Flood on Streams and Rivers	Probable maximum flooding level on streams and rivers does not exceed the maximum flood level defined in DCD Table 2.0-1.	COL Applicant to supply site-specific information in accordance with SRP 2.4.3 (COL 2.0-14-A).	COL Item 2.0-14-A is addressed in Section 2.4.3.
NAPS COL 2.0-15-A	2.4.4	Potential Dam Failures	Potential dam failures do not cause flooding to exceed the maximum flood level defined in DCD Table 2.0-1.	COL Applicant to supply site-specific information in accordance with SRP 2.4.4. COL Applicant to demonstrate that failure of existing and potential upstream or downstream water control structures will not cause flooding to exceed 0.3 m (1 ft) below plant grade (COL 2.0-15-A).	COL Item 2.0-15-A is addressed in Section 2.4.4.
NAPS COL 2.0-16-A	2.4.5	Probable Maximum Surge and Seiche Flooding	Probable maximum surge and seiche flooding level does not exceed the maximum flood level defined in DCD Table 2.0-1.	COL Applicant to supply site-specific information in accordance with SRP 2.4.5 (COL 2.0-16-A).	COL Item 2.0-16-A is addressed in Section 2.4.5.
NAPS COL 2.0-17-A	2.4.6	Probable Maximum Tsunami Flooding	Probable maximum tsunami flooding level does not exceed the maximum flood level defined in DCD Table 2.0-1.	COL Applicant to supply site-specific information in accordance with SRP 2.4.6 (COL 2.0-17-A).	COL Item 2.0-17-A is addressed in Section 2.4.6.
NAPS COL 2.0-18-A	2.4.7	Ice Effects	None	COL Applicant to supply site-specific information in accordance with SRP 2.4.7 (COL 2.0-18-A).	COL Item 2.0-18-A is addressed in Section 2.4.7.
NAPS COL 2.0-19-A	2.4.8	Cooling Water Canals and Reservoirs	None	COL Applicant to supply site-specific information in accordance with SRP 2.4.8 (COL 2.0-19-A).	COL Item 2.0-19-A is addressed in Section 2.4.8.
NAPS COL 2.0-20-A	2.4.9	Channel Diversions	None	COL Applicant to supply site-specific information in accordance with SRP 2.4.9 (COL 2.0-20-A).	COL Item 2.0-20-A is addressed in Section 2.4.9.
NAPS COL 2.0-21-A	2.4.10	Flooding Protection Requirements	None	COL Applicant to supply site-specific information in accordance with SRP 2.4.10 (COL 2.0-21-A).	COL Item 2.0-21-A is addressed in Section 2.4.10.
NAPS COL 2.0-22-A	2.4.11	Cooling Water Supply	None	COL Applicant to supply site-specific information in accordance with SRP 2.4.11 (COL 2.0-22-A).	COL Item 2.0-22-A is addressed in Section 2.4.11.
NAPS COL 2.0-23-A	2.4.12	Groundwater	Per DCD Table 2.0-1	COL Applicant to supply site-specific information in accordance with SRP 2.4.12 (COL 2.0-23-A).	COL Item 2.0-23-A is addressed in Section 2.4.12.

NAPS COL 2.0-2-A through 2.0-30-A

Table 2.0-2R Limits Imposed on Acceptance Criteria in Section II of SRP by ESBWR Design

	Subsection	Subject	ESBWR DCD Parameters, Considerations and/or Limits	COL Information	FSAR Section
NAPS COL 2.0-24-A	2.4.13	Accidental Releases of Liquid Effluents in Ground and Surface Waters	The source term provided in DCD Table 12.2-13a, "Liquid Waste Management System Equipment Drain Collection Tank Activity," is used in the effects analysis.	COL Applicant to address SRP 2.4.13 (COL 2.0-24-A).	COL Item 2.0-24-A is addressed in Section 2.4.13. The analysis of postulated failure effects considered the equipment drain collection tank and its source term along with the other Unit 3 tanks containing radioactive liquids. As described in Section 2.4.13, mitigating design features for the equipment drain collection tank were also evaluated consistent with DC/COL-ISG-013 (Reference 2.0-204) guidance for an effects analysis.
NAPS COL 2.0-25-A	2.4.14	Technical Specifications and Emergency Operation Requirements	None	COL Applicant to provide site-specific information in accordance with SRP 2.4.14 (COL 2.0-25-A).	COL Item 2.0-25-A is addressed in Section 2.4.14.
NAPS COL 2.0-26-A	2.5.1	Basic Geologic and Seismic Information	None	COL Applicant to provide site-specific information in accordance with SRP 2.5.1 (COL 2.0-26-A).	COL Item 2.0-26-A is addressed in Section 2.5.1.
NAPS COL 2.0-27-A **NAPS DEP 3.7-1**	2.5.2	Vibratory Ground Motion	Per DCD Table 2.0-1 (and DCD Figures 2.0-1 and 2.0-2)	COL Applicant to provide site-specific information in accordance with SRP 2.5.2 and confirm that the site-specific Foundation Input Response Spectra developed in accordance with Reference 2.0-7 guidance as implemented per Reference 2.0-8 is enveloped by the ESBWR design response spectra referenced at the foundation level (COL 2.0-27-A).	The portion of COL Item 2.0-27-A to provide site-specific information in accordance with SRP 2.5.2 is addressed in Section 2.5.2. Information provided in Table 2.0-201 shows that reactor building/fuel building (RB/FB), control building (CB), and firewater service complex (FWSC) foundation input response spectra (FIRS), developed in accordance with DCD Reference 2.0-7 guidance as implemented per DCD Reference 2.0-8, are not enveloped by the ESBWR certified seismic design response spectra (CSDRS) referenced at foundation level.
NAPS COL 2.0-28-A	2.5.3	Surface Faulting	ESBWR design assumes no permanent ground deformation from tectonic or non-tectonic faulting.	COL Applicant to provide site-specific information in accordance with SRP 2.5.3 (COL 2.0-28-A).	COL Item 2.0-28-A is addressed in Section 2.5.3. Information to address permanent ground deformation from tectonic or non-tectonic faulting is provided in Section 2.5.3.
NAPS COL 2.0-29-A	2.5.4	Stability of Subsurface Materials and Foundations	Per DCD Table 2.0-1	COL Applicant to provide site-specific information in accordance with SRP 2.5.4 and address: (1) localized liquefaction potential under other than Seismic Category I structures, and (2) settlement and differential settlements (COL 2.0-29-A).	The portion of COL Item 2.0-29-A to provide information in accordance with SRP 2.5.4 is addressed in Section 2.5.4. Information to address localized liquefaction potential under other than Seismic Category I structures is provided in Section 2.5.4.8. Information to address settlements and differential settlements is provided in Section 2.5.4.10.2.
NAPS COL 2.0-30-A	2.5.5	Stability of Slopes	Per DCD Table 2.0-1	COL Applicant to provide site-specific information in accordance with SRP 2.5.5 (COL 2.0-30-A).	COL Item 2.0-30-A is addressed in Section 2.5.5.

Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[***Maximum Ground Water Level***	*0.61 m (2 ft) below plant grade*]*		The DCD site parameter of maximum groundwater level of 0.61 m (2 ft) below plant grade is the same as the design groundwater level in DCD Table 3.4-1. The design plant grade elevation identified in DCD Table 3.4-1 is at 4650 mm, which corresponds to 88.4 m (290 ft NAVD88 (290.86 ft NGVD29)) for the Unit 3 site as shown in Figure 2.1-201. Therefore, the DCD site parameter value of 0.61 m (2 ft) below plant grade corresponds to a maximum groundwater level no higher than 87.8 m (288 ft NAVD88 (288.86 ft NGVD29)) for the Unit 3 site.
			ESP 82.3 m (270 ft) msl (which corresponds to 269.14 ft NAVD88 (270 ft NGVD29)) or 0.3 m (1 ft) below the free surface, whichever is higher	The ESP site characteristic value for maximum groundwater level is defined in ESP, Appendix A, as the maximum elevation of groundwater at the ESP site. The ESP value of 82.3 m (269.14 ft NAVD88 (270 ft NGVD29)) is based on the proposed finished plant grade in the SSAR of 82.6 m (270.14 ft NAVD88 (271 ft NGVD29)). The finished plant grade in the SSAR is the same as the finished ground level grade in DCD Table 3.4-1. With finished ground level grade for Unit 3 at 289.5 ft NAVD88 (290.36 ft NGVD29), the operative ESP site characteristic value becomes 0.3 m (1 ft) below the free surface (finished ground level grade) which is higher than 82.3 m (269.14 ft NAVD88 (270 ft NGVD29)). With a free surface at 289.5 ft NAVD88 (290.36 ft NGVD29), the ESP site characteristic corresponds to 288.5 ft NAVD88 (289.36 ft NGVD29) which does not fall within (is higher than) the value established by the DCD site parameter. SSAR Table 1.9-1 provides a value of < 82.3 m (270 ft) msl (which corresponds to 269.14 ft NAVD88 (270 ft NGVD29)) from SSAR Section 2.4.12.4 which is based on the proposed finished plant grade in the SSAR of 82.6 m (271 ft) msl.
			Unit 3 2.3 m (7.4 ft) below design plant grade	The Unit 3 site characteristic value for maximum groundwater level below design plant grade is 2.3 m (7.4 ft) around Seismic Category I structures based on the maximum groundwater elevation of 86.1 m (282.6 ft NAVD88 (283.46 ft NGVD29)) from Section 2.4.12 and the design plant grade elevation of 88.4 m (290 ft NAVD88 (290.86 ft NGVD29)). Therefore, the Unit 3 site characteristic value for maximum groundwater level below design plant grade falls within (is lower than) the DCD site parameter value. The maximum groundwater level in the power block area around Seismic Category I structures is 2.3 m (7.4 ft) below design plant grade, which meets the DCD site parameter limit of not higher than 0.61 m (2 ft) below design plant grade. The Unit 3 site characteristic value falls within (is lower than) the ESP site characteristic value.

* Text sections and table that are bracketed and italicized with an asterisk following the brackets are designated as Tier 2*. Prior NRC approval is required to change. See DCD Appendix 1D.

Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [(20)]	DCD Site Parameter Value [(1)(20)]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[*Extreme Wind* [(13)]			
	Seismic Category I, II and Radwaste Building Structures			
	100-year Wind Speed (3-sec gust)	*67.1 m/s (150 mph)*	**ESP and Unit 3** 42.9 m/s (96 mph), 3-second gust	The ESP site characteristic value for basic wind speed is defined as the 3-second gust wind speed at 10 m (33 ft) above the ground that has a 1 percent annual probability of being exceeded (100-year mean recurrence interval). The ESP site characteristic value for basic wind speed falls within (is lower than) the DCD site parameter value. SSAR Table 1.9-1, which refers to SSAR Section 2.3.1.3.1, provides the same value as ESP, Appendix A. The Unit 3 site characteristic value falls within (is the same as) the ESP site characteristic value.
	Exposure Category	*D*		The DCD site parameter of extreme wind exposure category is determined using ASCE 7 (DCD Reference 2.0-2). Exposure category is determined by a number of variables including wind speed, building shape and location, and surface roughness. A DCD site parameter of Exposure Category D results in the most severe design wind pressures.
			ESP No value provided	
			Unit 3 Exposure Category D	The Unit 3 site characteristic is Exposure Category D as this value cannot be exceeded. The Unit 3 site characteristic falls within (is the same as) the DCD site parameter value for extreme wind exposure category, i.e., Exposure Category D.
	Other Seismic Category NS Standard Plant Structures			
	50-year Wind Speed (3-sec gust)	*58.1 m/s (130 mph)*]*	**ESP** No value provided	
			Unit 3 42.9 m/s (96 mph) wind speed, 3-second gust, with a 100-year recurrence interval	The Unit 3 site characteristic value is the same as the ESP and Unit 3 site characteristic value for a 100-year wind speed (3-sec gust) identified above. This ESP and Unit 3 value is 42.9 m/s (96 mph). This value falls within (is less than) the DCD site parameter value for the 50-year wind speed (3-sec gust) of 58.1 m/s (130 mph). Because the 50-year wind speed (3-sec gust) value at Unit 3 can not be higher than the 100-year wind speed (3-sec gust), the Unit 3 site characteristic value for 50-year wind speed (3-sec gust) also falls within (is lower than) the DCD site parameter value for 50-year wind speed (3-sec gust). SSAR Section 2.3.1.3.1 provides the same value for a 100-year wind speed (3-sec gust) as ESP, Appendix A.

* Text sections and table that are bracketed and italicized with an asterisk following the brackets are designated as Tier 2*. Prior NRC approval is required to change. See DCD Appendix 1D.

Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject[20]	DCD Site Parameter Value[1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Maximum Flood (or Tsunami) Level [2]	*0.3 m (1 ft) below plant grade*		The DCD site parameter of maximum flood (or tsunami) water level of 0.3 m (1 ft) below plant grade is the same as the design flood level in DCD Table 3.4-1. The design plant grade elevation identified in DCD Table 3.4-1 is at 4650 mm, which corresponds to 88.4 m (290 ft NAVD88 (290.86 ft NGVD29)) for the Unit 3 site as shown in Figure 2.1-201. Therefore, the DCD site parameter value of 0.3 m (1 ft) below plant grade corresponds to a maximum flood water level below 88.1 m (289 ft NAVD88 (289.86 ft NGVD29)) for the Unit 3 site.
			ESP 82.3 m (270 ft) msl (which corresponds to 269.14 ft NAVD88 (270 ft NGVD29)) based on PMF	The ESP site characteristic value for maximum flood water level is defined as the maximum flood level at the ESP site due to a probable maximum flood (PMF) in Lake Anna's watershed, simultaneous failure of upstream storage reservoirs, and coincident wind-wave action. This value is 82.3 m (270 ft) msl (which corresponds to 269.14 ft NAVD88 (270 ft NGVD29)) at the Unit 3 site based on the PMF and remains the same value after the increase in design plant grade for Unit 3 to 88.4 m (290 ft NAVD88 (290.86 ft NGVD29)). The ESP site characteristic value falls within (is lower than) the DCD site parameter value.
			Unit 3 0.49 m (1.6 ft) below design plant grade based on PMP	The Unit 3 site characteristic value for maximum flood water level below design plant grade is due to the local probable maximum precipitation (PMP) flood. As described in Section 2.4.2, this value is 0.49 m (1.6 ft) below design plant grade in the power block area based on the local PMP flood water elevation of 288.4 ft NAVD88 (289.3 ft NGVD29) in this area. Therefore, the Unit 3 site characteristic value for maximum flood water level below design plant grade falls within (is lower than) the DCD site parameter value. The maximum flood water level in the power block area due to local PMP is 0.49 m (1.6 ft) below design plant grade, which meets the DCD site parameter limit for a maximum flood water level not higher than 0.3 m (1 ft) below design plant grade.
	Tornado			
	Maximum Tornado Wind Speed[3]	*147.5 m/s (330 mph)*	**ESP** 116.2 m/s (260 mph)	The ESP site characteristic value for design basis tornado maximum wind speed is defined as the maximum wind speed resulting from passage of a tornado having a probability of occurrence of 10^{-7} per year. This value is 260 mph. The ESP site characteristic value falls within (is lower than) the DCD site parameter value. SSAR Table 1.9-1, which refers to SSAR Section 2.3.1.3.2, provides the same value as ESP, Appendix A.
NAPS ESP VAR 2.3-1			**Unit 3**[21] 89 m/s (200 mph)	The Unit 3 site characteristic value of 200 mph is from Section 2.3.1.3.2 and falls within (is lower than) the DCD site parameter value. The Unit 3 site characteristic value does not fall within (is lower than) the ESP site characteristic value.
	Maximum Rotational Speed	*116.2 m/s (260 mph)*	**ESP** 93.0 m/s (208 mph)	The ESP site characteristic value for design basis tornado maximum rotational speed is defined as the rotational component of the maximum tornado wind speed. This value is 208 mph. The ESP site characteristic value falls within (is lower than) the DCD site parameter value. SSAR Table 1.9-1, which refers to SSAR Section 2.3.1.3.2, provides the same value as ESP, Appendix A.
NAPS ESP VAR 2.3-1			**Unit 3** 72 m/s (160 mph)	The Unit 3 site characteristic value of 160 mph is from Section 2.3.1.3.2 and falls within (is lower than) the DCD site parameter value. The Unit 3 site characteristic value does not fall within (is lower than) the ESP site characteristic value.
	Translational Speed	*31.3 m/s (70 mph)*	**ESP** 23.2 m/s (52 mph)	The ESP site characteristic value for design basis tornado maximum translational speed is defined as the translational component of the maximum tornado wind speed. This value is 52 mph. The ESP site characteristic value falls within (is lower than) the DCD site parameter value. SSAR Table 1.9-1, which refers to SSAR Section 2.3.1.3.2, provides the same value as ESP, Appendix A.
NAPS ESP VAR 2.3-1			**Unit 3** 18 m/s (40 mph)	The Unit 3 site characteristic value of 40 mph is from Section 2.3.1.3.2 and falls within (is lower than) the DCD site parameter value. The Unit 3 site characteristic value does not fall within (is lower than) the ESP site characteristic value.
	Radius	*45.7 m (150 ft)]**	**ESP and Unit 3** 45.7 m (150 ft)	The ESP site characteristic value for design basis tornado radius of maximum rotational speed is defined as the distance from the center of the tornado at which the maximum rotational wind speed occurs. The ESP site characteristic value falls within (is the same as) the DCD site parameter value. SSAR Table 1.9-1, which refers to SSAR Section 2.3.1.3.2, provides the same value as ESP, Appendix A. The Unit 3 site characteristic value falls within (is the same as) the ESP site characteristic value.

* Text sections and table that are bracketed and italicized with an asterisk following the brackets are designated as Tier 2*. Prior NRC approval is required to change. See DCD Appendix 1D.

Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject[20]	DCD Site Parameter Value[1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[*Tornado (continued)*			
	Pressure Drop	*16.6 kPa (2.4 psi)*	**ESP** 10.3 kPa (1.5 psi)	The ESP site characteristic value for design basis tornado pressure drop is defined as the decrease in ambient pressure from normal atmospheric pressure resulting from passage of the tornado. This value is 1.5 psi. The ESP site characteristic value falls within (is lower than) the DCD site parameter value. SSAR Table 1.9-1, which refers to SSAR Section 2.3.1.3.2, provides the same value as ESP, Appendix A.
NAPS ESP VAR 2.3-1			**Unit 3** 6.3 kPa/s (0.9 psi)	The Unit 3 site characteristic value of 0.9 psi is from Section 2.3.1.3.2 and falls within (is lower than) the DCD site parameter value. The Unit 3 site characteristic value does not fall within (is lower than) the ESP site characteristic value.
	Rate of Pressure Drop	*11.7 kPa/s (1.7 psi/s)*	**ESP** 5.2 kPa/s (0.76 psi/s)	The ESP site characteristic value for design basis tornado maximum rate of pressure drop is defined as the rate of pressure drop resulting from the passage of the tornado. This value is 0.76 psi/s. The ESP site characteristic value falls within (is lower than) the DCD site parameter value. SSAR Table 1.9-1, which refers to SSAR Section 2.3.1.3.2, provides the same value as ESP, Appendix A.
NAPS ESP VAR 2.3-1			**Unit 3** 2.5 kPa/s (0.4 psi/s)	The Unit 3 site characteristic value of 0.4 psi/s is from Section 2.3.1.3.2 and falls within (is lower than) the DCD site parameter value. The Unit 3 site characteristic value does not fall within (is lower than) the ESP site characteristic value.
	Missile Spectrum[3]	*Spectrum I of SRP 3.5.1.4, Rev. 2 applied to full building height.*]*	**ESP** No value provided	The DCD site parameter for tornado missile spectrum is based on SRP 3.5.1.4, Rev. 2, July 1981, with Spectrum I missiles applied to full building height. When the missiles in Spectrum I are applied to full building height and not limited to impacts at altitudes less than 9.1 m (30 ft) above all grade levels within 0.8 km (0.5 mi) of the safety-related structures, the DCD site parameter addresses variations in grade levels at a site.
			Unit 3[22] RG 1.76, Rev. 1, Table 2 for Region II, applied to full building height	The Unit 3 site characteristic for tornado missile spectrum is that provided in Table 2 of RG 1.76, Rev. 1, for Region II, applied to full building height. This spectrum fully addresses variations in grade levels at the Unit 3 site, and because Region II missiles have lower velocities than those for Spectrum I of SRP 3.5.1.4, Rev. 2, the Unit 3 site characteristic value falls within (is less than) the DCD site parameter value for tornado missile spectrum.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject[20]	DCD Site Parameter Value[1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[*Precipitation (for Roof Design)*			
	Maximum Rainfall Rate[4]	*49.3 cm/hr (19.4 in/hr)*	**ESP** 46.5 cm (18.3 in)/hr	The ESP site characteristic value for local intense precipitation is defined as the maximum potential rainfall at the immediate ESP site in inches of rain in an hour. This value is 46.5 cm (18.3 in)/hr. The ESP site characteristic value falls within (is less than) the DCD site parameter value.
			Unit 3 46.5 cm/hr (18.3 in/hr)	The Unit 3 site characteristic value of 46.5 cm/hr (18.3 in/hr) is from SSAR Table 2.4-3 and SSAR Table 1.9-1, and falls within (is the same as) the ESP site characteristic value.
	Maximum Short Term Rate	*15.7 cm (6.2 in) in 5 min*	**ESP** 15.5 cm (6.1 in) in 5 min	The ESP site characteristic value for local intense precipitation is defined as the maximum potential rainfall at the immediate ESP site in inches of rain in five minutes. This value is 15.5 cm (6.1 in) inches in 5 minutes. The ESP site characteristic value falls within (is less than) the DCD site parameter value.
			Unit 3 15.5 cm (6.1 in) in 5 min	The Unit 3 site characteristic value of 15.5 cm (6.1 in) in 5 min is from SSAR Table 2.4-3 and SSAR Table 1.9-1, and falls within (is the same as) the ESP site characteristic value.
	Maximum Ground Snow Load[5] *for normal winter precipitation event*	*2394 Pa (50 lbf/ft^2)*	**ESP and Unit 3** 1460 Pa (30.5 lb/ft^2) (100-yr recurrence)	The ESP site characteristic value for maximum ground snow load is defined as the weight of the 100-yr return period snow pack (to be used in determining extreme winter precipitation loads for roofs). The ESP site characteristic value falls within (is lower than) the DCD site parameter value. SSAR Section 2.3.1.3.4 and SSAR Table 1.9-1 provide the same value as ESP, Appendix A. The Unit 3 site characteristic value for normal winter precipitation is based on the highest ground-level weight, which is due to the 100-yr return period snowpack, with a ground-level weight of 30.5 lb/ft^2. The Unit 3 site characteristic value falls within (is the same as) the ESP site characteristic value.
	Maximum Ground Snow Load[5] *for extreme winter precipitation event*	*7757 Pa (162 lbf/ft^2)]**	**ESP** No value provided	
			Unit 3 6765 Pa (141.3 lbf/ft^2)	The Unit 3 site characteristic value for extreme winter precipitation event in the site region is the sum of the normal ground snow roof load from the 100-year return snowpack (30.5 lb/ft^2) and the weight of the 48-hour probable maximum winter precipitation (PMWP) for the site (110.8 lbf/ft^2) from Section 2.3.1.3.4. The ground snow load for the extreme winter precipitation event is therefore 6765 Pa (141.3 lbf/ft^2) which falls within (is lower than) the DCD site parameter value of 7757 Pa (162 lbf/ft^2).

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1] [20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Ambient Design Temperature [6]			
	2% Annual Exceedance Values			
	Maximum	*35.6ºC (96ºF) dry bulb 26.1ºC (79ºF) wet bulb (mean coincident)*	**ESP and Unit 3** 32.2ºC (90ºF) dry bulb with 23.9ºC (75ºF) wet bulb (mean coincident) (2% annual exceedance values)	The ESP site characteristic values for maximum dry-bulb temperature with mean coincident wet-bulb temperature for 2% annual exceedance are the ambient dry-bulb temperature (and mean coincident wet-bulb temperature) that will be exceeded 2% of the time annually. The ESP site characteristic values fall within (are lower than) the DCD site parameter values. SSAR Table 2.3-18 and SSAR Table 1.9-1 provide the same values as ESP, Appendix A. The Unit 3 site characteristic values fall within (are the same as) the ESP site characteristic values.
		27.2ºC (81ºF) wet bulb (non-coincident)	**ESP** No value provided	
			Unit 3 26.1ºC (79ºF) wet bulb (non-coincident) (0.4% annual exceedance value)	The Unit 3 site characteristic value is the ESP site characteristic value for the maximum wet bulb temperature (non-coincident) for 0.4% annual exceedance. This value is defined as the ambient wet-bulb temperature that will be exceeded 0.4% of the time annually. This value is 26.1ºC (79ºF) wet bulb (non-coincident) and falls within (is less than) the DCD site parameter value for 2% annual exceedance. Because the 2% site characteristic value is even lower than the 0.4% value, the site's 2% value also falls within (is lower than) the DCD site parameter value for 2% annual exceedance. SSAR Table 2.3-18 and SSAR Table 1.9-1 provide the same 0.4% value as ESP, Appendix A.
	Minimum	*–23.3ºC (–10ºF)*	**ESP** No value provided	
			Unit 3 –7.8ºC (18ºF) (99% annual exceedance value)	The Unit 3 site characteristic value is the ESP site characteristic value for the minimum dry bulb temperature for 99% annual exceedance. This value is defined as the ambient dry-bulb temperature below which dry-bulb temperatures will fall 1% of the time annually. This value is –7.8ºC (18ºF) and falls within (is higher than) the DCD site parameter value for 2% annual exceedance (i.e., the ambient dry-bulb temperature below which dry-bulb temperatures will fall 2% of the time annually). Because the minimum temperature site characteristic value for 2% is even higher than the 1% value, the site's 2% value also falls within (is higher than) the DCD site parameter value for 2% annual exceedance. SSAR Table 2.3-18 and SSAR Table 1.9-1 provide the same 1% value as ESP, Appendix A.
	1% Annual Exceedance Values			
	Maximum	*37.8ºC (100ºF) dry bulb 26.1ºC (79ºF) wet bulb (mean coincident)]**	**ESP** No value provided	
			Unit 3 35ºC (95ºF) dry bulb with 25ºC (77ºF) wet bulb (mean coincident) (0.4% annual exceedance value)	The Unit 3 site characteristic values are the ESP site characteristic values for the maximum dry bulb temperature with mean coincident wet bulb temperature for 0.4% annual exceedance. These values are the ambient dry-bulb temperature (and mean coincident wet-bulb temperature) that will be exceeded 0.4 percent of the time annually. These values are 35°C (95°F) dry bulb with 25°C (77°F) wet bulb (mean coincident) and fall within (are less than) the DCD site parameter values for 1% exceedance. Because the 1% site characteristic values are even lower than the 0.4% values, the site's 1% values also fall within (are lower than) the DCD site parameter values for 1% annual exceedance. SSAR Table 2.3-18 and SSAR Table 1.9-1 provide the same 0.4% values as ESP, Appendix A.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Ambient Design Temperature[6] (continued) 1% Annual Exceedance Values (continued)			
	Maximum	*27.8°C (82°F) wet bulb (non-coincident)*	**ESP** No value provided	
			Unit 3 26.1°C (79°F) wet-bulb (non-coincident) (0.4% annual exceedance value)	The Unit 3 site characteristic value is the ESP site characteristic value for the maximum wet bulb temperature (non-coincident) for 0.4% annual exceedance. This value is defined as the ambient wet-bulb temperature that will be exceeded 0.4% of the time annually. This value is 26.1°C (79°F) wet bulb (non-coincident) and falls within (is less than) the DCD site parameter value for 1% annual exceedance. Because the 1% site characteristic value is even lower than the 0.4% value, the site's 1% value also falls within (is lower than) the DCD site parameter value for 1% annual exceedance. SSAR Table 2.3-18 and SSAR Table 1.9-1 provide the same 0.4% value as ESP, Appendix A.
	Minimum	*-23.3°C (-10°F)*	**ESP and Unit 3** –7.8°C (18°F) (99% annual exceedance value)	The ESP site characteristic value for minimum dry-bulb temperature 99% annual exceedance is defined as the ambient dry-bulb temperature below which dry-bulb temperatures will fall 1% of the time annually. The ESP site characteristic value falls within (is higher than) the DCD site parameter value. SSAR Table 2.3-18 and SSAR Table 1.9-1 provide the same value as ESP, Appendix A. The Unit 3 site characteristic value falls within (is the same as) the ESP site characteristic value.
	0% Exceedance Values			
	Maximum	*47.2°C (117°F) dry bulb 26.7°C (80°F) wet bulb (mean coincident)*	**ESP** No value provided	
			Unit 3 42.8°C (109°F) dry-bulb with 24.4°C (76°F) wet bulb coincident (100-year return values)	The Unit 3 site characteristic values for maximum dry bulb with coincident wet bulb temperatures are the maximum dry bulb temperature for a 100-year return period as provided in SSAR Tables 2.3-18 and 1.9-1, and its corresponding wet bulb temperature (using a correlation between dry bulb and wet bulb temperatures). As shown in Section 2.3.1.2, these values are 42.8°C (109°F) dry-bulb with 24.4°C (76°F) wet bulb coincident and fall within (are less than) the DCD site parameter values for 0% exceedance. The Unit 3 site characteristic 0% exceedance values (historic maximum values) for dry bulb with coincident wet bulb temperatures are provided in SSAR Tables 2.3-18 and 1.9-1, and also fall within (are less than) the DCD site parameter values for 0% exceedance.
		31.1°C (88°F) wet bulb (non-coincident)	**ESP** No value provided.	
			Unit 3 31.1°C (88°F) wet-bulb (non-coincident) (100-year return value)	The Unit 3 site characteristic value for maximum wet bulb temperature (non-coincident) is the 100-year return period temperature as provided in SSAR Tables 2.3-18 and 1.9-1. This value is 31.1°C (88°F) wet bulb non-coincident and falls within (is equal to) the DCD site parameter value for 0% exceedance. The Unit 3 site characteristic 0% exceedance value (historic maximum value) for wet bulb temperature (non-coincident) is provided in SSAR Tables 2.3-18 and 1.9-1, and also falls within (is less than) the DCD site parameter value for 0% exceedance.
	Minimum	*–40°C (–40°F)]**	**ESP** No value provided	
			Unit 3 –29.4°C (–21°F) (0% exceedance value)	The Unit 3 site characteristic value for minimum 0% exceedance value temperature is the historic minimum dry bulb temperature as provided in SSAR Table 2.3-5. This value is –29.4°C (–21°F) and falls within (is higher than) the DCD site parameter value for 0% exceedance.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Ambient Design Temperature[6] (continued)			
	Maximum Average Dry Bulb Temperature for 0% Exceedance Maximum Temperature Day[17]			
		39.7°C (103.5°F)	**ESP** No value provided	
			Unit 3 34.2°C (93.6°F)	The Unit 3 site characteristic value, as determined per Note (17), is provided in Section 2.3.1.2. This value is 34.2°C (93.6°F) and falls within (is lower than) the DCD site parameter value.
	Minimum Average Dry Bulb Temperature for 0% Exceedance Minimum Temperature Day[18]			
		-32.5°C (-26.5°F)	**ESP** No value provided	
			Unit 3 -19.4°C (-3°F)	The Unit 3 site characteristic value, as determined per Note (18), is provided in Section 2.3.1.2. This value is -19.4°C (-3°F) and falls within (is higher than) the DCD site parameter value.
	Maximum High Humidity Average Wet Bulb Globe Temperature Index for 0% Exceedance Maximum Wet Bulb Temperature Day[19]			
		*30.3°C (86.6°F)]**	**ESP** No value provided	
			Unit 3 29.3°C (81.4°F)	The Unit 3 site characteristic value, as determined per Note (19), is provided in Section 2.3.1.2. This value is 29.3°C (81.4°F) and falls within (is lower than) the DCD site parameter value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[*Soil Properties*[16]			
	Minimum Static Bearing Capacity*[7]*: Greater than or equal to the maximum static bearing demand			
	Maximum Static Bearing Demand:			
	Reactor/Fuel Building	*699 kPa (14,600 lbf/ft^2)*		The DCD site parameter of minimum static bearing capacity underlying the reactor building/fuel building foundation is determined by the minimum static bearing capacity for any layer of material under this foundation. As shown in Table 2.5.4-211, concrete fill, Zone III-IV, and Zone IV materials are under the reactor building/fuel building foundation for Unit 3. Of these, the Zone III-IV material has the lowest minimum bearing capacity value.
			ESP and Unit 3 3830 kPa (80,000 lbf/ft^2) for Zone III-IV material	The ESP site characteristic value for minimum bearing capacity of Zone III-IV material is defined as the allowable load-bearing capacity of this layer for supporting plant structures. This value is 3830 kPa (80,000 lbf/ft^2) and falls within (is greater than) the DCD site parameter value. SSAR Section 2.5.4 provides the same value as ESP, Appendix A. The Unit 3 site characteristic value falls within (is the same as) the ESP site characteristic value.
	Control Building	*292 kPa (6,100 lbf/ft^2)*		The DCD site parameter of minimum static bearing capacity underlying the control building foundation is determined by the minimum static bearing capacity for any layer of material under this foundation. As shown in Table 2.5.4-211, concrete fill, Zone III-IV, and Zone IV materials are under the control building foundation for Unit 3. Of these, the Zone III-IV material has the lowest minimum bearing capacity value.
			ESP and Unit 3 3830 kPa (80,000 lbf/ft^2) for Zone III-IV material	The ESP site characteristic value for minimum bearing capacity of Zone III-IV material is defined as the allowable load-bearing capacity of this layer for supporting plant structures. This value is 3830 kPa (80,000 lbf/ft^2) and falls within (is greater than) the DCD site parameter value. SSAR Section 2.5.4 provides the same value as ESP, Appendix A. The Unit 3 site characteristic value falls within (is the same as) the ESP site characteristic value.
	Firewater Service Complex	*165 kPa (3.450 lbf/ft^2)*]*		The DCD site parameter of minimum static bearing capacity underlying the FWSC foundation is determined by the minimum static bearing capacity for any layer of material under this foundation. As shown in Table 2.5.4-211, concrete fill, Zone III-IV, and Zone IV materials are under the FWSC foundation for Unit 3. Of these, the Zone III-IV material has the lowest minimum bearing capacity value.
			ESP and Unit 3 3830 kPa (80,000 lbf/ft^2) for Zone III-IV material	The ESP site characteristic value for minimum bearing capacity of Zone III-IV material is defined as the allowable load-bearing capacity of this layer for supporting plant structures. This value is 3830 kPa (80,000 lbf/ft^2) and falls within (is greater than) the DCD site parameter value. SSAR Section 2.5.4 provides the same value as ESP, Appendix A. The Unit 3 site characteristic value falls within (is the same as) the ESP site characteristic value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Soil Properties [16] (continued)			
	Minimum Dynamic Bearing Capacity [7]: Greater than or equal to the maximum dynamic bearing demand			
	Maximum Dynamic Bearing Demand (SSE + Static):			
	Reactor/Fuel Building			
	Soft	*1100 kPa (23,000 lbf/ft²)*	**ESP** No values provided	
	Medium	*2700 kPa (56,400 lbf/ft²)*	**Unit 3** 9528 kPa (199,000 lbf/ft²)	The Unit 3 site characteristic value for minimum dynamic bearing capacity for the RB/FB structure is from Table 2.5.4-211 and falls within (is greater than) the DCD site parameter minimum value for any type of soil: hard, medium, or soft. The materials beneath the RB/FB structure are classified as hard in accordance with Note (7).
	Hard	*1100 kPa (23,000 lbf/ft²)*		
	Control Building			
	Soft	*599 kPa (10,500 lbf/ft²)*	**ESP** No values provided	
	Medium	*2200 kPa (46,000 lbf/ft²)*	**Unit 3** 9528 kPa (199,000 lbf/ft²)	The Unit 3 site characteristic value for minimum dynamic bearing capacity for the CB structure is from Table 2.5.4-211 and falls within (is greater than) the DCD site parameter minimum value for any type of soil: hard, medium, or soft. The materials beneath the CB structure are classified as hard in accordance with Note (7).
	Hard	*420 kPa (8,800 lbf/ft²)*		
	Firewater Service Complex			
	Soft	*460 kPa (9,600 lbf/ft²)*	**ESP** No values provided	
	Medium	*690 kPa (14,400 lbf/ft²)*	**Unit 3** 9528 kPa (199,000 lbf/ft²)	The Unit 3 site characteristic value for minimum dynamic bearing capacity for the FWSC structure is from Table 2.5.4-211 and falls within (is greater than) the DCD site parameter minimum value for any type of soil: hard, medium, or soft. The materials beneath the FWSC structure are classified as medium in accordance with Note (7).
	Hard	*1200 kPa (25,100 lbf/ft²)]**		

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

NAPS COL 2.0-1-A

Subject[20]	DCD Site Parameter Value[1][20]	Site Characteristic	Evaluation
Part 1 – Evaluation of DCD Site Parameters			
[***Soil Properties***[16] ***(continued)***			
Minimum Shear Wave Velocity[8]	*300 m/s (1000 ft/s)*	**ESP** No value provided	
		Unit 3 Value for supporting material for each Seismic Category I structure (RB/FB, CB, and FWSC): Greater than 1,000 ft/sec Value for material surrounding each Seismic Category I structure: • Below top of concrete fill: Greater than 1,000 ft/sec • Above top of concrete fill: Neglected	In accordance with Note (8), the DCD's site parameter requirement for minimum shear wave velocity (SWV) applies to the supporting foundation material and material surrounding the embedded walls for the RB/FB, CB, and FWSC. In accordance with Note (16) and as described in Section 3.7.2.4, Unit 3 site-specific soil structure interaction (SSI) analyses were performed for the RB/FB, CB, and FWSC. For the materials supporting the foundations, concrete fill, Zone III-IV, and Zone IV materials are used to support the RB/FB, CB, and FWSC. These materials have minimum SWV values that fall within (are greater than) the DCD site parameter value. For the material surrounding the embedded walls of the RB/FB and CB, concrete fill is used below the top of Zone III material surrounding the RB/FB and CB embedded walls. This material has a minimum SWV value that falls within (is greater than) the DCD site parameter value. In the Unit 3 site-specific SSI for the RB/FB and CB as described in Section 3.7.2.4, the structural fill above the top of the concrete fill was neglected. Therefore, the DCD site parameter for minimum SWV for material surrounding the embedded RB/FB and CB walls does not apply above the concrete fill. For the material surrounding the embedded walls of the FWSC (i.e., the walls of foundation), structural fill is used. In the Unit 3 site-specific SSI for the FWSC, the structural fill was neglected as described in Section 3.7.2.4; therefore, the DCD site parameter for minimum shear wave velocity for material surrounding the embedded FWSC foundation walls does not apply. As shown in Figures 2.5.4-225 through 2.5.4-228, and in Figures 2.5.4-230 through 2.5.4-233, the RB/FB, CB, and FWSC foundations are founded on competent bedrock or on concrete fill with a shear wave velocity in the same range as the bedrock. There is no overall dip of the bedrock across the site. Therefore, the ratio of the largest to the smallest shear wave velocity over each mat foundation level does not exceed 1.7. See Note (8).
Liquefaction Potential			
Seismic Category I Structures	*None under footprint of Seismic Category I structures resulting from site-specific SSE*	**ESP** No value provided	
		Unit 3 None at site-specific SSE under Seismic Category I structures	The Unit 3 site characteristic value for liquefaction falls within (is the same as) the DCD site parameter. As described in Section 2.5.4.8, there is no potential for liquefaction under Unit 3 Seismic Category I structures at the site-specific SSE ground motion. SSAR Table 1.9-1 states that safety-related structures would be founded on rock with no liquefaction potential, or on soil with a factor of safety against liquefaction equal to or greater than 1.1 at the SSE ground motion.
Other than Seismic Category I Structures	*See Note (14)*	See Evaluation column	Note (14) in DCD Table 2.0-1 identifies a requirement to address liquefaction potential under other than Seismic Category I structures. This requirement is not a site parameter. Section 2.5.4.8 provides the results of the liquefaction analysis for the Unit 3 site and addresses potential liquefaction under other than Seismic Category I structures. Seismic Category II structures have no potential for liquefaction. Structures other than Seismic Category I and II structures are located such that a failure of such a structure does not affect the safety of Seismic Category I structures.
Angle of Internal Friction (in-situ and backfill)	*≥35 degrees*]*	**ESP** No value provided	
		Unit 3 ≥35 degrees	The Unit 3 site characteristic value for angle of internal friction is provided in Section 2.5.4.2.5 and falls within (is the same as) the DCD site parameter value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[*Soil Properties*[16] *(continued)*			
	Backfill on sides of and underneath Seismic Category I structures			
			See Evaluation Column	These three soil properties site parameters apply to the structural fill on the sides of Unit 3 Seismic Category I structures above Zone III rock. Structural fill is not used underneath Unit 3 Seismic Category I structures. In accordance with Note (16), Unit 3 site-specific SSI analyses were performed for the RB/FB, CB, and FWSC. The Unit 3 site-specific sliding analyses for the RB/FB, CB, and FWSC do not require structural fill for sliding stability. Therefore, the $k_0\gamma$ site parameter for structural fill on the sides of Unit 3 Seismic Category I structures is not applicable
	Product of peak ground acceleration α (in g), Poisson's ratio ν and density γ:	*$\alpha(0.95\nu+0.65)\gamma$:* *1220 kg/m^3 (76 lbf/ft^3) maximum*	$\alpha(0.95\nu+0.65)\gamma$ 1089 kg/m^3 (73 lbf/ft^3)	The Unit 3 site characteristic value for this site parameter is based on: a) a peak ground acceleration of 0.56g as described in Section 2.5.4.7.4 for the soils surrounding Seismic Category I structures at the Unit 3 site; b) a maximum Poisson's ratio (low strain) for structural fill of 0.37 from Table 2.5.4-208; and c) a total unit weight for structural fill of 130 lbf/ft^3 from Table 2.5.4-208. The Unit 3 value falls within (is smaller than) the DCD site parameter.
	Product of at-rest pressure coefficient k_0 and density:	*$k_0\gamma$:* *750 kg/m^3 (47 lbf/ft^3) minimum*	Not applicable	The Unit 3 site-specific sliding analyses for the Seismic Category I structures do not require structural fill on the sides for sliding stability and this site parameter is not applicable.
	Soil density:	*γ:* *2000 kg/m^3 (125 lbf/ft^3) minimum*]*	γ: 2082 kg/m^3 (130 lbf/ft^3)	The Unit 3 site characteristic value for this site parameter is based on a total unit weight for structural fill of 130 lbf/ft^3 from Table 2.5.4-208. The Unit 3 value falls within (is greater than) the DCD site parameter.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Seismology			
	SSE Horizontal Ground Response Spectra [9]	*See DCD Figure 2.0-1*		The DCD site parameter values for SSE response spectra at foundation level are identified as the CSDRS. The CSDRS for the CB and RB/FB are shown in DCD Figure 2.0-1 (horizontal) and in DCD Figure 2.0-2 (vertical). The CSDRS for the FWSC are 1.35 times the accelerations shown in DCD Figure 2.0-1 (horizontal) and in DCD Figure 2.0-2 (vertical) per Note (9) in DCD Table 2.0-1.
	SSE Vertical Ground Response Spectra [9]	*See DCD Figure 2.0-2*	**ESP** No values provided	
NAPS DEP 3.7-1			**Unit 3** See Figures 2.5.2-307, 2.5.2-308, 2.5.2-309, 2.5.2-310, and 2.5.2-312	The Unit 3 site characteristic values are identified as the FIRS. The CB FIRS are shown in Figures 2.5.2-308 and 2.5.2-310. The RB/FB FIRS are shown in Figures 2.5.2-307 and 2.5.2-309. The FWSC FIRS are shown in Figure 2.5.2-312. The comparisons of the DCD site parameter (CSDRS for the CB and RB/FB) and Unit 3 site characteristic values (FIRS for the CB and RB/FB) are provided in Figure 2.0-201 for the horizontal spectra and in Figure 2.0-202 for the vertical spectra. These comparisons demonstrate that the Unit 3 site characteristic values do not fall within (are greater than) the values established by the DCD site parameters. The comparisons of the DCD site parameter (CSDRS for the FWSC) and Unit 3 site characteristic values (FIRS for the FWSC) are provided in Figure 2.0-203 for the horizontal spectra and in Figure 2.0-204 for the vertical spectra. These comparisons demonstrate that the Unit 3 site characteristic values do not fall within (are greater than) the values established by the DCD site parameters.
	Hazards in Site Vicinity			
	Site Proximity Missiles and Aircraft	*< about 10^{-7} per year*	**ESP** No value provided	
			Unit 3 No site proximity missile hazards identified	The Unit 3 site characteristic value for site proximity missiles value is that there are no site proximity missile sources identified. As provided in Section 2.2, there are no nearby missile sources identified in the site vicinity and this value falls within (is less than) the DCD site parameter value.
			Unit 3 Annual aircraft crash probability of 1.98×10^{-7} (includes civil and military aircraft)	The Unit 3 site characteristic value for total probability per year of a civil or military aircraft crashing was estimated per NUREG-0800 as shown in Section 2.2.3.2.2 and the total accident probability falls within (is the same as) the DCD site parameter value.
	Volcanic Activity	*None]**	**ESP** No value provided	
			Unit 3 No volcanic activity at the site	The Unit 3 site characteristic value for volcanic activity is that there is no evidence of non-tectonic deformation at the site, such as volcanic intrusion, as presented in SSAR Section 2.5.3.8. The Unit 3 site characteristic value falls within (is the same as) the DCD site parameter value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[*Hazards in Site Vicinity (continued)*			
	Toxic Gases	*None**		
	** Maximum toxic gas concentrations at the Main Control Room (MCR) HVAC intakes*	*<toxicity limits*	**ESP** No value provided **Unit 3** < toxicity limits	The Unit 3 site characteristic value for toxic gases is that the control room concentration for each chemical analyzed does not exceed the applicable toxicity limit. Based on this result, Seismic Category I Class 1E toxic gas monitoring instrumentation is not required for the MCR HVAC air intakes. The Unit 3 site characteristic value for toxic gases (control room concentrations < toxicity limits) is presented in Section 6.4.5 and falls within (is the same as) the DCD site parameter value for toxic gases (control room concentrations < toxicity limits).
	Required Stability of Slopes[10]			Note (10) in DCD Table 2.0-1 identifies that factors of safety for stability of slopes are not site parameters. These factors are used with slope design features to ensure stability for static and dynamic loading.
	Factor of safety for static (non-seismic) loading	*1.5*	See Evaluation column	Section 2.5.5.2 specifies that the minimum acceptable long-term static (non-seismic) factor of safety against slope stability failure is 1.5.
	Factor of safety for dynamic (seismic) loading due to site-specific SSE	*1.1*]*	See Evaluation column	Section 2.5.5.2 specifies that the minimum acceptable long-term dynamic (seismic) factor of safety against slope stability failure is 1.1.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject[20]	DCD Site Parameter Value[1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Maximum Settlement Values for Seismic Category I Buildings[15]			
	Maximum Settlement at any corner of basemat			
	Under Reactor/Fuel Building	*103 mm (4.0 inches)*	**ESP** No value provided	
			Unit 3 1 mm (0.05 in) for the maximum settlement of a RB/FB corner	The Unit 3 site characteristic value for the maximum settlement of a corner for the RB/FB foundation is provided in Table 2.5.4-212 and falls within (is less than) the DCD site parameter value.
	Under Control Building	*18 mm (0.7 inches)*	**ESP** No value provided	
			Unit 3 0.25 mm (0.01 in) for the maximum settlement of a CB corner	The Unit 3 site characteristic value for the maximum settlement of a corner for the CB foundation is provided in Table 2.5.4-212 and falls within (is less than) the DCD site parameter value.
	Under FWSC Structure	*17 mm (0.7 inches)*	**ESP** No value provided	
			Unit 3 0.13 mm (0.005 in) for the maximum settlement of a FWSC corner	The Unit 3 site characteristic value for the maximum settlement of a corner for the FWSC foundation is provided in Table 2.5.4-212 and falls within (is less than) the DCD site parameter value.
	Averaged Settlement at four corners of basemat			
	Under Reactor/Fuel Building	*65 mm (2.6 inches)*	**ESP** No value provided	
			Unit 3 1 mm (0.05 in) for the maximum settlement of a RB/FB corner	The Unit 3 site characteristic value for the averaged settlement at four corners is the maximum settlement of a corner because each corner settles the same amount, i.e., the maximum amount for a corner. The maximum settlement of a corner for the RB/FB foundation is provided in Table 2.5.4-212 and falls within (is less than) the DCD site parameter value.
	Under Control Building	*12 mm (0.5 inches)]**	**ESP** No value provided	
			Unit 3 0.25 mm (0.01 in) for the maximum settlement of a CB corner	The Unit 3 site characteristic value for the averaged settlement at four corners is the maximum settlement of a corner because each corner settles the same amount, i.e., the maximum amount for a corner. The maximum settlement of a corner for the CB foundation is provided in Table 2.5.4-212 and falls within (is less than) the DCD site parameter value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1] [20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Maximum Settlement Values for Seismic Category I Buildings (continued) ***Averaged Settlement at four corners of basemat (continued)***			
	Under FWSC Structure	*10 mm (0.4 inches)*	**ESP** No value provided	
			Unit 3 0.13 mm (0.005 in) for the maximum settlement of a FWSC corner	The Unit 3 site characteristic value for the averaged settlement at four corners is the maximum settlement of a corner because each corner settles the same amount, i.e., the maximum amount for a corner. The maximum settlement of a corner for the FWSC foundation is provided in Table 2.5.4-212 and falls within (is less than) the DCD site parameter value.
	Maximum Differential Settlement along the longest mat foundation dimension			
	Within Reactor/Fuel Building	*77 mm (3.0 inches)*	**ESP** No value provided	
			Unit 3 2 mm (0.07 in)	The Unit 3 site characteristic value for the maximum differential settlement along the longest mat foundation dimension is the maximum settlement of the center of the RB/FB foundation less the maximum settlement for a corner. These values are provided in Table 2.5.4-212. The difference in these values determines the Unit 3 site characteristic value for the maximum differential settlement for the RB/FB foundation which, as shown, falls within (is less than) the DCD site parameter value.
	Within Control Building	*14 mm (0.6 inches)*	**ESP** No value provided	
			Unit 3 0.305 mm (0.012 in)	The Unit 3 site characteristic value for the maximum differential settlement along the longest mat foundation dimension is the maximum settlement of the center of the CB foundation less the maximum settlement for a corner. These values are provided in Table 2.5.4-212. The difference in these values determines the Unit 3 site characteristic value for the maximum differential settlement for the CB foundation which, as shown, falls within (is less than) the DCD site parameter value.
	Under FWSC Structure	*12 mm (0.5 inches)*	**ESP** No value provided	
			Unit 3 0.152 mm (0.006 in)	The Unit 3 site characteristic value for the maximum differential settlement along the longest mat foundation dimension is the maximum settlement of the center of the FWSC foundation less the maximum settlement for a corner after the installation of the basemat (applied load excluding weight of basemat). These values are provided in Table 2.5.4-212. The difference in these values determines the Unit 3 site characteristic value for the maximum differential settlement for the FWSC foundation which, as shown, falls within (is less than) the DCD site parameter value.
	Maximum Differential Displacement between Reactor/Fuel Buildings and Control Building			
		*85 mm (3.3 inches)]**	**ESP** No value provided	
			Unit 3 2.5 mm (0.1 in)	The Unit 3 site characteristic value for the maximum differential displacement between the RB/FB foundation and the CB foundation is the maximum settlement of the center of the RB/FB foundation less the maximum settlement of the center of the CB foundation. For the RB/FB and the CB foundations, the maximum settlement of the center of each is provided in Table 2.5.4-212. The difference in these values determines the Unit 3 site characteristic value for the maximum differential displacement between the RB/FB foundation and the CB foundation which, as shown, falls within (is less than) the DCD site parameter value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1] [20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Meteorological Dispersion (χ/Q) [11]			
	EAB χ/Q			
	0–2 hours	*2.00E-03 s/m^3*	**ESP and Unit 3** 2.26E-04 s/m^3	The ESP site characteristic value for short-term (accident release) atmospheric dispersion for 0–2 hr χ/Q value at the EAB is defined as the 0–2 hour atmospheric dispersion factor to be used to estimate dose consequences of accidental airborne releases at the EAB. The ESP site characteristic value falls within (is lower than) the DCD site parameter value. SSAR Table 2.3-3 and SSAR Table 1.9-1 provide the same value as the ESP. Note that although the EAB location yielding the highest atmospheric dispersion factors was determined by GIS measurement to be 1609 m (1.0 mi) ESE, the SSAR distance of 1416 m (0.88 mi) ESE is conservative and used. The Unit 3 site characteristic value falls within (is the same as) the ESP site characteristic value.
	LPZ χ/Q			
	0–8 hours	*1.90E-04 s/m^3*	**ESP and Unit 3** 2.05E-05 s/m^3	The ESP site characteristic value for short-term (accident release) atmospheric dispersion for 0–8 hr χ/Q value at the LPZ is defined as the 0–8 hour atmospheric dispersion factor to be used to estimate dose consequences of accidental airborne releases at the LPZ. The ESP site characteristic value falls within (is lower than) the DCD site parameter value. SSAR Table 2.3-3 and SSAR Table 1.9-1 provide the same value as the ESP. The Unit 3 site characteristic value falls within (is the same as) the ESP site characteristic value.
	8–24 hours	*1.40E-04 s/m^3*	**ESP and Unit 3** 1.36E-05 s/m^3	The ESP site characteristic value for short-term (accident release) atmospheric dispersion for 8–24 hr χ/Q value at the LPZ is defined as the 8–24 hour atmospheric dispersion factor to be used to estimate dose consequences of accidental airborne releases at the LPZ. The ESP site characteristic value falls within (is lower than) the DCD site parameter value. SSAR Table 2.3-3 and SSAR Table 1.9-1 provide the same value as the ESP. The Unit 3 site characteristic value falls within (is the same as) the ESP site characteristic value.
	1–4 days	*7.50E-05 s/m^3*	**ESP and Unit 3** 5.58E-06 s/m^3	The ESP site characteristic value for short-term (accident release) atmospheric dispersion for 1–4 day χ/Q value at the LPZ is defined as the 1–4 day atmospheric dispersion factor to be used to estimate dose consequences of accidental airborne releases at the LPZ. The ESP site characteristic value falls within (is lower than) the DCD site parameter value. SSAR Table 2.3-3 and SSAR Table 1.9-1 provide the same value as the ESP. The Unit 3 site characteristic value falls within (is the same as) the ESP site characteristic value.
	4–30 days	*3.00E-05 s/m^3]**	**ESP and Unit 3** 1.55E-06 s/m^3	The ESP site characteristic value for short-term (accident release) atmospheric dispersion for 4–30 day χ/Q value at the LPZ is defined as the 4–30 day atmospheric dispersion factor to be used to estimate dose consequences of accidental airborne releases at the LPZ. The ESP site characteristic value falls within (is lower than) the DCD site parameter value. SSAR Table 2.3-3 and SSAR Table 1.9-1 provide the same value as the ESP. The Unit 3 site characteristic value falls within (is the same as) the ESP site characteristic value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Meteorological Dispersion (χ/Q) (continued)			
	Control Room χ/Q*		Control Room χ/Q values shown on the same row in DCD Table 2.0-1 are in sets below: first a set for unfiltered inleakage, followed by a set for air intakes (emergency and normal).	
	** First value is for unfiltered inleakage. Second value is for air intakes (emergency and normal)*			
	Reactor Building			
	Unfiltered inleakage			
	0–2 hours	*1.90E-03 s/m^3*	**ESP** No value provided	
			Unit 3 1.73E-03 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-201 and falls within (is less than) the DCD site parameter value.
	2–8 hours	*1.30E-03 s/m^3*	**ESP** No value provided	
			Unit 3 1.18E-03 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-201 and falls within (is less than) the DCD site parameter value.
	8–24 hours	*5.90E-04 s/m^3*	**ESP** No value provided	
			Unit 3 4.13E-04 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-201 and falls within (is less than) the DCD site parameter value.
	1–4 days	*5.00E-04 s/m^3*	**ESP** No value provided	
			Unit 3 3.48E-04 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-201 and falls within (is less than) the DCD site parameter value.
	4–30 days	*4.40E-04 s/m^3*	**ESP** No value provided	
			Unit 3 2.82E-04 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-201 and falls within (is less than) the DCD site parameter value.
	Air intakes (emergency and normal)			
	0–2 hours	*1.50E-03 s/m^3*	**ESP** No value provided	
			Unit 3 1.19E-03 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-201 and falls within (is less than) the DCD site parameter value.
	2–8 hours	*1.10E-03 s/m^3]**	**ESP** No value provided	
			Unit 3 8.21E-04 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-201 and falls within (is less than) the DCD site parameter value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject[20]	DCD Site Parameter Value[1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Meteorological Dispersion (χ/Q) (continued) ***Control Room χ/Q* (continued)*** ** First value is for unfiltered inleakage. Second value is for air intakes (emergency and normal)* ***Reactor Building (continued)*** ***Air intakes (emergency and normal) (continued)***			
	8–24 hours	*5.00E-04 s/m^3*	**ESP** No value provided	
			Unit 3 3.18E-04 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-201 and falls within (is less than) the DCD site parameter value.
	1–4 days	*4.20E-04 s/m^3*	**ESP** No value provided	
			Unit 3 2.55E-04 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-201 and falls within (is less than) the DCD site parameter value.
	4–30 days	*3.80E-04 s/m^3*	**ESP** No value provided	
			Unit 3 2.05E-04 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-201 and falls within (is less than) the DCD site parameter value.
	Passive Containment Cooling System/Reactor Building Roof ***Unfiltered inleakage***			
	0–2 hours	*3.40E-03 s/m^3*	**ESP** No value provided	
			Unit 3 1.58E-03 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-203 and falls within (is less than) the DCD site parameter value.
	2–8 hours	*2.70E-03 s/m^3*	**ESP** No value provided	
			Unit 3 1.33E-03 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-203 and falls within (is less than) the DCD site parameter value.
	8–24 hours	*1.40E-03 s/m^3]**	**ESP** No value provided	
			Unit 3 5.58E-04 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-203 and falls within (is less than) the DCD site parameter value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Meteorological Dispersion (χ/Q) (continued) ***Control Room χ/Q* (continued)*** ** First value is for unfiltered inleakage. Second value is for air intakes (emergency and normal)* ***Passive Containment Cooling System/Reactor Building Roof (continued)*** ***Unfiltered inleakage (continued)***			
	1–4 days	*1.10E-03 s/m^3*	**ESP** No value provided	
			Unit 3 3.97E-04 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-203 and falls within (is less than) the DCD site parameter value.
	4–30 days	*7.90E-04 s/m^3*	**ESP** No value provided	
			Unit 3 3.34E-04 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-203 and falls within (is less than) the DCD site parameter value.
	Air intakes (emergency and normal)			
	0–2 hours	3.00E-03 s/m^3	**ESP** No value provided	
			Unit 3 1.31E-03 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-203 and falls within (is less than) the DCD site parameter value.
	2–8 hours	2.50E-03 s/m^3	**ESP** No value provided	
			Unit 3 9.32E-04 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-203 and falls within (is less than) the DCD site parameter value.
	8–24 hours	*1.20E-03 s/m^3*	**ESP** No value provided	
			Unit 3 3.73E-04 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-203 and falls within (is less than) the DCD site parameter value.
	1–4 days	*9.00E-04 s/m^3*	**ESP** No value provided	
			Unit 3 2.71E-04 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-203 and falls within (is less than) the DCD site parameter value.
	4–30 days	*7.00E-04 s/m^3*]*	**ESP** No value provided	
			Unit 3 2.19E-04 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-203 and falls within (is less than) the DCD site parameter value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject[20]	DCD Site Parameter Value[1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Meteorological Dispersion (χ/Q) (continued) ***Control Room χ/Q* (continued)*** ** First value is for unfiltered inleakage. Second value is for air intakes (emergency and normal)*			
	HELB Blowout Panels/Reactor Building			
	Unfiltered Leakage			
	0–2 hours	*7.00E-03 s/m³*	**ESP** No value provided	
			Unit 3 4.38E-03 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-206 and falls within (is less than) the DCD site parameter value.
	2–8 hours	5.00E-03 s/m³	**ESP** No value provided	
			Unit 3 3.36E-03 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-206 and falls within (is less than) the DCD site parameter value.
	8–24 hours	2.10E-03 s/m³	**ESP** No value provided	
			Unit 3 1.35E-03 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-206 and falls within (is less than) the DCD site parameter value.
	1–4 days	*1.70E-03 s/m³*	**ESP** No value provided	
			Unit 3 1.01E-03 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-206 and falls within (is less than) the DCD site parameter value.
	4–30 days	*1.50E-03 s/m³*	**ESP** No value provided	
			Unit 3 8.15E-04 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-206 and falls within (is less than) the DCD site parameter value.
	Air intakes (emergency and normal)			
	0–2 hours	*5.90E-03 s/m³*	**ESP** No value provided	
			Unit 3 3.34E-03 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-206 and falls within (is less than) the DCD site parameter value.
	2–8 hours	*4.70E-03 s/m³]**	**ESP** No value provided	
			Unit 3 2.51E-03 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-206 and falls within (is less than) the DCD site parameter value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Meteorological Dispersion (χ/Q) (continued) ***Control Room χ/Q* (continued)*** ** First value is for unfiltered inleakage. Second value is for air intakes (emergency and normal)* ***HELB Blowout Panels/Reactor Building (continued)*** ***Air intakes (emergency and normal) (continued)***			
	8–24 hours	*1.50E-03 s/m*^{3}	**ESP** No value provided	
			Unit 3 9.54E-04 s/m^{3}	The Unit 3 site characteristic value is provided in Table 2.3-206 and falls within (is less than) the DCD site parameter value.
	1–4 days	1.10E-03 s/m^{3}	**ESP** No value provided	
			Unit 3 7.00E-04 s/m^{3}	The Unit 3 site characteristic value is provided in Table 2.3-206 and falls within (is less than) the DCD site parameter value.
	4–30 days	*1.00E-03 s/m*^{3}	**ESP** No value provided	
			Unit 3 6.30E-04 s/m^{3}	The Unit 3 site characteristic value is provided in Table 2.3-206 and falls within (is less than) the DCD site parameter value.
	Turbine Building ***Unfiltered inleakage***			
	0–2 hours	1.20E-03 s/m^{3}	**ESP** No value provided	
			Unit 3 7.24E-04 s/m^{3}	The Unit 3 site characteristic value is provided in Table 2.3-202 and falls within (is less than) the DCD site parameter value.
	2–8 hours	*9.80E-04 s/m*^{3}	**ESP** No value provided	
			Unit 3 3.60E-04 s/m^{3}	The Unit 3 site characteristic value is provided in Table 2.3-202 and falls within (is less than) the DCD site parameter value.
	8–24 hours	3.90E-04 s/m^{3}]*	**ESP** No value provided	
			Unit 3 1.64E-04 s/m^{3}	The Unit 3 site characteristic value is provided in Table 2.3-202 and falls within (is less than) the DCD site parameter value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject[20]	DCD Site Parameter Value[1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Meteorological Dispersion (χ/Q) (continued) ***Control Room χ/Q* (continued)*** ** First value is for unfiltered inleakage. Second value is for air intakes (emergency and normal)* ***Turbine Building (continued)*** ***Unfiltered inleakage (continued)***			
	1–4 days	*3.80E-04 s/m³*	**ESP** No value provided	
			Unit 3 1.25E-04 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-202 and falls within (is less than) the DCD site parameter value.
	4–30 days	*3.20E-04 s/m³*	**ESP** No value provided	
			Unit 3 9.91E-05 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-202 and falls within (is less than) the DCD site parameter value.
	Air intakes (emergency and normal)			
	0–2 hours	*1.20E-03 s/m³*	**ESP** No value provided	
			Unit 3 7.80E-04 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-202 and falls within (is less than) the DCD site parameter value.
	2–8 hours	*9.80E-04 s/m³*	**ESP** No value provided	
			Unit 3 3.77E-04 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-202 and falls within (is less than) the DCD site parameter value.
	8–24 hours	*3.90E-04 s/m³*	**ESP** No value provided	
			Unit 3 1.71E-04 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-202 and falls within (is less than) the DCD site parameter value.
	1–4 days	*3.80E-04 s/m³*	**ESP** No value provided	
			Unit 3 1.43E-04 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-202 and falls within (is less than) the DCD site parameter value.
	4–30 days	*3.20E-04 s/m³]**	**ESP** No value provided	
			Unit 3 1.10E-04 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-202 and falls within (is less than) the DCD site parameter value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject[20]	DCD Site Parameter Value[1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Meteorological Dispersion (χ/Q) (continued) ***Control Room χ/Q* (continued)*** ** First value is for unfiltered inleakage. Second value is for air intakes (emergency and normal)* ***Fuel Building*** ***Unfiltered inleakage***			
	0–2 hours	*2.80E-03 s/m³*	**ESP** No value provided	
			Unit 3 2.23E-03 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-204 and falls within (is less than) the DCD site parameter value
	2–8 hours	*2.50E-03 s/m³*	**ESP** No value provided	
			Unit 3 1.56E-03 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-204 and falls within (is less than) the DCD site parameter value.
	8–24 hours	*1.25E-03 s/m³*	**ESP** No value provided	
			Unit 3 5.64E-04 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-204 and falls within (is less than) the DCD site parameter value.
	1–4 days	*1.10E-03 s/m³*	**ESP** No value provided	
			Unit 3 4.95E-04 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-204 and falls within (is less than) the DCD site parameter value.
	4–30 days	*1.00E-03 s/m³*	**ESP** No value provided	
			Unit 3 4.30E-04 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-204 and falls within (is less than) the DCD site parameter value.
	Air intakes (emergency and normal)			
	0–2 hours	*2.80E-03 s/m³*	**ESP** No value provided	
			Unit 3 1.98E-03 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-204 and falls within (is less than) the DCD site parameter value
	2–8 hours	*2.50E-03 s/m³]**	**ESP** No value provided	
			Unit 3 1.44E-03 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-204 and falls within (is less than) the DCD site parameter value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Meteorological Dispersion (χ/Q) (continued) ***Control Room χ/Q* (continued)*** ** First value is for unfiltered inleakage. Second value is for air intakes (emergency and normal)* ***Fuel Building Source (continued)*** ***Air intakes (emergency and normal) (continued)***			
	8–24 hours	*1.25E-03 s/m³*	**ESP** No value provided	
			Unit 3 5.15E-04 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-204 and falls within (is less than) the DCD site parameter value.
	1–4 days	*1.10E-03 s/m³*	**ESP** No value provided	
			Unit 3 4.23E-04 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-204 and falls within (is less than) the DCD site parameter value.
	4–30 days	*1.00E-03 s/m³*	**ESP** No value provided	
			Unit 3 3.64E-04 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-204 and falls within (is less than) the DCD site parameter value.
	Technical Support Center χ/Q:* ** First value is for unfiltered inleakage. Second value is for air intakes (emergency and normal).*		Technical Support Center χ/Q values shown on the same row in DCD Table 2.0-1 are the same. One value is shown for both unfiltered inleakage and for air intakes (emergency and normal).	
	Reactor Building ***Unfiltered inleakage and Air intakes (emergency and normal)***			
	0–2 hours	1.00E-03 s/m³	**ESP** No value provided	
			Unit 3 2.41E-04 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-201 and falls within (is less than) the DCD site parameter value.
	2–8 hours	6.00E-04 s/m³	**ESP** No value provided	
			Unit 3 1.85E-04 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-201 and falls within (is less than) the DCD site parameter value.
	8–24 hours	3.00E-04 s/m³]*	**ESP** No value provided	
			Unit 3 7.54E-05 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-201 and falls within (is less than) the DCD site parameter value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject[20]	DCD Site Parameter Value[1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Meteorological Dispersion (χ/Q) (continued) ***Technical Support Center χ/Q* (continued)*** ** First value is for unfiltered inleakage. Second value is for air intakes (emergency and normal).* ***Reactor Building (continued)*** ***Unfiltered inleakage and Air intakes (emergency and normal) (continued)***			
	1–4 days	*2.00E-04 s/m³*	**ESP** No value provided	
			Unit 3 5.90E-05 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-201 and falls within (is less than) the DCD site parameter value.
	4–30 days	1.00E-04 s/m³	**ESP** No value provided	
			Unit 3 4.78E-05 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-201 and falls within (is less than) the DCD site parameter value.
	Turbine Building ***Unfiltered inleakage and Air intakes (emergency and normal)***			
	0–2 hours	*2.00E-03 s/m³*	**ESP** No value provided	
			Unit 3 7.13E-04 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-202 and falls within (is less than) the DCD site parameter value.
	2–8 hours	1.50E-03 s/m³	**ESP** No value provided	
			Unit 3 4.15E-04 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-202 and falls within (is less than) the DCD site parameter value.
	8–24 hours	8.00E-04 s/m³	**ESP** No value provided	
			Unit 3 1.81E-04 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-202 and falls within (is less than) the DCD site parameter value.
	1–4 days	*6.00E-04 s/m³*]*	**ESP** No value provided	
			Unit 3 1.37E-04 s/m³	The Unit 3 site characteristic value is provided in Table 2.3-202 and falls within (is less than) the DCD site parameter value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Meteorological Dispersion (χ/Q) (continued) ***Technical Support Center χ/Q* (continued)*** ** First value is for unfiltered inleakage. Second value is for air intakes (emergency and normal).* ***Turbine Building (continued)*** ***Unfiltered inleakage and Air intakes (emergency and normal) (continued)***			
	4–30 days	*5.00E-04 s/m^3*	**ESP** No value provided	
			Unit 3 1.18E-04 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-202 and falls within (is less than) the DCD site parameter value.
	Passive Containment Cooling System/Reactor Building Roof ***Unfiltered inleakage and Air intakes (emergency and normal)***			
	0–2 hours	*2.00E-03 s/m^3*	**ESP** No value provided	
			Unit 3 3.61E-04 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-203 and falls within (is less than) the DCD site parameter value.
	2–8 hours	1.10E-03 s/m^3	**ESP** No value provided	
			Unit 3 2.85E-04 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-203 and falls within (is less than) the DCD site parameter value.
	8–24 hours	*5.00E-04 s/m^3*	**ESP** No value provided	
			Unit 3 1.15E-04 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-203 and falls within (is less than) the DCD site parameter value.
	1–4 days	*4.00E-04 s/m^3*	**ESP** No value provided	
			Unit 3 8.79E-05 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-203 and falls within (is less than) the DCD site parameter value.
	4–30 days	*3.00E-04 s/m^3]**	**ESP** No value provided	
			Unit 3 6.76E-05 s/m^3	The Unit 3 site characteristic value is provided in Table 2.3-203 and falls within (is less than) the DCD site parameter value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject[20]	DCD Site Parameter Value[1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[*Long Term Dispersion Estimates*[12]			
NAPS COL 12.2-2-A	*χ/Q:* *Reactor/Fuel Building Ventilation Stack (RB-VS)* *Turbine Building Ventilation Stack (TB-VS)* *Radwaste Building Ventilation Stack (RW-VS)* *D/Q:* *RB-VS* *TB-VS* *RW-VS*	 *1.5E-07 s/m*^{3} *1.2E-07 s/m*^{3} *5.0E-06 s/m*^{3} *4.8E-09 m*$^{-2}$ *3.5E-09 m*$^{-2}$ *1.9E-08 m*$^{-2}$	**ESP** The ESP site characteristic values for long term (routine release) atmospheric dispersion estimates are based on the maximally exposed individual (MEI) for each pathway. **Unit 3** The Unit 3 site characteristic values assume conservatively, that each sensitive receptor (meat animal, vegetable garden, residence) is at the location of the closest receptor.	The ESP site characteristic values for long term (routine release) atmospheric dispersion estimates are defined based on type of sensitive receptor (MEI) and decay time. Each of these values is compared with the appropriate DCD site parameter values, χ/Q or D/Q, below. Each ESP site characteristic value that is equal to or less than a DCD site parameter value results in a lower estimated dose for the same source term, and conversely, a higher χ/Q or D/Q results in a higher estimated dose. As shown below, every ESP site characteristic value does not fall within (some are greater than) the DCD site parameter value. As also shown below, every Unit 3 site characteristic value falls within (is smaller than) the DCD site parameter value. Per Note (12), offsite doses due to radioactive airborne effluents are calculated using site-specific χ/Q and D/Q values to demonstrate compliance with the regulatory dose limits. Because the ESP site characteristic values are defined based on ground level releases from the ESP plant parameter envelope boundary, which is shown in Figure 2.0-205, there is a single χ/Q and D/Q value for each type of sensitive receptor (MEI) and decay time, rather than values for releases from each ventilation stack. Each ESP site characteristic χ/Q value is compared with all three DCD site parameter χ/Q values, which correspond to a value for each of the three buildings with a ventilation stack. Each ESP site characteristic D/Q value is similarly compared with all three DCD site parameter D/Q values. The Unit 3 site characteristic values are determined using mixed mode releases. These are modeled based on the distances to each sensitive receptor (MEI) from the ESP plant parameter envelope boundary, which is shown in Figure 2.0-205, and the ventilation stack parameters from DCD Appendix 2B. The Unit 3 mixed mode release results are compared below to the DCD site parameter values for each of the three buildings with a ventilation stack.
	χ/Q: *RB-VS* *TB-VS* *RW-VS*	 *1.5E-07 s/m*^{3} *1.2E-07 s/m*^{3} *5.0E-06 s/m*^{3}]*	**ESP** 3.7×10^{-6} s/m^3, annual average, undepleted/no decay, EAB, east-southeast, 1.4 km (0.88 mi)	The ESP site characteristic value for this long term dispersion estimate is defined as the maximum annual average EAB undepleted/no decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. The ESP site characteristic value does not fall within (is greater than) two of the DCD site parameter values.
			Unit 3 RB-VS 7.1×10^{-8} s/m^3 North-northeast 0.88 mi TB-VS 5.2×10^{-8} s/m^3 North-northeast 0.88 mi RW-VS 8.1×10^{-7} s/m^3 North-northeast 0.88 mi	The Unit 3 site characteristic values for this long term dispersion estimate are provided in Table 2.3-16R. The Unit 3 site characteristic value for releases from each building falls within (is smaller than) the DCD site parameter value. See Section 12.2 for the site-specific concentration and dose analysis inputs and results. The Unit 3 site characteristic values fall within (are smaller than) the ESP site characteristic value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject[20]	DCD Site Parameter Value[1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[*Long Term Dispersion Estimates*[12] *(continued)*			
	χ/Q: *RB-VS* *TB-VS* *RW-VS*	 *1.5E-07 s/m³* *1.2E-07 s/m³* *5.0E-06 s/m³*	**ESP** 3.7×10^{-6} s/m³, annual average, undepleted/2.26-day decay, EAB, east-southeast, 1.4 km (0.88 mi)	The ESP site characteristic value for this long term dispersion estimate is defined as the maximum annual average EAB undepleted/2.26-day decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. The ESP site characteristic value does not fall within (is greater than) two of the DCD site parameter values.
			Unit 3 RB-VS 7.1×10^{-8} s/m³ North-northeast 0.88 mi TB-VS 5.2×10^{-8} s/m³ North-northeast 0.88 mi RW-VS 8.1×10^{-7} s/m³ North-northeast 0.88 mi	The Unit 3 site characteristic values for this long term dispersion estimate are provided in Table 2.3-16R. The Unit 3 site characteristic value for releases from each building falls within (is smaller than) the DCD site parameter value. See Section 12.2 for the site-specific concentration and dose analysis inputs and results. The Unit 3 site characteristic values fall within (are smaller than) the ESP site characteristic value.
	χ/Q: *RB-VS* *TB-VS* *RW-VS*	 *1.5E-07 s/m³* *1.2E-07 s/m³* *5.0E-06 s/m³*]*	**ESP** 3.3×10^{-6} s/m³, annual average, depleted/8.00-day decay, EAB, east-southeast, 1.4 km (0.88 mi)	The ESP site characteristic value for this long term dispersion estimate is defined as the maximum annual average EAB depleted/8.00-day decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. The ESP site characteristic value does not fall within (is greater than) two of the DCD site parameter values.
			Unit 3 RB-VS 6.9×10^{-8} s/m³ North-northeast 0.88 mi TB-VS 5.0×10^{-8} s/m³ North-northeast 0.88 mi RW-VS 8.0×10^{-7} s/m³ North-northeast 0.88 mi	The Unit 3 site characteristic values for this long term dispersion estimate are provided in Table 2.3-16R. The Unit 3 site characteristic value for releases from each building falls within (is smaller than) the DCD site parameter value. See Section 12.2 for the site-specific concentration and dose analysis inputs and results. The Unit 3 site characteristic values fall within (are smaller than) the ESP site characteristic value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1] [20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Long Term Dispersion Estimates [12] ***(continued)***			
	D/Q: *RB-VS* *TB-VS* *RW-VS*	 *4.8E-09 m^{-2}* *3.5E-09 m^{-2}* *1.9E-08 m^{-2}*	**ESP** 1.2×10^{-8} $1/m^2$, annual average, D/Q value, EAB, South 0.62 mi	The ESP site characteristic value for this long term dispersion estimate is defined as the maximum annual average EAB D/Q value for use in determining gaseous pathway doses to the maximally exposed individual. The ESP site characteristic value does not fall within (is greater than) two of the DCD site parameter values.
			Unit 3 RB-VS 1.7×10^{-9} $1/m^2$ South 0.62 mi South-southeast 0.73 mi TB-VS 1.6×10^{-9} $1/m^2$ North-northeast 0.88 mi South-southeast 0.73 mi RW-VS 5.5×10^{-9} $1/m^2$ South 0.62 mi	The Unit 3 site characteristic values for this long term dispersion estimate are provided in Table 2.3-16R. The Unit 3 site characteristic value for releases from each building falls within (is smaller than) the DCD site parameter value. See Section 12.2 for the site-specific concentration and dose analysis inputs and results. The Unit 3 site characteristic values fall within (are smaller than) the ESP site characteristic value.
	χ/Q: *RB-VS* *TB-VS* *RW-VS*	 *1.5E-07 s/m^3* *1.2E-07 s/m^3* *5.0E-06 s/m^3]**	**ESP** 2.4×10^{-6} s/m^3, annual average, undepleted/no decay, nearest resident, north-northeast, 1.5 km (0.96 mi)	The ESP site characteristic value for this long term dispersion estimate is defined as the maximum annual average resident undepleted/no decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. The ESP site characteristic value does not fall within (is greater than) two of the DCD site parameter values.
			Unit 3 RB-VS 6.8×10^{-8} s/m^3 North-northeast 0.74 mi TB-VS 5.5×10^{-8} s/m^3 North-northeast 0.74 mi RW-VS 8.3×10^{-7} s/m^3 North-northeast 0.74 mi	The Unit 3 site characteristic values for this long term dispersion estimate are provided in Table 2.3-16R. The Unit 3 site characteristic values fall within (are smaller than) the DCD site parameter values. See Section 12.2 for the site-specific concentration and dose analysis inputs and results. The Unit 3 site characteristic values fall within (are smaller than) the ESP site characteristic value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Long Term Dispersion Estimates [12] ***(continued)***			
	χ/Q: *RB-VS* *TB-VS* *RW-VS*	 *1.5E-07 s/m^3* *1.2E-07 s/m^3* *5.0E-06 s/m^3*	**ESP** 2.4×10^{-6} s/m^3, annual average, undepleted/2.26-day decay, nearest resident, north-northeast, 1.5 km (0.96 mi)	The ESP site characteristic value for this long term dispersion estimate is defined as the maximum annual average resident undepleted/2.26 day decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. The ESP site characteristic value does not fall within (is greater than) two of the DCD site parameter values.
			Unit 3 RB-VS 6.8×10^{-8} s/m^3 North-northeast 0.74 mi TB-VS 5.5×10^{-8} s/m^3 North-northeast 0.74 mi RW-VS 8.3×10^{-7} s/m^3 North-northeast 0.74 mi	The Unit 3 site characteristic values for this long term dispersion estimate are provided in Table 2.3-16R. The Unit 3 site characteristic values fall within (are smaller than) the DCD site parameter values. See Section 12.2 for the site-specific concentration and dose analysis inputs and results. The Unit 3 site characteristic values fall within (are smaller than) the ESP site characteristic value.
	χ/Q: *RB-VS* *TB-VS* *RW-VS*	 *1.5E-07 s/m^3* *1.2E-07 s/m^3* *5.0E-06 s/m^3*]*	**ESP** 2.1×10^{-6} s/m^3, annual average, depleted/8.00-day decay, nearest resident, north-northeast, 1.5 km (0.96 mi)	The ESP site characteristic value for this long term dispersion estimate is defined as the maximum annual average resident depleted/8.00-day decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. The ESP site characteristic value does not fall within (is greater than) two of the DCD site parameter values.
			Unit 3 RB-VS 6.6×10^{-8} s/m^3 North-northeast 0.74 mi TB-VS 5.3×10^{-8} s/m^3 North-northeast 0.74 mi RW-VS 8.2×10^{-7} s/m^3 North-northeast 0.74 mi	The Unit 3 site characteristic values for this long term dispersion estimate are provided in Table 2.3-16R. The Unit 3 site characteristic values fall within (are smaller than) the DCD site parameter values. See Section 12.2 for the site-specific concentration and dose analysis inputs and results. The Unit 3 site characteristic values fall within (are smaller than) the ESP site characteristic value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Long Term Dispersion Estimates [12] ***(continued)***			
	D/Q: *RB-VS* *TB-VS* *RW-VS*	 *4.8E-09 m^{-2}* *3.5E-09 m^{-2}* *1.9E-08 m^{-2}*	**ESP** 7.2×10^{-9} $1/m^2$, annual average, nearest resident, north-northeast, 1.5 km (0.96 mi)	The ESP site characteristic value for this long term dispersion estimate is defined as the maximum annual average resident D/Q value for use in determining gaseous pathway doses to the maximally exposed individual. The ESP site characteristic value does not fall within (is greater than) two of the DCD site parameter values.
			Unit 3 RB-VS 1.8×10^{-9} $1/m^2$ North-northeast 0.74 mi Southeast 0.74 mi TB-VS 1.8×10^{-9} $1/m^2$ North-northeast 0.74 mi RW-VS 4.4×10^{-9} $1/m^2$ South 0.74 mi	The Unit 3 site characteristic values for this long term dispersion estimate are provided in Table 2.3-16R. The Unit 3 site characteristic values fall within (are smaller than) the DCD site parameter values. See Section 12.2 for the site-specific concentration and dose analysis inputs and results. The Unit 3 site characteristic values fall within (are smaller than) the ESP site characteristic value.
	χ/Q: *RB-VS* *TB-VS* *RW-VS*	 *1.5E-07 s/m^3* *1.2E-07 s/m^3* *5.0E-06 s/m^3]**	**ESP** 1.4×10^{-6} s/m^3, annual average, undepleted/ no decay, nearest meat animal, southeast, 2.2 km (1.37 mi)	The ESP site characteristic value for this long term dispersion estimate is defined as the maximum annual average meat animal undepleted/no decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. The ESP site characteristic value does not fall within (is greater than) two of the DCD site parameter values.
			Unit 3 RB-VS 6.8×10^{-8} s/m^3 North-northeast 0.74 mi TB-VS 5.5×10^{-8} s/m^3 North-northeast 0.74 mi RW-VS 8.3×10^{-7} s/m^3 North-northeast 0.74 mi	The Unit 3 site characteristic values for this long term dispersion estimate are provided in Table 2.3-16R. The Unit 3 site characteristic values fall within (are smaller than) the DCD site parameter values. See Section 12.2 for the site-specific concentration and dose analysis inputs and results. The Unit 3 site characteristic values fall within (are smaller than) the ESP site characteristic value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[*Long Term Dispersion Estimates*[12] *(continued)*			
	χ/Q: *RB-VS* *TB-VS* *RW-VS*	 *1.5E-07 s/m³* *1.2E-07 s/m³* *5.0E-06 s/m³*	**ESP** 1.4×10^{-6} s/m³, annual average, undepleted/2.26-day decay, nearest meat animal, southeast, 2.2 km (1.37 mi)	The ESP site characteristic value for this long term dispersion estimate is defined as the maximum annual average meat animal undepleted/2.26-day decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. This ESP site characteristic value is 1.4×10^{-6} s/m³ and does not fall within (is greater than) two of the DCD site parameter values.
			Unit 3 RB-VS 6.8×10^{-8} s/m³ North-northeast 0.74 mi TB-VS 5.5×10^{-8} s/m³ North-northeast 0.74 mi RW-VS 8.3×10^{-7} s/m³ North-northeast 0.74 mi	The Unit 3 site characteristic values for this long term dispersion estimate are provided in Table 2.3-16R. The Unit 3 site characteristic values fall within (are smaller than) the DCD site parameter values. See Section 12.2 for the site-specific concentration and dose analysis inputs and results. The Unit 3 site characteristic values fall within (are smaller than) the ESP site characteristic value.
	χ/Q: *RB-VS* *TB-VS* *RW-VS*	 *1.5E-07 s/m³* *1.2E-07 s/m³* *5.0E-06 s/m³*]*	**ESP** 1.2×10^{-6} s/m³, annual average, depleted/8.00-day decay, nearest meat animal, southeast, 2.2 km (1.37 mi)	The ESP site characteristic value for this long term dispersion estimate is defined as the maximum annual average meat animal depleted/8.00-day decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. The ESP site characteristic value does not fall within (is greater than) two of the DCD site parameter values.
			Unit 3 RB-VS 6.6×10^{-8} s/m³ North-northeast 0.74 mi TB-VS 5.3×10^{-8} s/m³ North-northeast 0.74 mi RW-VS 8.2×10^{-7} s/m³ North-northeast 0.74 mi	The Unit 3 site characteristic values for this long term dispersion estimate are provided in Table 2.3-16R. The Unit 3 site characteristic values fall within (are smaller than) the DCD site parameter values. See Section 12.2 for the site-specific concentration and dose analysis inputs and results. The Unit 3 site characteristic values fall within (are smaller than) the ESP site characteristic value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Long Term Dispersion Estimates [12] (continued)			
	D/Q: *RB-VS* *TB-VS* *RW-VS*	 *4.8E-09 m^{-2}* *3.5E-09 m^{-2}* *1.9E-08 m^{-2}*	**ESP** 3.1×10^{-9} $1/m^2$, annual average, nearest meat animal, southeast, 2.2 km (1.37 mi)	The ESP site characteristic value for this long term dispersion estimate is defined as the maximum annual average meat animal D/Q value for use in determining gaseous pathway doses to the maximally exposed individual. The ESP site characteristic value falls within (is smaller than) the DCD site parameter values.
NAPS ESP VAR 2.0-1			**Unit 3** RB-VS 1.8×10^{-9} $1/m^2$ North-northeast 0.74 mi Southeast 0.74 mi TB-VS 1.8×10^{-9} $1/m^2$ North-northeast 0.74 mi RW-VS 4.4×10^{-9} $1/m^2$ South 0.74 mi	The Unit 3 site characteristic values for this long term dispersion estimate are provided in Table 2.3-16R. The Unit 3 site characteristic values fall within (are smaller than) the DCD site parameter values. See Section 12.2 for the site-specific concentration and dose analysis inputs and results. The Unit 3 site characteristic value for the RW-VS does not fall within (is greater than) the ESP site characteristic value.
	χ/Q: *RB-VS* *TB-VS* *RW-VS*	 *1.5E-07 s/m^3* *1.2E-07 s/m^3* *5.0E-06 s/m^3*]*	**ESP** 2.0×10^{-6} s/m^3, annual average, undepleted/no decay, nearest vegetable garden, northeast, 1.5 km (0.94 mi)	The ESP site characteristic value for this long term dispersion estimate is defined as the maximum annual average vegetable garden undepleted/no decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. The ESP site characteristic value does not fall within (is greater than) two of the DCD site parameter values.
			Unit 3 RB-VS 6.8×10^{-8} s/m^3 North-northeast 0.74 mi TB-VS 5.5×10^{-8} s/m^3 North-northeast 0.74 mi RW-VS 8.3×10^{-7} s/m^3 North-northeast 0.74 mi	The Unit 3 site characteristic values for this long term dispersion estimate are provided in Table 2.3-16R. The Unit 3 site characteristic values fall within (are smaller than) the DCD site parameter values. See Section 12.2 for the site-specific concentration and dose analysis inputs and results. The Unit 3 site characteristic values fall within (are smaller than) the ESP site characteristic value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject[20]	DCD Site Parameter Value[1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[*Long Term Dispersion Estimates*[12] *(continued)*			
	χ/Q: *RB-VS* *TB-VS* *RW-VS*	 *1.5E-07 s/m*^{3} *1.2E-07 s/m*^{3} *5.0E-06 s/m*^{3}	**ESP** 2.0×10^{-6} s/m^3, annual average, undepleted/2.26-day decay, nearest vegetable garden, northeast, 1.5 km (0.94 mi)	The ESP site characteristic value for this long term dispersion estimate is defined as the maximum annual average vegetable garden undepleted 2.26-day decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. The ESP site characteristic value does not fall within (is greater than) two of the DCD site parameter values.
			Unit 3 RB-VS 6.8×10^{-8} s/m^3 North-northeast 0.74 mi TB-VS 5.5×10^{-8} s/m^3 North-northeast 0.74 mi RW-VS 8.3×10^{-7} s/m^3 North-northeast 0.74 mi	The Unit 3 site characteristic values for this long term dispersion estimate are provided in Table 2.3-16R. The Unit 3 site characteristic values fall within (are smaller than) the DCD site parameter values. See Section 12.2 for the site-specific concentration and dose analysis inputs and results. The Unit 3 site characteristic values fall within (are smaller than) the ESP site characteristic value.
	χ/Q: *RB-VS* *TB-VS* *RW-VS*	 *1.5E-07 s/m*^{3} *1.2E-07 s/m*^{3} *5.0E-06 s/m*^{3}]*	**ESP** 1.8×10^{-6} s/m^3, annual average, depleted/8.00-day decay, nearest vegetable garden, northeast, 1.5 km (0.94 mi)	The ESP site characteristic value for this long term dispersion estimate is defined as the maximum annual average vegetable garden depleted/8.00-day decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. The ESP site characteristic value does not fall within (is greater than) two of the DCD site parameter values.
			Unit 3 RB-VS 6.6×10^{-8} s/m^3 North-northeast 0.74 mi TB-VS 5.3×10^{-8} s/m^3 North-northeast 0.74 mi RW-VS 8.2×10^{-7} s/m^3 North-northeast 0.74 mi	The Unit 3 site characteristic values for this long term dispersion estimate are provided in Table 2.3-16R. The Unit 3 site characteristic values fall within (are smaller than) the DCD site parameter values. See Section 12.2 for the site-specific concentration and dose analysis inputs and results. The Unit 3 site characteristic values fall within (are smaller than) the ESP site characteristic value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS COL 2.0-1-A	**Part 1 – Evaluation of DCD Site Parameters**			
	[Long Term Dispersion Estimates [12] (continued)			
	D/Q: *RB-VS* *TB-VS* *RW-VS*	 *4.8E-09 m^{-2}* *3.5E-09 m^{-2}* *1.9E-08 m^{-2}*	**ESP** 6.0×10^{-9} $1/m^2$, annual average, nearest vegetable garden, northeast, 1.5 km (0.94 mi)	The ESP site characteristic value for this long term dispersion estimate is defined as the maximum annual average vegetable garden D/Q value for use in determining gaseous pathway doses to the maximally exposed individual. The ESP site characteristic value does not fall within (is greater than) two of the DCD site parameter values.
			Unit 3 RB-VS 1.8×10^{-9} $1/m^2$ North-northeast 0.74 mi Southeast 0.74 mi TB-VS 1.8×10^{-9} $1/m^2$ North-northeast 0.74 mi RW-VS 4.4×10^{-9} $1/m^2$ South 0.74 mi	The Unit 3 site characteristic values for this long term dispersion estimate are provided in Table 2.3-16R. The Unit 3 site characteristic values fall within (are smaller than) the DCD site parameter values. See Section 12.2 for the site-specific concentration and dose analysis inputs and results. The Unit 3 site characteristic values fall within (are smaller than) the ESP site characteristic value.
	χ/Q: *RB-VS* *TB-VS* *RW-VS*	 *1.5E-07 s/m^3* *1.2E-07 s/m^3* *5.0E-06 s/m^3*	**ESP and Unit 3** No value provided for annual average, nearest cow-milk, undepleted/no decay χ/Q value; annual average undepleted/2.26-day decay χ/Q value; and annual average depleted/8.00-day decay	The ESP and Unit 3 site characteristic values for each of these long term χ/Q dispersion coefficients is "No value provided." The milk exposure pathway was not considered because there are no reported cows or goats used for milk production in the near vicinity of the site, within 5 miles. Each ESP and Unit 3 site characteristic value falls within (is smaller than) the DCD site parameter values. See Section 12.2 for the site-specific concentration and dose analysis inputs and results. The Unit 3 site characteristic values fall within (are the same as) the ESP site characteristic value.
	D/Q: *RB-VS* *TB-VS* *RW-VS*	 *4.8E-09 m^{-2}* *3.5E-09 m^{-2}* *1.9E-08 m^{-2}]**	**ESP and Unit 3** No value provided for annual average, nearest cow-milk	The ESP and Unit 3 site characteristic values for this long term D/Q dispersion estimate is "No value provided." The milk exposure pathway was not considered because there are no reported cows or goats used for milk production in the near vicinity of the site, within 5 miles. The ESP and Unit 3 site characteristic values fall within (are the smaller than) the DCD site parameter values. See Section 12.2 for the site-specific concentration and dose analysis inputs and results. The Unit 3 site characteristic value falls within (is the same as) the ESP site characteristic value.

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Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

NAPS SUP 2.0-1

Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
Part 2 – Evaluation of ESP Site Characteristics and Design Parameters For Which There is No Corresponding DCD Site Parameter			
Site Characteristic			
Exclusion Area Boundary	No value provided	**ESP** Perimeter of a 1524 m (5000 ft) radius circle from the center of the abandoned Unit 3 containment **Unit 3** 10 CFR 100.21(a) Meets requirement	The ESP site characteristic value is defined as the area surrounding the reactor, in which the reactor licensee has the authority to determine all activities including exclusion or removal of personnel and property from the area. The Unit 3 site characteristic is presented as a criterion and the value is described in SSAR Table 1.9-1 as: "The exclusion area boundary is the perimeter of a 5000-ft-radius circle from the center of the abandoned Unit 3 containment." The Unit 3 site characteristic value falls within (is the same as) the ESP site characteristic value.
Low Population Zone	No value provided	**ESP** 9.7 km (6 mi) radius circle centered at the Unit 1 containment building. **Unit 3** 10 CFR 100.21(a) Meets requirement	The ESP site characteristic value is defined as the area immediately surrounding the exclusion area which contains residents. The Unit 3 site characteristic is presented as a criterion and the value is described in SSAR Table 1.9-1 as: "The low population zone is a 6-mile radius circle centered at the Unit 1 containment building." The Unit 3 site characteristic value falls within (is the same as) the ESP site characteristic value.
Population Center Distance	No value provided	**ESP** Minimum of 12.9 km (8 mi) **Unit 3** 10 CFR 100.21(b) Meets requirement	The ESP site characteristic value is defined as the minimum allowable distance from the reactor to the nearest boundary of a densely populated center containing more than about 25,000 residents. The Unit 3 site characteristic is presented as a criterion and the value is described in SSAR Table 1.9-1 as: "The distance from the ESP plant parameter envelope to the nearest boundary of a densely populated center containing more than about 25,000 residents is not less than one and one-third times the distance from the ESP plant parameter envelope to the outer boundary of the LPZ." The Unit 3 site characteristic criterion equates to a minimum of 12.9 km (8 mi) because the Unit 3 LPZ is a 9.7 km (6 mi) radius circle. The Unit 3 site characteristic value falls within (is the same as) the ESP site characteristic value. Unit 3 meets this criterion because, as stated in SSAR Section 2.1.3.5, the nearest population center to Unit 3 with more than 25,000 residents is the City of Charlottesville and the closest point of this city to Unit 3 is 36 miles west.
Maximum Dry-Bulb Temperature 100-year return period	No value provided	**ESP and Unit 3** 42.8ºC (109ºF)	The ESP site characteristic value is defined as the ambient dry-bulb temperature that has a 1% annual probability of being exceeded (100-year mean recurrence interval). The Unit 3 site characteristic value is provided in SSAR Table 2.3-18 and SSAR Table 1.9-1; and falls within (is the same as) the ESP site characteristic value.
Minimum Dry-Bulb Temperature 99.6% annual exceedance	No value provided	**ESP and Unit 3** -10ºC (14ºF)	The ESP site characteristic value is defined as the ambient dry-bulb temperature below which dry-bulb temperature will fall 0.4% of the time annually. The Unit 3 site characteristic value is provided as the 0.4% annual exceedance value for minimum dry bulb temperature in SSAR Table 2.3-18 and SSAR Table 1.9-1; and falls within (is the same as) the ESP site characteristic value.
100-year return period	No value provided	**ESP and Unit 3** –28.3°C (–19°F)	The ESP site characteristic value is defined as the ambient dry-bulb temperature for which a 1% annual probability of a lower dry-bulb temperature exists (100-year mean recurrence interval). The Unit 3 site characteristic value is provided in SSAR Tables 2.3-18 and 1.9-1, and falls within (is the same as) the ESP site characteristic value.

Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

NAPS SUP 2.0-1

Subject[20]	DCD Site Parameter Value[1][20]	Site Characteristic	Evaluation
Part 2 – Evaluation of ESP Site Characteristics and Design Parameters For Which There is No Corresponding DCD Site Parameter			
Site Characteristic (continued)			
Maximum Wet-Bulb Temperature 100-year return period	No value provided	**ESP and Unit 3** 31.1°C (88°F)	The ESP site characteristic value is defined as the ambient wet-bulb temperature that has a 1 percent annual probability of being exceeded (100-year mean recurrence interval). The Unit 3 site characteristic value is provided in SSAR Table 2.3-18 and SSAR Table 1.9-1; and falls within (is the same as) the ESP site characteristic value.
Ultimate Heat Sink Ambient Air Temperature and Humidity			Although the Unit 3 site characteristic value is presented for comparison with the ESP site characteristic value, the ultimate heat sink (UHS) for the passive Unit 3 ESBWR design does not use safety-related engineered underground reservoirs or storage basins. Comparisons of meteorological conditions are provided as information required per 10 CFR 52.79(b)(1).
Meteorological Conditions Resulting in the Minimum Water Cooling During Any 1 Day	No value provided	**ESP and Unit 3** 26.1°C (78.9°F) wet-bulb temperature with coincident 30.9°C (87.7°F) dry-bulb temperature	The ESP site characteristic value is defined as the historic worst 1-day daily average of wet-bulb temperatures and coincident dry-bulb temperatures. The Unit 3 site characteristic value is provided in SSAR Table 1.9-1, which refers to SSAR Section 2.3.1.3.8, and falls within (is the same as) the ESP site characteristic value.
Meteorological Conditions Resulting in the Minimum Water Cooling During Any Consecutive 5 days	No value provided	**ESP and Unit 3** 25.3°C (77.6°F) wet-bulb temperature with coincident 27.2°C (80.9°F) dry-bulb temperature	The ESP site characteristic value is defined as the historic worst 5-day daily average of wet-bulb temperatures and coincident dry-bulb temperatures resulting in minimum water cooling. The Unit 3 site characteristic value is provided in SSAR Table 1.9-1, which refers to SSAR Section 2.3.1.3.8, and falls within (is the same as) the ESP site characteristic value.
Meteorological Conditions Resulting in the Maximum Evaporation and Drift Loss During Any Consecutive 30 Days	No value provided	**ESP and Unit 3** 24.6°C (76.3°F) wet-bulb temperature with coincident 26.4°C (79.5°F) dry-bulb temperature	The ESP site characteristic value is defined as the historic worst 30-day daily average of wet-bulb temperatures and coincident dry-bulb temperatures. The Unit 3 site characteristic value is provided in SSAR Table 1.9-1, which refers to SSAR Section 2.3.1.3.8, and falls within (is the same as) the ESP site characteristic value.
Meteorological Conditions Resulting in the Maximum Water Freezing in the UHS Water Storage Facility	No value provided	**ESP and Unit 3** 179 degree(C)-days (322 degree(F)-days) below freezing	The ESP site characteristic value is defined as the historic maximum cumulative degree-days below freezing. The Unit 3 site characteristic value is provided in SSAR Table 1.9-1, which refers to SSAR Section 2.3.1.3.8, and falls within (is the same as) the ESP site characteristic value.

Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS SUP 2.0-1	**Part 2 – Evaluation of ESP Site Characteristics and Design Parameters For Which There is No Corresponding DCD Site Parameter**			
	Site Characteristic (continued)			
	Hydrology			
	Proposed Facility Boundaries	No value provided	**ESP** Proposed facility boundary as shown in ESP, Appendix A, Figure 1. (Reference 2.0-203) Figure 1 shows the proposed facility boundary using the boundary corners numbered 1-8. Notes 1 and 2 apply.	The ESP site characteristic value is defined as the ESP site boundary map. The Unit 3 site characteristic value, as shown in Figure 2.0-205, falls within (power block buildings which could have postulated accidental fission product releases are located within) the ESP site characteristic value.
	Proposed Facility Boundaries	No value provided	**Unit 3** Figure 2.0-205, which shows that the Unit 3 power block buildings which could have postulated accidental fission product releases are located within the Figure 1 proposed facility boundary.	
NAPS ESP VAR 2.0-7a			Coordinates of the proposed facility boundaries are shown in Figure 2.0-205.	ESP, Appendix A, Figure 1, Note 1 states: "North Anna Site and State NAD 83 (South Zone) coordinates are shown as noted." There are two sets of values given as Coordinates (NAPS GRID) and Coordinates (State NAD 83 South Zone). The Unit 3 site characteristics are two sets of values given in Figure 2.0-205 as COORDINATES (NAPS U1 & U2 GRID) and COORDINATES (STATE PLANE NAD 83 VA SOUTH ZONE). The Unit 3 values for the COORDINATES (NAPS U1 & U2 GRID) fall within (are the same as) the ESP Coordinates (NAPS GRID) values. The Unit 3 values for the COORDINATES (STATE PLANE NAD 83 VA SOUTH ZONE) do not fall within (are different from) the ESP Coordinates (State NAD 83 South Zone) values.
NAPS ESP VAR 2.0-7b			No removal of abandoned mat foundations unless a Unit 3 Seismic Category I or II structure would be located above a foundation.	ESP, Appendix A, Figure 1, Note 2 states: "Abandoned Unit 3 and 4 Reactor Building Mat Foundations are to be removed." The Unit 3 Site characteristic is no removal of abandoned mat foundations unless a Unit 3 Seismic Category I or II structure would be located above a foundation. The Unit 3 site characteristic does not fall within (is not the same as) the ESP site characteristic.
	Minimum Lake Water Level	No value provided	**ESP and Unit 3** 242 ft msl which corresponds to 241.14 ft NAVD88 (242 ft NGVD29)	The ESP site characteristic value is defined as the low water surface shutdown elevation for operation of NAPS Units 1 and 2, and Unit 3. The Unit 3 site characteristic value is provided in Section 2.4.14 and falls within (is the same as) the ESP site characteristic value.
	Frazil and Anchor Ice	No value provided	**ESP and Unit 3** Potential for formation of frazil and anchor ice	The ESP site characteristic value is defined as the accumulated ice formation in a turbulent flow condition. The Unit 3 site characteristic value is provided in SSAR Table 1.9-1, which refers to SSAR Section 2.4.7.4, and falls within (is the same as) the ESP site characteristic value.
	Maximum Ice Thickness	No value provided	**ESP and Unit 3** 43.4 cm (17.1 in) thick	The ESP site characteristic value is defined as the ice sheet thickness at Lake Anna (based on maximum cumulative degree-days below freezing of 178.8ºC (321.8ºF)). The Unit 3 site characteristic value is provided in SSAR Section 2.4.7 and falls within (is the same as) the ESP site characteristic value.

Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS SUP 2.0-1	**Part 2 – Evaluation of ESP Site Characteristics and Design Parameters For Which There is No Corresponding DCD Site Parameter**			
	Site Characteristic (continued)			
	Hydrology (continued)			
	Max Cumulative Degree-Days Below Freezing	No value provided	**ESP** 178.8 degree(C)-days (321.8 degree(F)-days) **Unit 3** 179 degree(C)-days (322 degree(F)-days)	The ESP site characteristic value is defined as the measure of severity of winter weather conditions conducive to ice formation (computed using air temperature data from the Piedmont Research Station). The Unit 3 site characteristic value is provided in SSAR Section 2.3.1.3.8 and falls within (is greater than–essentially the same as) the ESP site characteristic value.
	Hydraulic Conductivity	No value provided	**ESP** 1.0 m/d (3.4 ft/d)	The ESP site characteristic value is defined as the groundwater flow rate per unit hydraulic gradient. SSAR Table 1.9-1 identifies the hydraulic conductivity as 1.0 m/d (3.4 ft/d).
NAPS ESP VAR 2.0-2			**Unit 3** 3.0 m/d (9.9 ft/d)	The Unit 3 site characteristic value is provided in Section 2.4.12 and does not fall within (is greater than) the ESP site characteristic value.
	Hydraulic Gradient	No value provided	**ESP** 0.03 m/m (0.03 ft/ft)	The ESP site characteristic value is defined as the slope of groundwater surface under unconfined conditions or slope of hydraulic pressure head under confined conditions. SSAR Table 1.9-1 identifies the hydraulic gradient as 0.03 m/m (0.03 ft/ft).
NAPS ESP VAR 2.0-3			**Unit 3** 0.05 m/m (0.05 ft/ft)	The Unit 3 site characteristic value is provided in Section 2.4.12 and does not fall within (is greater than) the ESP site characteristic value.
	Basic Geologic and Seismic Information Capable Tectonic Structures	No value provided	**ESP and Unit 3** No fault displacement potential within the investigative area	The ESP site characteristic value is defined as no fault displacement potential within the investigative area. The Unit 3 site characteristic value is provided in SSAR Sections 2.5.1.2.4 and 2.5.3.2.2, as identified in SSAR Table 1.9-1. The Unit 3 site characteristic value falls within (is the same as) the ESP site characteristic value.
	Vibratory Ground Motion Design Response Spectra (GMRS)	No value provided	**ESP** ESP, Appendix A, Figure 2	The ESP site characteristic values are the horizontal and vertical response spectra provided in ESP, Appendix A, Figure 2. SSAR Table 1.9-1 states that the site-specific response spectra are provided in SSAR Section 2.5.2.6. That section includes SSAR Figure 2.5-48A which is the same as ESP, Appendix A, Figure 2.
NAPS ESP VAR 2.0-4			**Unit 3** Figure 2.5.2-313	The Unit 3 site characteristic values are the horizontal and vertical ground motion response spectra (GMRS) provided in Figure 2.5.2-313. The Unit 3 site characteristic values (response spectra) do not fall within (are not lower than) the ESP site characteristic values (response spectra) at every frequency. Figure 2.0-206 and Table 2.0-202 compare the ESP and Unit 3 horizontal GMRS. Figure 2.0-207 and Table 2.0-203 compare the ESP and Unit 3 vertical GMRS. The tables show where the Unit 3 GMRS exceed the ESP spectra.

Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS SUP 2.0-1	**Part 2 – Evaluation of ESP Site Characteristics and Design Parameters For Which There is No Corresponding DCD Site Parameter**			
	Site Characteristic (continued)			
	Stability of Subsurface Materials and Foundations			
	Zone III Weathered Rock (205 ft–298 ft)			
	Minimum Bearing Capacity	No value provided	**ESP** 766 kPa (16 ksf) **Unit 3** 958 kPa (20 ksf)	The ESP site characteristic value is defined as the allowable load-bearing capacity of layer supporting plant structures. The Unit 3 site characteristic value is provided in Table 2.5.4-211 and falls within (is greater than) the ESP site characteristic value. SSAR Table 1.9-1 refers to the value in SSAR Table 2.5-47, which is 766 kPa (16 ksf).
	Minimum Shear Wave Velocity	No value provided	**ESP** 610 m/sec (2000 ft/sec) **Unit 3** 914 m/sec (3000 ft/sec)	The ESP site characteristic value is defined as the propagation of shear waves through foundation materials. The Unit 3 site characteristic value is the best estimate shear wave velocity in Table 2.5.4-211. This corresponds to the best estimate ESP shear wave velocity in SSAR Table 1.9-1, which refers to SSAR Table 2.5-45, and FSER Section 2.5.4.1.7 (Reference 2.0-202). The Unit 3 site characteristic value falls within (is greater than) the ESP site characteristic value.
	Zone III–IV			
	Minimum Bearing Capacity	No value provided	**ESP and Unit 3** 3830 kPa (80 ksf)	The ESP site characteristic value is defined as the allowable load-bearing capacity of layer supporting plant structures. The Unit 3 site characteristic value is provided in Table 2.5.4-211 falls within (is the same as) the ESP site characteristic value. SSAR Table 1.9-1 refers to the value in SSAR Table 2.5-47, which is 3830 kPa (80 ksf).
	Minimum Shear Wave Velocity	No value provided	**ESP** 1006 m/sec (3300 ft/sec) **Unit 3** 1829 m/sec (6000 ft/sec)	The ESP site characteristic value is defined as the propagation of shear waves through foundation materials. The Unit 3 site characteristic value is the best estimate shear wave velocity in Table 2.5.4-211. This corresponds to the best estimate ESP shear wave velocity in SSAR Table 1.9-1, which refers to SSAR Table 2.5-45, and FSER Section 2.5.4.1.7 (Reference 2.0-202). The Unit 3 site characteristic value falls within (is greater than) the ESP site characteristic value.
	Zone IV Bedrock (188 ft–298 ft)			
	Minimum Bearing Capacity	No value provided	**ESP and Unit 3** 7661 kPa (160 ksf)	The ESP site characteristic value is defined as the allowable load-bearing capacity of layer supporting plant structures. The Unit 3 site characteristic value falls within (is the same as) the ESP site characteristic value. Minimum bearing capacities are provided in Table 2.5.4-211. SSAR Table 1.9-1 refers to the value in SSAR Table 2.5-47, which is 7661 kPa (160 ksf).
	Minimum Shear Wave Velocity	No value provided	**ESP** 1920 m/sec (6300 ft/sec) **Unit 3** 2743 m/sec (9000 ft/s)	The ESP site characteristic value is defined as the propagation of shear waves through foundation materials. The Unit 3 site characteristic value is the best estimate shear wave velocity in Table 2.5.4-211. This corresponds to the best estimate ESP shear wave velocity in SSAR Table 1.9-1, which refers to SSAR Table 2.5-45, and FSER Section 2.5.4.1.7 (Reference 2.0-202). The Unit 3 site characteristic value falls within (is greater than) the ESP site characteristic value.

Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS SUP 2.0-1	**Part 2 – Evaluation of ESP Site Characteristics and Design Parameters For Which There is No Corresponding DCD Site Parameter**			
	Bounding Parameters		In the rows below, this column contains ESP Design Parameters and Unit 3 Design Characteristics	
	Maximum Cooling Water Flow Rate – Unit 3	No value provided	**ESP Table B-1 and Unit 3** 5056.3 m^3/h (49.6 cfs)	The ESP bounding design parameter value is defined as the maximum instantaneous withdrawal rate from the North Anna reservoir. The Unit 3 design characteristic value is provided in SSAR Section 2.4.1 and falls within (is the same as) the ESP bounding design parameter value.
	Minimum Site Grade	No value provided	**ESP, Table B-1** 82.6 m (271 ft) msl which corresponds to 270.14 ft NAVD88 (271 ft NGVD29) **Unit 3** 289.5 ft NAVD88 (290.36 ft NGVD29)	The ESP bounding design parameter value is defined as the finished site grade. The Unit 3 design characteristic corresponds to the finished ground level grade in DCD Table 3.4-1. For Unit 3, the finished ground level grade is 0.5 ft lower than the design plant grade value which is 290 ft NAVD88 (290.86 ft NGVD29) as provided in Figure 2.1-201. The Unit 3 value for finished ground level grade is therefore 289.5 ft NAVD88 (290.36 ft NGVD29) and falls within (is greater than) the ESP bounding design parameter value.
NAPS ESP VAR 2.0-6	**Source Term**			
	Gaseous (Post Accident)	See Evaluation column	**ESP** Values in ESP Appendix B tables **SSAR Table 1.9-1** Values in SSAR Section 15.4 tables (maximum values) **Unit 3** Values in DCD Section 15.4 tables	ESP (design) controlling parameters superseded. Design basis accident (DBA) analyses evaluated in SSAR Chapter 15 were based on accidents and associated source terms for the AP1000, ABWR, and the ESBWR plant designs. The source terms for the DBAs evaluated for the ESBWR in DCD Chapter 15 are not bounded by the ESP source terms (included in ESP-003, Appendix B) in all cases. This is variance NAPS ESP VAR 2.0-6. Calculated doses are shown in DCD Chapter 15 to be within limits set by regulatory guidance documents and applicable regulations. Unit 3 site-specific short term (accident) meteorological dispersion values (χ/Q) are demonstrated in Part 1 of this table to fall within the associated DCD site parameter values. Therefore, the doses for the accidents evaluated in DCD Chapter 15 are bounding for Unit 3 and are within limits set by regulatory guidance documents and applicable regulations.

Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject[20]	DCD Site Parameter Value[1][20]	Site Characteristic	Evaluation
NAPS SUP 2.0-2	**Part 3 – Evaluation of SSAR Bounding Site Characteristics and Design Parameters For Which There is No Corresponding ESP or DCD Value**			
	Winter Precipitation			
	100-year Snowpack plus 48-hour Maximum Snowfall	No value provided	**SSAR Table 1.9-1 and Unit 3** 2.18 kPa (45.5 lb/sq ft)	SSAR Table 1.9-1 specifies a value of 2.18 kPa (45.5 lb/sq ft) as the 48-hour maximum snowfall (72.4 cm (28.5 inches), at 0.72 kPa (15 lb/sq ft)) on top of a 100-year return snowpack (1.46 kPa (30.5 lb/sq ft)). The Unit 3 site characteristic value is from SSAR Table 1.9-1 and falls within (is the same as) the SSAR site characteristic value.
	Distribution Coefficients (K_d)			
	Mn-54	No value provided	**SSAR Table 1.9-1** 50 cm^3/g	The SSAR Table 1.9-1 site characteristic value is the distribution coefficient used to assess subsurface hydrological radionuclide transport and is consistent with SSAR Table 2.4-20.
NAPS ESP VAR 2.0-5			**Unit 3** 4.5 cm^3/g	The Unit 3 site characteristic value listed in Table 2.4-207 is the minimum measured K_d value and does not fall within (is less than) the SSAR site characteristic value. See Section 2.4.13 for the radionuclide transport analysis.
	Fe-55 Fe-59	No value provided	**SSAR Table 1.9-1** 165 cm^3/g	The SSAR Table 1.9-1 site characteristic value is the distribution coefficient used to assess subsurface hydrological radionuclide transport and is consistent with SSAR Table 2.4-20.
			Unit 3 4504 cm^3/g	The Unit 3 site characteristic value listed in Table 2.4-207 is the minimum measured K_d value and falls within (is greater than) the SSAR site characteristic value. See Section 2.4.13 for the radionuclide transport analysis.
	Co-58 Co-60	No value provided	**SSAR Table 1.9-1** 60 cm^3/g	The SSAR Table 1.9-1 site characteristic value is the distribution coefficient used to assess subsurface hydrological radionuclide transport and is consistent with SSAR Table 2.4-20.
NAPS ESP VAR 2.0-5			**Unit 3** 6.5 cm^3/g	The Unit 3 site characteristic value listed in Table 2.4-207 is the minimum measured K_d value and does not fall within (is less than) the SSAR site characteristic value. See Section 2.4.13 for the radionuclide transport analysis.
	Zn-65	No value provided	**SSAR Table 1.9-1** 200 cm^3/g	The SSAR Table 1.9-1 site characteristic value is the distribution coefficient used to assess subsurface hydrological radionuclide transport and is consistent with SSAR Table 2.4-20.
NAPS ESP VAR 2.0-5			**Unit 3** 11.8 cm^3/g	The Unit 3 site characteristic value listed in Table 2.4-207 is the minimum measured K_d value and does not fall within (is less than) the SSAR site characteristic value. See Section 2.4.13 for the radionuclide transport analysis.
	Rb-89 Sr-89 Sr-90 Y-90 Sr-91 Y-91m Y-91	No value provided	**SSAR Table 1.9-1** 15 cm^3/g	The SSAR Table 1.9-1 site characteristic value is the distribution coefficient used to assess subsurface hydrological radionuclide transport and is consistent with SSAR Table 2.4-20.
NAPS ESP VAR 2.0-5			**Unit 3** 3.6 cm^3/g	The Unit 3 site characteristic value for Sr listed in Table 2.4-207 is the minimum measured K_d value and does not fall within (is less than) the SSAR site characteristic value. The K_d value for each of the other listed nuclides is assumed to be the same as for Sr. See Section 2.4.13 for the radionuclide transport analysis.
	Ru-106 Rh-106	No value provided	**SSAR Table 1.9-1** 55 cm^3/g	The SSAR Table 1.9-1 site characteristic value is the distribution coefficient used to assess subsurface hydrological radionuclide transport and is consistent with SSAR Table 2.4-20.
			Unit 3 272 cm^3/g	The Unit 3 site characteristic value for Ru listed in Table 2.4-207 is the minimum measured K_d value and falls within (is greater than) the SSAR site characteristic value. The K_d value for Rh is assumed to be the same as for Ru. See Section 2.4.13 for the radionuclide transport analysis.

Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS SUP 2.0-2	**Part 3 – Evaluation of SSAR Bounding Site Characteristics and Design Parameters For Which There is No Corresponding ESP or DCD Value**			
	Distribution Coefficients (K_d) (continued)			
	Cs-134 Cs-137 Ba-137m	No value provided	**SSAR Table 1.9-1** 30 cm^3/g **Unit 3** 64.9 cm^3/g	The SSAR Table 1.9-1 site characteristic value is the distribution coefficient used to assess subsurface hydrological radionuclide transport and is consistent with SSAR Table 2.4-20. The Unit 3 site characteristic value for Cs listed in Table 2.4-207 is the minimum measured K_d value and falls within (is greater than) the SSAR site characteristic value. The K_d value for Ba is assumed to be the same as for Cs. See Section 2.4.13 for the radionuclide transport analysis.
	Ni-63	No value provided	**SSAR Table 1.9-1** No value provided **Unit 3** 12.7 cm^3/g	SSAR Table 1.9-1 does not identify a distribution coefficient for this radionuclide. The Unit 3 site characteristic value listed in Table 2.4-207 is the minimum measured K_d value and is the distribution coefficient used to assess subsurface hydrological radionuclide transport. See Section 2.4.13 for the radionuclide transport analysis.
	Ag-110m Ag-110	No value provided	**SSAR Table 1.9-1** No value provided **Unit 3** 2.5 cm^3/g	SSAR Table 1.9-1 does not identify a distribution coefficient for this radionuclide. The Unit 3 site characteristic value listed in Table 2.4-207 is the minimum measured K_d value and is the distribution coefficient used to assess subsurface hydrological radionuclide transport. See Section 2.4.13 for the radionuclide transport analysis.
	Ce-144 Pr-144m Pr-144	No value provided	**SSAR Table 1.9-1** No value provided **Unit 3** 329.1 cm^3/g	SSAR Table 1.9-1 does not identify a distribution coefficient for this radionuclide. The Unit 3 site characteristic value listed in Table 2.4-207 is the minimum measured K_d value and is the distribution coefficient used to assess subsurface hydrological radionuclide transport. The K_d value for Pr is assumed to be the same as for Ce. See Section 2.4.13 for the radionuclide transport analysis.
	Np-239 Pu-239	No value provided	**SSAR Table 1.9-1** No value provided **Unit 3** 5.3 cm^3/g	SSAR Table 1.9-1 does not identify a distribution coefficient for this radionuclide. The Unit 3 site characteristic value listed in Table 2.4-207 is the minimum measured K_d value and is the distribution coefficient used to assess subsurface hydrological radionuclide transport. The K_d value for Np is assumed to be the same as for Pu. See Section 2.4.13 for the radionuclide transport analysis.
	Dose Consequences			
NAPS ESP VAR 2.0-6	Post Accident	No value provided	**SSAR Table 1.9-1** 10 CFR 50.34(a)(1) and 10 CFR 100 dose limits **Unit 3** 10 CFR 50.34(a)(1) and 10 CFR 100 dose limits	The Unit 3 site characteristic criteria fall within (are the same as) the SSAR Table 1.9-1 site characteristic criteria. SSAR Table 1.9-1 states that the radiological dose consequences due to gaseous releases from postulated plant accidents are addressed in SSAR Sections 15.2 and 15.4. SSAR Section 15.2 provides the site-specific χ/Q values for accident evaluations. The Unit 3 values are provided under Meteorological Dispersion (χ/Q) in Part 1 of this table above and the values fall within (are the same as) the SSAR Table 1.9-1 (SSAR Section 15.2) values. SSAR Section 15.4 provides dose estimates for three reactors. The estimates for the ABWR and AP-1000 do not apply to Unit 3. SSAR Section 15.4 provides estimated doses for postulated ESBWR design basis accidents (DBAs). Since the SSAR was submitted, activity releases were revised for the ESBWR DBAs. The Unit 3 dose from each DBA is provided in DCD Section 15.4, which conservatively assumes DCD χ/Q values rather than the Unit 3 site-specific χ/Q values. The DCD χ/Q values bound the Unit 3 values as shown under Meteorological Dispersion (χ/Q) in Part 1 of this table above. Most Unit 3 doses do not fall within (are larger than) the SSAR Table 1.9-1 (SSAR Section 15.4) values. While, the Unit 3 doses based on the DCD values are below the regulatory limits, this is NAPS ESP VAR 2.0-6.

Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

NAPS SUP 2.0-2

Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
Part 3 – Evaluation of SSAR Bounding Site Characteristics and Design Parameters For Which There is No Corresponding ESP or DCD Value			
Release Point			
Minimum Distance to Site Boundary	No value provided	**SSAR Table 1.9-1** 870.17 m (2854.9 ft) **Unit 3** 0.54 mi	The Unit 3 site characteristic value falls within (is the same as) the SSAR Table 1.9-1 site characteristic value (when feet are converted to miles). Table 2.3-15R identifies this distance as the closest point from the plant facility boundary to the EAB. The plant facility boundary is the basis for estimating distances for χ/Q values used in SSAR Table 2.3-15 and remains the basis for the Unit 3 site-specific χ/Q values. Figure 2.0-205 shows that Unit 3 power block buildings which could have postulated accidental fission product releases are located within that boundary. Because the buildings are within the boundary, the minimum distance to the site boundary is conservatively estimated. DCD Figure 2A-1 shows the potential release points for the Unit 3 power block buildings.
Population Density			
Population density at the time of initial site approval and within about 5 years thereafter	No value provided	**SSAR Table 1.9-1** Population density meets the guidance of RS-002, Section 2.1.3 for RG 4.7, Regulatory Position C.4 **Unit 3** Population density meets the guidance of RS-002, Section 2.1.3 for RG 4.7, Regulatory Position C.4	Based on SSAR Table 1.9-1, the Unit 3 site characteristic criterion is that at the time of initial site approval and within about 5 years hereafter, the population densities, including weighted transient population, averaged over any radial distance out to 20 miles (cumulative population at a distance divided by the circular area at that distance), would not exceed 500 persons per square mile. The Unit 3 site characteristic criterion falls within (is the same as) the SSAR Table 1.9-1 criterion. Time dependent population densities are provided in SSAR Section 2.1.3.6 which refers to SSAR Figure 2.1-14. That figure shows the projected population density at 2040 (i.e., much later than 5 years after expected initial site approval) meets the requirement.
Population density at the time of initial operation	No value provided	**SSAR Table 1.9-1** Population density meets the guidance of RS-002, Section 2.1.3 **Unit 3** Population density meets the guidance of RS-002, Section 2.1.3	Based on SSAR Table 1.9-1, the Unit 3 site characteristic criterion is that the population densities, including weighted transient population, averaged over any radial distance out to 30 miles (cumulative population at a distance divided by the area at that distance), would not exceed 500 persons per square mile at the time of initial operation. The Unit 3 site characteristic criterion falls within (is the same as) the SSAR Table 1.9-1 criterion. Time dependent population densities are provided in SSAR Section 2.1.3.6 which refers to SSAR Figure 2.1-14. That figure shows the projected population density at 2040 (i.e., much later than the expected time of initial operation) meets the requirement.
Population density over the lifetime of the new units until 2065	No value provided	**SSAR Table 1.9-1** Population density meets the guidance of RS-002, Section 2.1.3 **Unit 3** Population density meets the guidance of RS-002, Section 2.1.3	Based on SSAR Table 1.9-1, the Unit 3 site characteristic criterion is that the population densities, including weighted transient population, averaged over any radial distance out to 30 miles (cumulative population at a distance divided by the area at that distance), would not exceed 1000 persons per square mile over the lifetime of Unit 3. The Unit 3 site characteristic criterion falls within (is the same as) the SSAR Table 1.9-1 criterion. Time dependent population densities are provided in SSAR Section 2.1.3.6 which refers to SSAR Figure 2.1-14. That figure shows the projected population density over the lifetime of Unit 3 operation meets the requirement.

BASIS: ESBWR COLA

Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject [20]	DCD Site Parameter Value [1][20]	Site Characteristic	Evaluation
NAPS SUP 2.0-2	**Part 3 – Evaluation of SSAR Bounding Site Characteristics and Design Parameters For Which There is No Corresponding ESP or DCD Value**			
	Population Density (continued)			
	Site is Away from Very Densely Populated Centers	No value provided	**SSAR Table 1.9-1** 10 CFR 100.21(h) Meets requirement **Unit 3** 10 CFR 100.21(h) Meets requirement	Based on SSAR Table 1.9-1, the Unit 3 site characteristic criterion is that reactor sites should be located away from very densely populated centers. Areas of low population density are, generally, preferred. However, in determining the acceptability of a particular site located away from a very densely populated center but not in an area of low density, consideration will be given to safety, environmental, economic, or other factors, which may result in the site being found acceptable. The Unit 3 site characteristic criterion falls within (is the same as) the SSAR Table 1.9-1 criterion. SSAR Section 2.1.3.5 identifies that the nearest population center with more than 25,000 residents is the City of Charlottesville which is 36 miles away.
	Design Parameter	In the following rows, values for Unit 3 design characteristics presented in the DCD are identified in the Evaluation column	In the following rows, this column contains SSAR Table 1.9-1, Design Parameters and Unit 3 Design Characteristics	
	Structure Height	See Evaluation column	**SSAR Table 1.9-1** ≤71.3 m (234 ft) **Unit 3** 71.3 m (234 ft)	The tallest power block structure is the Turbine Building vent stack (see DCD Table 2B-1) at 71.3 m (234 ft) above finished grade. This is the Unit 3 design characteristic value. The Unit 3 design characteristic value falls within (is equal to) the SSAR Table 1.9-1 design parameter value.
	Structure Foundation Embedment	See Evaluation column	**SSAR Table 1.9-1** ≤42.7 m (140 ft) **Unit 3** 20 m (65.6 ft) Nominal	The Unit 3 design characteristic value for structure foundation embedment is based on the bottom of the deepest power block structure basemat, which is the reactor building at 20 m (65.62 ft) nominal, below finished ground level grade (El. 88.24 m (289.50 ft NAVD88 (290.36 ft NGVD29)). The embedment of 20 m (65.62 ft) is based on the lowest elevation of -15.5 m (50.85 ft) and a finished ground level grade of +4.5 m (14.76 ft), yielding a depth of 20 m (65.62 ft), not including concrete fill below the basemat. This Unit 3 design characteristic value is shown in Table 2.5.4-209. The Unit 3 design characteristic value falls within (is less than) the SSAR Table 1.9-1 design parameter value.

Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics

	Subject[20]	DCD Site Parameter Value[1][20]	Site Characteristic	Evaluation
NAPS SUP 2.0-2	**Part 3 – Evaluation of SSAR Bounding Site Characteristics and Design Parameters For Which There is No Corresponding ESP or DCD Value**			
	Normal Plant Heat Sink **Unit 3 Closed-Cycle, Dry and Wet Tower**			
	Make-Up Flow Rate	No value provided	**SSAR Table 1.9-1** ≤84.30 m^3/m (22,269 gpm) maximum (EC mode) **Unit 3** 84.26 m^3/m (22,260 gpm) maximum (EC mode)	The Unit 3 design characteristic value for the hybrid cooling tower makeup rate in EC mode plus the PSWS cooling tower makeup rate is the expected rate of water withdrawal from Lake Anna to replace water lost from the operation of both closed-cycle cooling water systems during this mode. The losses are from evaporation, blowdown, and drift. The Unit 3 design characteristic value for the EC mode of operation falls within (is less than) the SSAR Table 1.9-1 design parameter value.
	Blowdown Flow Rate	No value provided	**SSAR Table 1.9-1** ≤21.1 m^3/m (5565 gpm) maximum (EC mode) **Unit 3** 21.0 m^3/m (5558 gpm) maximum (EC mode)	The Unit 3 design characteristic value for the cooling systems' blowdown rate is the expected rate at which water is lost through blowdown flows from the closed-cycle cooling water systems (CIRC and PSWS) to the Waste Heat Treatment Facility (WHTF). The Unit 3 design characteristic value for the EC mode of operation falls within (is less than) the SSAR Table 1.9-1 design parameter value.
	Unit 4 Dry Cooling Towers			
	Evaporation Rate	No value provided	**SSAR Table 1.9-1** None or negligible (on the order of 1 gpm, average) **Unit 3** Not applicable	This design parameter is not applicable because a Unit 4 is not included in this FSAR.
	Make-Up Flow Rate	No value provided	**SSAR Table 1.9-1** None or negligible (on the order of 1 gpm, average) **Unit 3** Not applicable	This design parameter is not applicable because a Unit 4 is not included in this FSAR.
	Release Point			
	Elevation (Post Accident)	No value provided	**SSAR Table 1.9-1** Ground level **Unit 3** Ground level	The Unit 3 design characteristic value is an assumed ground level release point elevation for radiological consequences for accident releases. The Unit 3 design characteristic value falls within (is the same as) the SSAR Table 1.9-1 design parameter value.
	Plant Characteristics			
	Megawatts Thermal	See Evaluation column	**SSAR Table 1.9-1** ≤4500 MWt **Unit 3** 4500 MWt	This Unit 3 design characteristic value of 4500 MWt is the rated reactor thermal power, as described in DCD Section 1.1.2.7. The Unit 3 design characteristic value falls within (is the same as) the SSAR Table 1.9-1 design parameter value.

NAPS COL 2.0-1-A **Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics**

1. [*The site parameters defined in this table are applicable to Seismic Category I, II, and Radwaste Building structures, unless noted otherwise*.
2. *Probable maximum flood level, as defined in Table 1.2-6 of Volume III of Reference 2.0-4.*
3. *Maximum speed selected is based on Attachment I of Reference 2.0-5, which summarizes the NRC Interim Position on Regulatory Guide 1.76. Concrete structures designed to resist Spectrum I missiles of SRP 3.5.1.4, Rev. 2, also resist missiles postulated in Regulatory Guide 1.76, Revision 1. Tornado missiles do not apply to Seismic Category NS and Seismic Category II buildings. For the Radwaste building, the tornado missiles defined in Regulatory Guide 1.143, Table 2, Class RW-IIa apply. The hurricane missile spectrum for Seismic Category NS and Seismic Category II structures that house RTNSS equipment is consistent with the tornado missile spectrum identified in this table. See Tables 19A-3 and 19A-4 for additional details*.
4. *Based on probable maximum precipitation (PMP) for one hour over 2.6 km^2 (one square mile) with a ratio of 5 minutes to one hour PMP of 0.32 as found in Reference 2.0-3. See also Table 3G.1-2*.
5. *See Reference 2.0-9 for the definition of normal winter precipitation and extreme winter precipitation events. The maximum ground snow load for extreme winter precipitation event includes the contribution from the normal winter precipitation event. See also Table 3G.1-2*.
6. *Zero percent exceedance values are based on conservative estimates of historical high and low values for potential sites. Consistent with Reference 2.0-4, they represent historical limits excluding peaks of less than two hours. One and two percent annual exceedance values were selected in order to bound the values presented in Reference 2.0-4 and available Early Site Permit applications*.

NAPS COL 2.0-1-A **Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics**

7. *At the foundation level of Seismic Category I structures. The dynamic bearing pressure is the toe pressure. The maximum static bearing demand is compared with the site-specific allowable static bearing pressure, which is obtained by dividing the ultimate soil bearing capacity by a factor of safety appropriate for the design load combination. The maximum dynamic bearing demand is compared with the site-specific allowable dynamic bearing pressure, which is obtained by dividing the ultimate soil bearing capacity by a factor of safety appropriate for the design load combination. When a site-specific shear wave velocity is between soft soil and medium soil the larger of the soft or medium maximum dynamic bearing demand will be used. When a site-specific shear wave velocity is between medium soil and hard soil the larger of the medium or hard maximum dynamic bearing demand will be used. Alternatively, for soils with a site-specific shear wave velocity a linearly interpolated dynamic bearing demand between soft and medium soil or between medium and hard soil can be used. The shear wave velocities of soft, medium and hard soils are 300 m/sec (1000 ft/sec), 800 m/sec (2600 ft/sec) and greater than or equal to 1700 m/sec (5600 ft/sec), respectively.*
8. *This is the minimum shear wave velocity of the supporting foundation material and material surrounding the embedded walls associated with seismic strains for lower bound soil properties at minus one sigma from the mean. The ratio of the largest to the smallest shear wave velocity over the mat foundation width of the surrounding foundation material does not exceed 1.7.*

NAPS COL 2.0-1-A **Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics**

9. ~~*Safe Shutdown Earthquake (SSE) design ground response spectra of 5% damping, also termed Certified Seismic Design Response Spectra (CSDRS), are defined as free-field outcrop spectra at the foundation level (bottom of the base slab) of the Reactor/Fuel and Control Building structures. For the Firewater Service Complex, which is essentially a surface founded structure, the CSDRS is 1.35 times the values shown in Figures 2.0-1 and 2.0-2 and is defined as free-field outcrop spectra at the foundation level (bottom of the base slab) of the Firewater Service Complex structure.*~~

NAPS DEP 3.7-1 *Safe Shutdown Earthquake (SSE) design ground motion for purposes of seismic design, analysis, and qualification of Unit 3 Reactor Building/Fuel Building (RB/FB) and Control Building (CB) structures, systems, and components, is defined by two sets of ground motion acceleration response spectra (ARS): the standard design Certified Seismic Design Response Spectra (CSDRS), and the site-specific Foundation Input Response Spectra (FIRS) for these two buildings. For Firewater Service Complex (FWSC) that is essentially a surface founded structure, the SSE design ground motion is defined as 1.35 times the spectra of the CSDRS and the FWSC site specific FIRS. Figures 2.0-201 through 2.0-204 present these spectra that define the free-field outcrop motion at the foundation bottom of each structure. DCD Figures 2.0-1 and 2.0-2 present the standard design CSDRS. The same process will be followed for the Seismic Category II and Radwaste Building structures.*

10. *Values reported here are actually design criteria rather than site parameters. They are included here because they don't appear elsewhere in the DCD.*

11. *If a selected site has a χ/Q value that exceeds the ESBWR reference site value, the COL Applicant will address how the radiological consequences associated with the controlling design basis accident continue to meet the dose reference values provided in 10 CFR 52.79(a)(1)(vi) and control room operator dose limits provided in General Design Criterion 19 using site-specific χ/Q values.*

12. *Subsection 12.2.2.1 provides a discussion regarding the χ/Q and D/Q values in this table. Per Subsection 12.2.2.2, a COL applicant is responsible for ensuring that offsite dose (using site-specific generated χ/Q and D/Q values) due to radioactive airborne effluents complies with the regulatory dose limits in Sections II.B and II.C of 10 CFR 50, Appendix I.*

13. *Values were selected to comply with expected requirements of southeastern coastal locations, which include the consideration of hurricanes as described in ASCE 7-02. Wind speeds are considered to be at 10 m (33 ft) above ground per ASCE 7-02. Seismic Category NS buildings that house RTNSS equipment are designed to withstand hurricane Category 5 wind velocity at 87.2 m/s (195 mph), 3-second gust, and missiles generated by that wind velocity. See Tables 19A-3 and 19A-4 for additional details.*

NAPS COL 2.0-1-A **Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics**

14. *Localized liquefaction potential under other than Seismic Category I structures is addressed per SRP 2.5.4 in Table 2.0-2.*
15. *Settlement values are long-term (post-construction) values except for differential settlement within the foundation mat. The design of the foundation mat accommodates immediate and long-term (post-construction) differential settlements after the installation of the basemat.*
16. *For sites not meeting the soil property requirements, a site-specific analysis is required to demonstrate the adequacy of the standard plant design.*
17. *The Maximum Average Dry Bulb Temperature for 0% Exceedance Maximum Temperature Day is defined in Appendix 3H Subsection 3H.3.2.1.1.*
18. *The Minimum Average Dry Bulb Temperature for 0% Exceedance Minimum Temperature Day is defined in Appendix 3H Subsection 3H.3.2.1.2.*
19. *The Maximum High Humidity Average Wet Bulb Globe Temperature Index for 0% Exceedance Maximum Wet Bulb Temperature Day is defined in Appendix 3H Subsection 3.2.1.3.*]*

* Text sections and tables that are bracketed and italicized with an asterisk following the brackets are designated as Tier 2*. Prior NRC approval is required to change. See DCD Appendix 1D.

NAPS COL 2.0-1-A **Table 2.0-201 Evaluation of Site/Design Parameters and Characteristics**

20. Information in this column and notes (1) through (19) are from DCD Table 2.0-1. In these notes, cited appendices, tables, figures, and references are from the DCD.
21. A 140 mph maximum hurricane wind for Unit 3 is based on RG 1.221 as described in Section 2.3.1.3.1.
22. The effects of hurricane missiles are addressed in Section 3.5.1.4.

NAPS COL 2.0-1-A
NAPS ESP VAR 2.0-4

Table 2.0-202 Comparison of the ESP Horizontal SSE Design Response Spectrum for the Top of Zone III-IV and Unit 3 Horizontal GMRS

Freq. (Hz)	GMRS SA[a] (g)	ESP SA[b][c] (g)	Controlling ESP or GMRS[c]
100	0.658	0.555	GMRS
90	0.692	—	—
80	0.769	—	—
70	0.930	—	—
60	1.169	—	—
50	1.408	1.20	GMRS
45	1.505	—	—
40	1.570	—	—
35	1.608	—	—
30	1.629	1.47	GMRS
25	1.648	1.48	GMRS
20	1.560	1.45	GMRS
15	1.352	—	—
12.5	1.169	—	—
10	0.943	0.945	ESP
9	0.863	—	—
8	0.783	0.717	GMRS
7	0.705	—	—
6	0.626	0.481	GMRS
5	0.545	0.376	GMRS
4	0.447	0.287	GMRS
3	0.342	0.214	GMRS
2.5	0.285	0.179	GMRS
2	0.238	0.142	GMRS
1.5	0.182	—	—
1.25	0.149	—	—

NAPS COL 2.0-1-A
NAPS ESP VAR 2.0-4

Table 2.0-202 Comparison of the ESP Horizontal SSE Design Response Spectrum for the Top of Zone III-IV and Unit 3 Horizontal GMRS

Freq. (Hz)	GMRS SA[(a)] (g)	ESP SA[(b)(c)] (g)	Controlling ESP or GMRS[(c)]
1	0.114	0.0677	GMRS
0.9	0.108	—	—
0.8	0.101	0.0576	GMRS
0.7	0.0928	—	—
0.6	0.0834	0.0488	GMRS
0.5	0.0728	0.0429	GMRS
0.4	0.0583	0.0343	GMRS
0.3	0.0437	0.0233	GMRS
0.2	0.0291	0.0130	GMRS
0.167	0.0243	—	—
0.125	0.0182	—	—
0.1	0.0146	0.00382	GMRS

(a) Values from Table 2.5.2-228
(b) Values from SSAR Table 2.5-27A
(c) "—" denotes not applicable: SA(g) value was not calculated for the ESPA SSAR

NAPS COL 2.0-1-A
NAPS ESP VAR 2.0-4

Table 2.0-203 Comparison of the ESP Vertical SSE Design Response Spectrum for the Top of Zone III-IV and Unit 3 Vertical GMRS

Freq. (Hz)	GMRS SA[a] (g)	ESP SA[b][c] (g)	Controlling ESP or GMRS[c]
100	0.658	0.555	GMRS
90	0.718	—	—
80	0.838	—	—
70	1.048	—	—
60	1.329	—	—
50	1.583	1.33	GMRS
45	1.659	—	—
40	1.636	—	—
35	1.577	—	—
30	1.526	1.38	GMRS
25	1.451	1.29	GMRS
20	1.288	1.20	GMRS
15	1.065	—	—
12.5	0.901	—	—
10	0.707	0.708	ESP
9	0.647	—	—
8	0.587	0.537	GMRS
7	0.529	—	—
6	0.469	0.360	GMRS
5	0.409	0.282	GMRS
4	0.335	0.215	GMRS
3	0.257	0.160	GMRS
2.5	0.214	0.134	GMRS
2	0.179	0.106	GMRS
1.5	0.137	—	—
1.25	0.112	—	—
1	0.0856	0.0507	GMRS

NAPS COL 2.0-1-A
NAPS ESP VAR 2.0-4

Table 2.0-203 Comparison of the ESP Vertical SSE Design Response Spectrum for the Top of Zone III-IV and Unit 3 Vertical GMRS

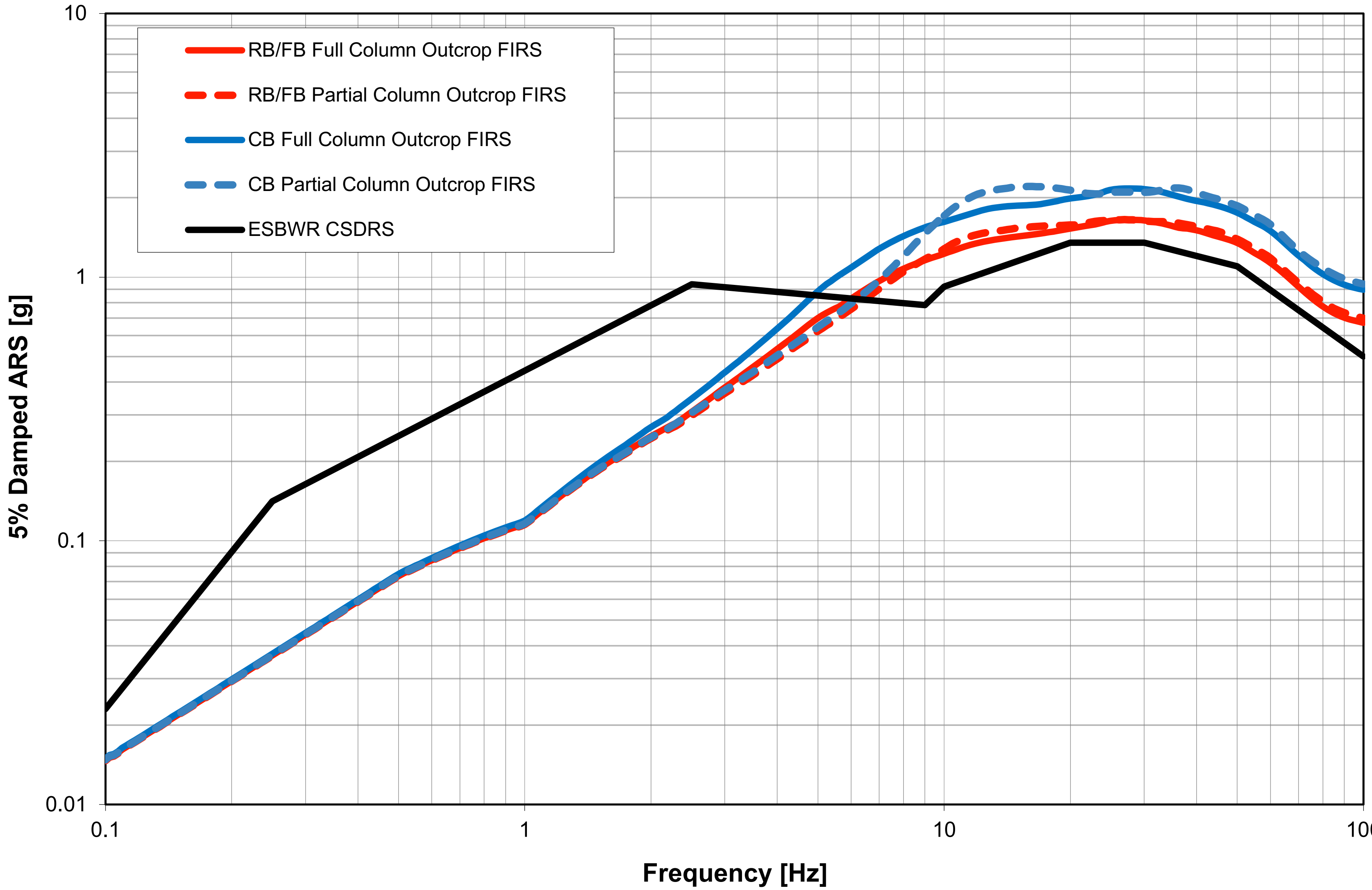
Freq. (Hz)	GMRS SA[(a)] (g)	ESP SA[(b)(c)] (g)	Controlling ESP or GMRS[(c)]
0.9	0.0809	—	—
0.8	0.0757	0.0432	GMRS
0.7	0.0696	—	—
0.6	0.0626	0.0366	GMRS
0.5	0.0546	0.0321	GMRS
0.4	0.0437	0.0257	GMRS
0.3	0.0328	0.0174	GMRS
0.2	0.0218	0.00973	GMRS
0.167	0.0182	—	—
0.125	0.0136	—	—
0.1	0.0109	0.00286	GMRS

(a) Values from Table 2.5.2-228
(b) Values from SSAR Table 2.5-27A
(c) "—" denotes not applicable: SA(g) value was not calculated for the ESPA SSAR

BASIS: NEW

NAPS COL 2.0-1-A
NAPS DEP 3.7-1

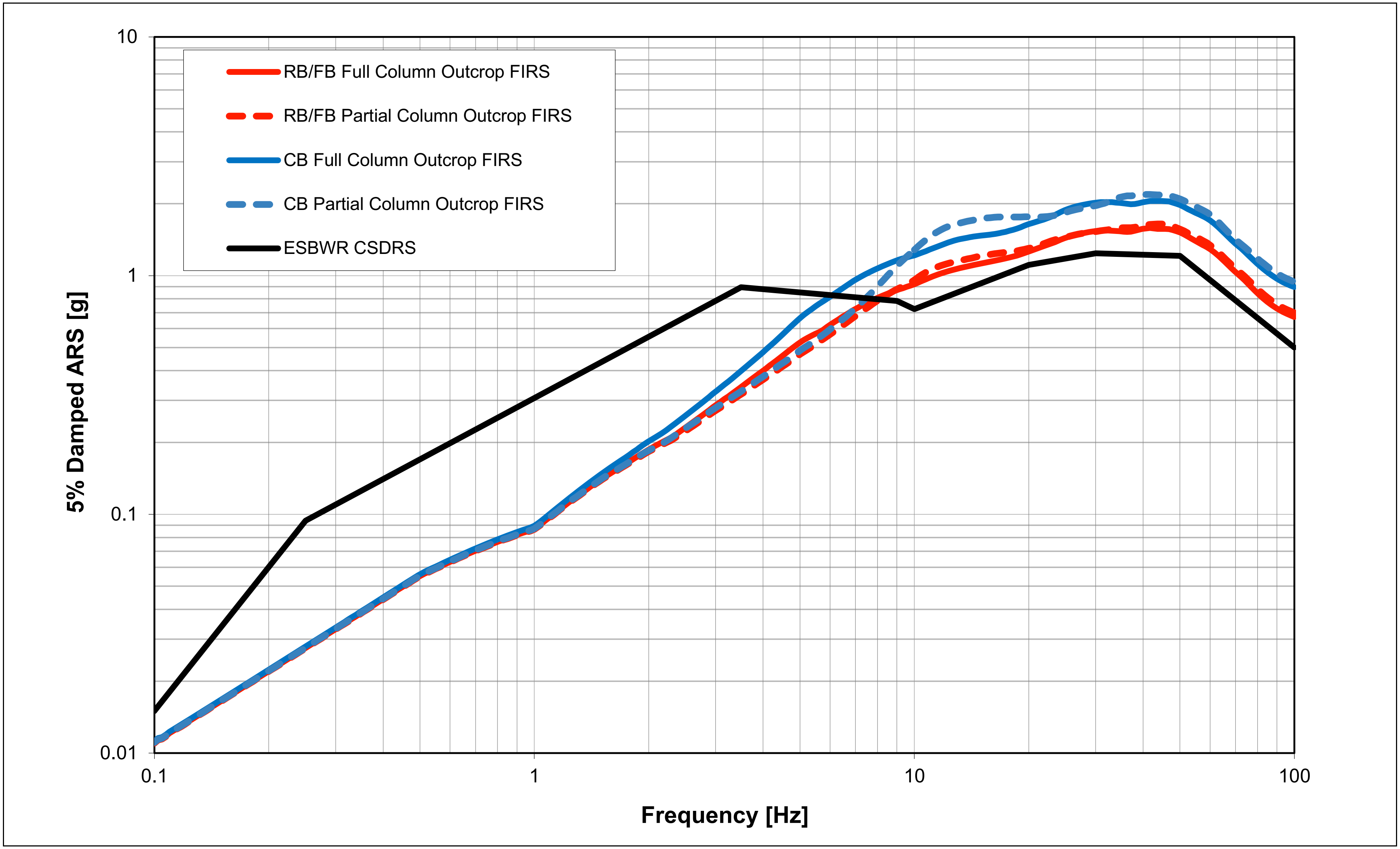
Figure 2.0-201 Comparison of Horizontal CSDRS with Unit 3 FIRS for RB/FB and CB



BASIS: NEW

NAPS COL 2.0-1-A
NAPS DEP 3.7-1

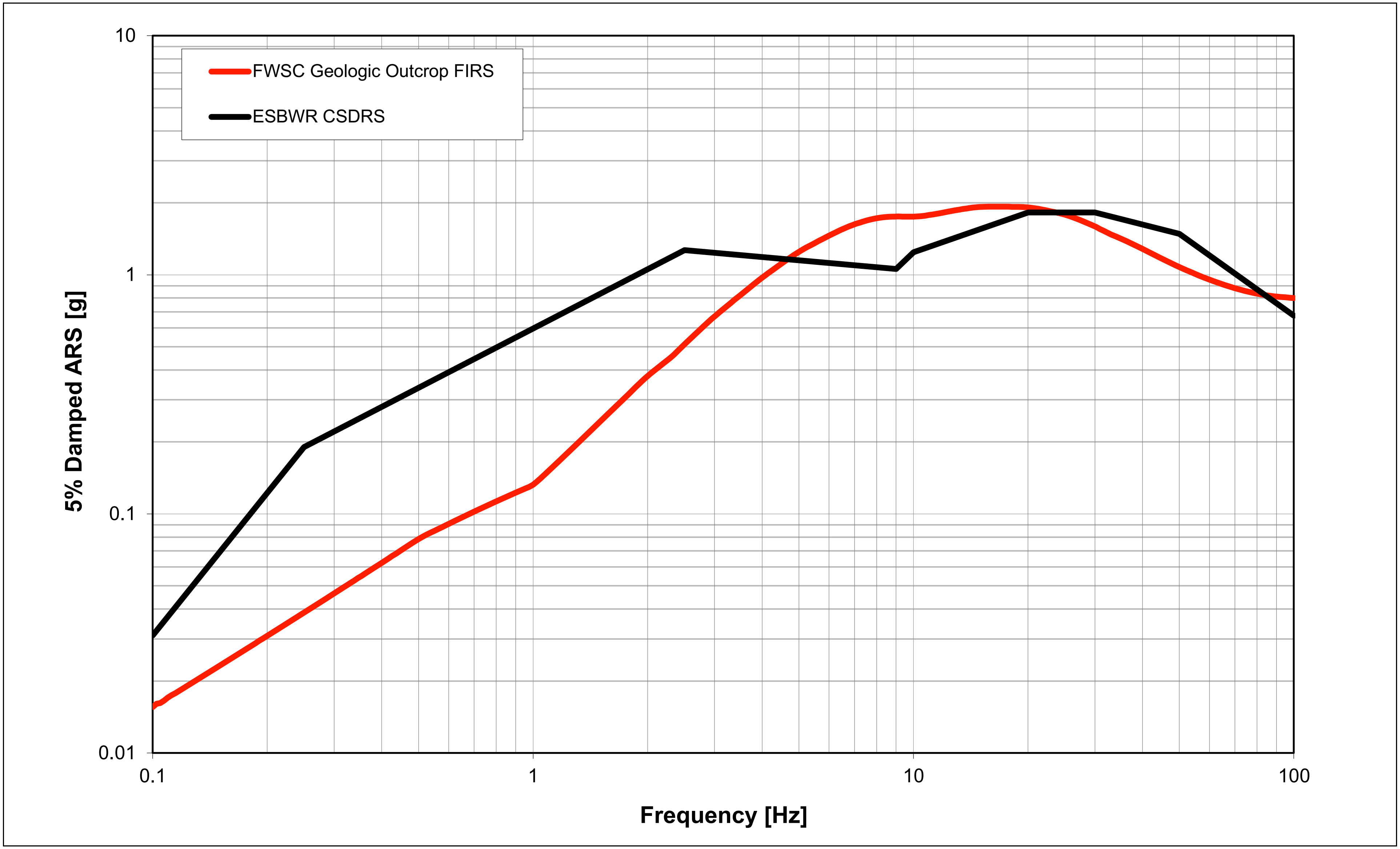
Figure 2.0-202 Comparison of Vertical CSDRS with Unit 3 FIRS for RB/FB and CB



BASIS: NEW

NAPS COL 2.0-1-A
NAPS DEP 3.7-1

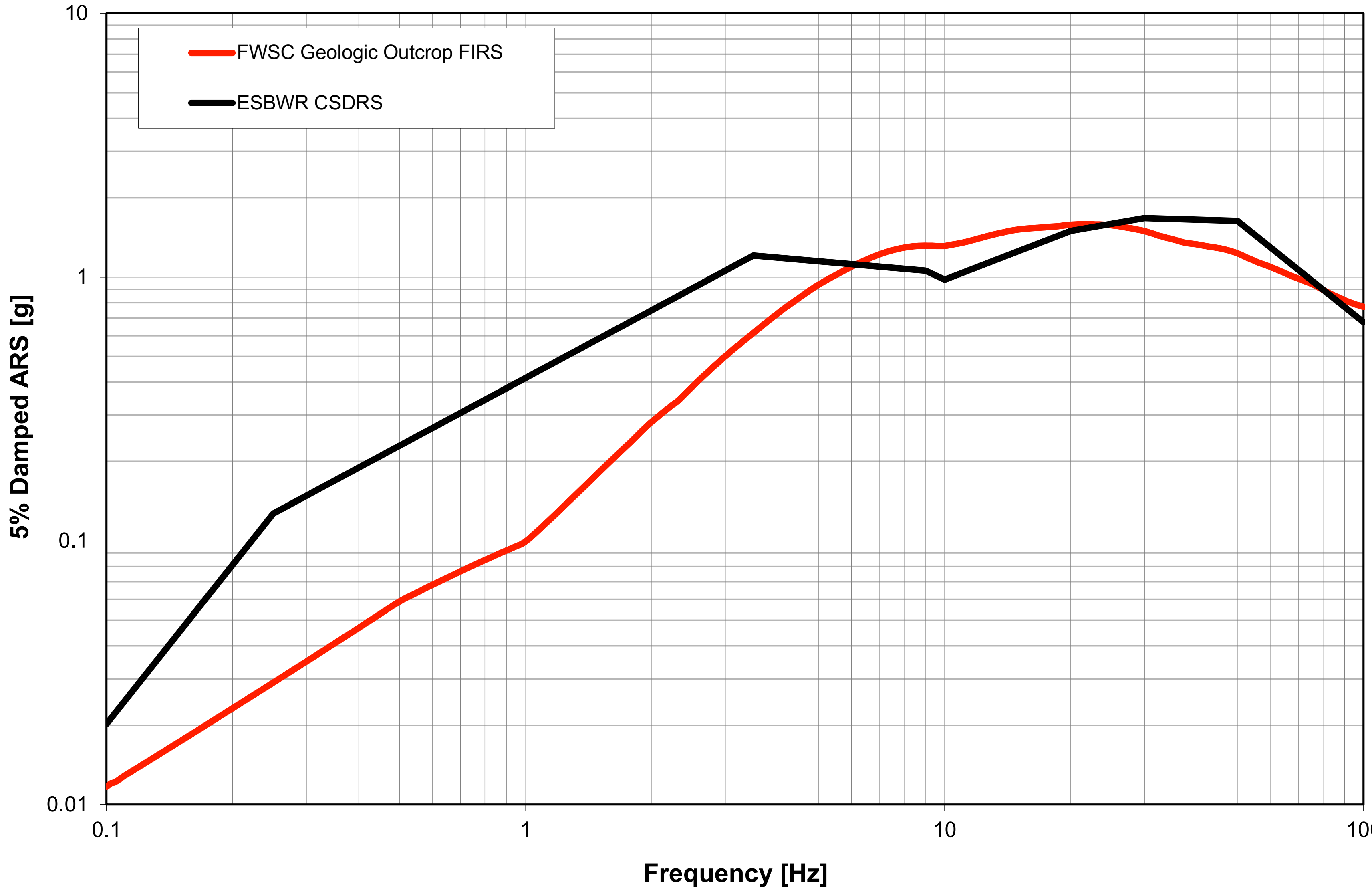
Figure 2.0-203 Comparison of Horizontal CSDRS with Unit 3 FIRS for the FWSC



BASIS: NEW

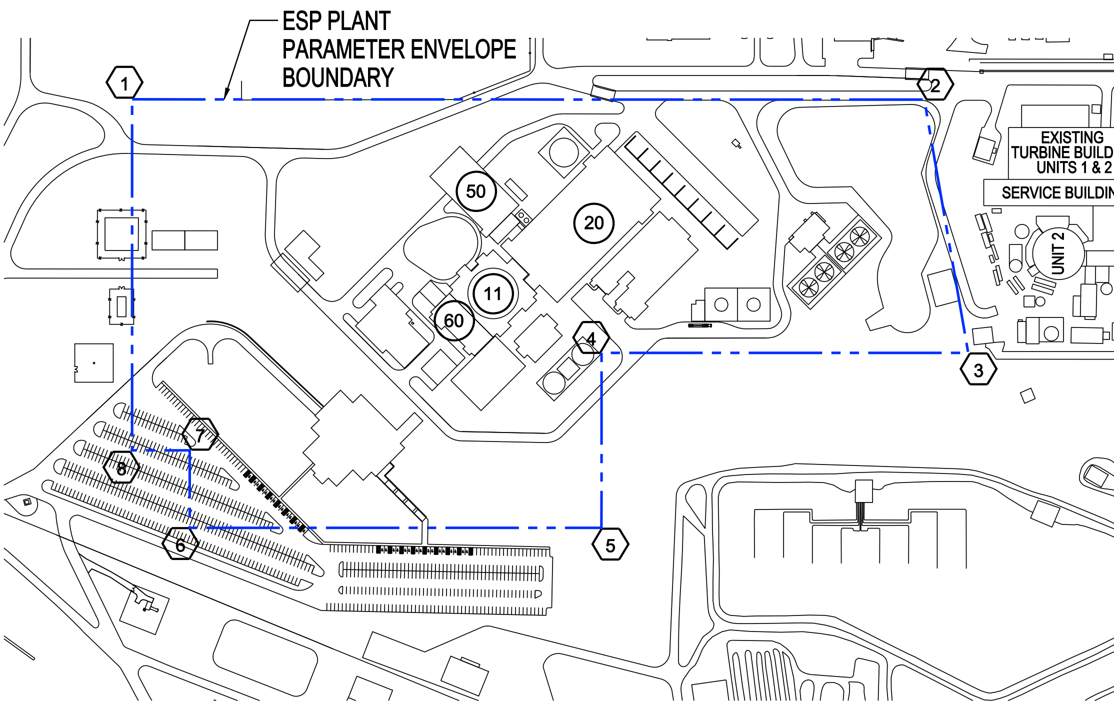
NAPS COL 2.0-1-A
NAPS DEP 3.7-1

Figure 2.0-204 Comparison of Vertical CSDRS with Unit 3 FIRS for the FWSC



NAPS COL 2.0-1-A

Figure 2.0-205 Unit 3 Power Block Building Locations Within the ESP Proposed Facility Boundary

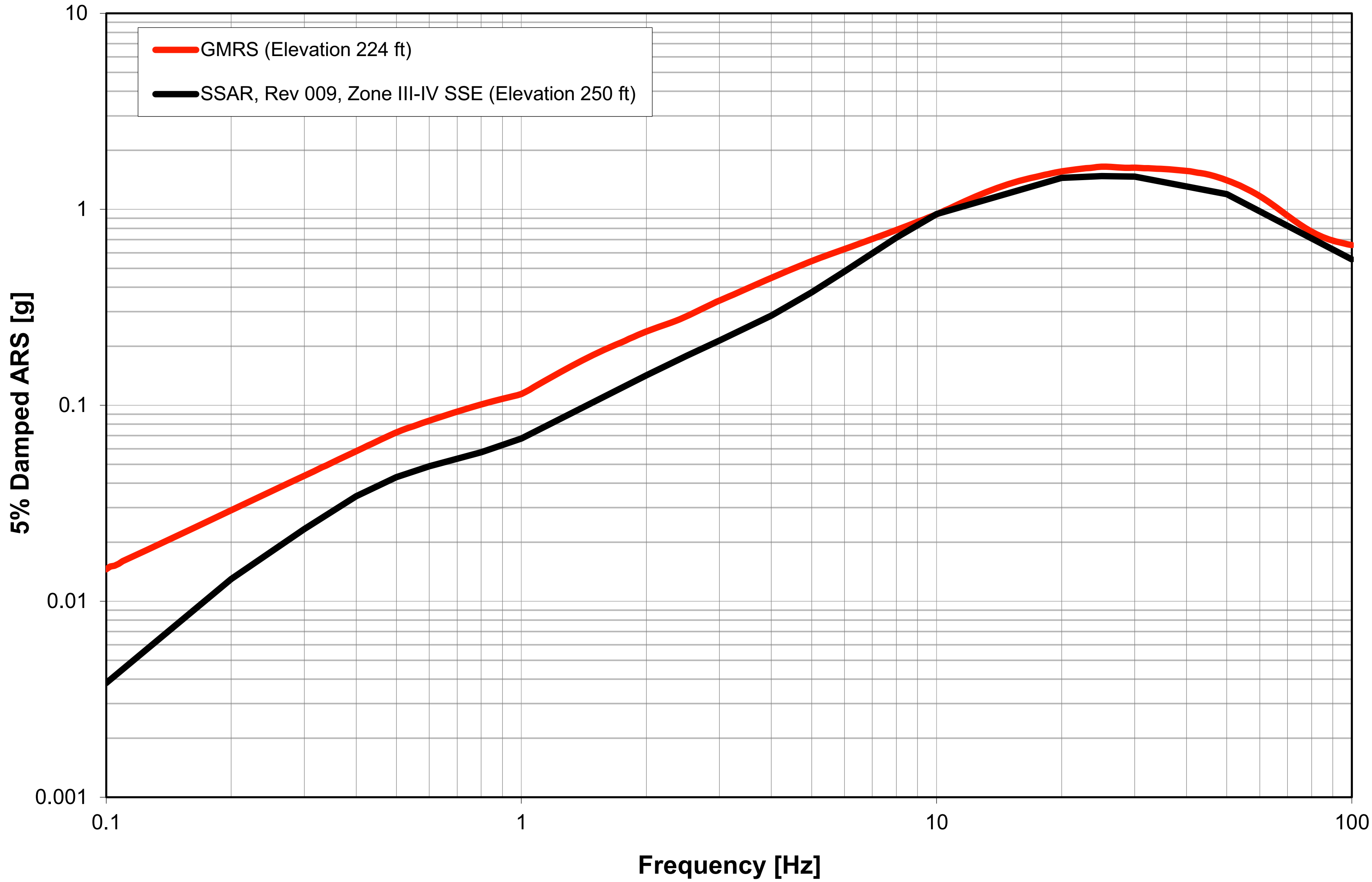


LEGEND:
11 REACTOR BUILDING
20 TURBINE BUILDING
50 RADWASTE BUILDING
60 FUEL BUILDING

⬡	COORDINATES (NAPS U1 & U2 GRID)		COORDINATES (STATE PLANE NAD 83 VA SOUTH ZONE)	
POINT	PLANT NORTH (FEET)	PLANT EAST (FEET)	NORTHING (FEET)	EASTING (FEET)
1	5400.00	7320.00	3909903.70	11684870.43
2	5400.00	9378.00	3910657.08	11686785.57
3	4741.66	9492.26	3910086.27	11687132.90
4	4741.66	8539.65	3909737.54	11686246.42
5	4287.00	8539.65	3909314.44	11686412.86
6	4287.00	7470.00	3908922.87	11685417.46
7	4488.00	7470.00	3909109.92	11685343.88
8	4488.00	7320.00	3909055.00	11685204.29

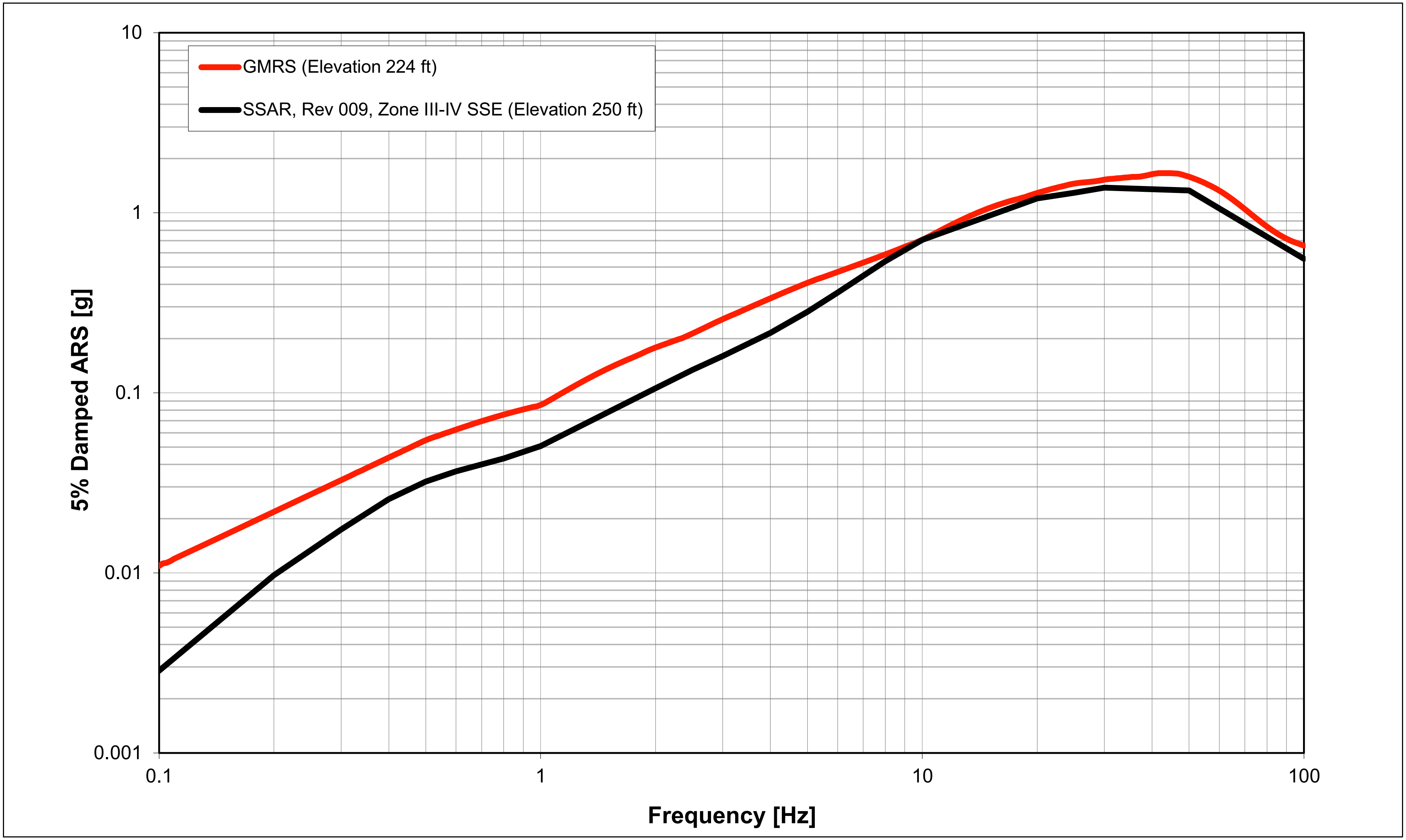
NAPS COL 2.0-1-A
NAPS ESP VAR 2.0-4

Figure 2.0-206 Comparison of the ESP Horizontal SSE Design Response Spectrum for the Top of Zone III-IV and Unit 3 Horizontal GMRS



NAPS COL 2.0-1-A
NAPS ESP VAR 2.0-4

Figure 2.0-207 Comparison of the ESP Vertical SSE Design Response Spectrum for the Top of Zone III-IV and Unit 3 Vertical GMRS



2.1 Introduction

2.1.1 Site Location and Description

NAPS COL 2.0-2-A

The information needed to address DCD COL Item 2.0-2-A is included in SSAR Section 2.1.1, which is incorporated by reference with the following supplements.

2.1.1.1 Site Location

The first paragraph of this SSAR section is supplemented as follows with information on the location of Unit 3 at the NAPS site.

NAPS COL 2.0-2-A

The Unit 3 site plan is shown in Figure 2.1-201 and remains within the ESP proposed facility boundary (ESP plant parameter envelope) as shown in Figure 2.0-205. The center of the Unit 3 Reactor Building is approximately 450 m (1476 ft) southwest of the center of the Unit 2 Containment Building.

NAPS ESP COL 2.1-1

The coordinates of the Unit 3 Reactor Building are:

- Latitude 38 Degrees 03 Minutes 31.01 Seconds (38.058614)
- Longitude 77 Degrees 47 Minutes 41.80 Seconds (77.794944)

The corresponding Universal Transverse Mercator (UTM) coordinates are:

- NAD83, Zone 18-78W to 72W (US ft), N13832016.995/E835901.295

2.1.1.2 Site Description

The last paragraph of this SSAR section is supplemented as follows with information on ownership and control.

NAPS COL 2.0-2-A

Since the ESP Application was submitted by Dominion Nuclear North Anna, LLC, the Commonwealth of Virginia has passed legislation re-regulating the electric power industry in Virginia, and the State Corporation Commission has determined that Dominion should be the COL applicant. In addition, Old Dominion Electric Cooperative (ODEC) has sold to Dominion its interest in the portion of NAPS on which Unit 3 will be located, while retaining its 11.6 percent undivided interest in common in the remainder of NAPS. As a result, rather than Dominion Nuclear North Anna, LLC, purchasing or leasing the ESP Site, Dominion will own the Unit 3 site, and Dominion will continue to control the existing

NAPS exclusion area as a single exclusion area and single restricted area for all reactor units located within the NAPS property, including Unit 3.

2.1.2 Exclusion Area Authority and Control

NAPS COL 2.0-3-A

The information needed to address DCD COL Item 2.0-3-A is included in SSAR Section 2.1.2, which is incorporated by reference with the following supplements.

2.1.2.1 Authority

The first four paragraphs in this SSAR section are supplemented as follows with information to address the authority of the COL applicant.

NAPS COL 2.0-3-A

NAPS ESP PC 3.E(1)

Since the ESP Application was submitted by Dominion Nuclear North Anna, LLC, the Commonwealth of Virginia has passed legislation re-regulating the electric power industry in Virginia, and the State Corporation Commission has determined that Dominion should be the COL applicant. In addition, ODEC has sold to Dominion its interest in the portion of NAPS on which Unit 3 will be located. As a result, rather than Dominion Nuclear North Anna, LLC, purchasing or leasing the ESP Site, Dominion will own the entire Unit 3 site, and Dominion will continue to maintain sole control of the existing exclusion area as a single exclusion area and single restricted area for all of the reactor units located within the NAPS property, including Unit 3. Dominion currently controls the NAPS site and exclusion area under its existing agreement with ODEC, and no approvals are required by state law for shared control of the exclusion area.

As the owner of the Unit 3 site and entity in control of NAPS, Dominion possesses the right to implement the site redress plan.

The last paragraph in this SSAR section is supplemented as follows with information to address recreational use of the lake.

NAPS COL 2.0-3-A

The lake access and control practices in effect for Units 1 and 2 are maintained for Unit 3.

2.1.2.2 Control of Activities Unrelated to Plant Operation

The third paragraph in this SSAR section is supplemented as follows with information to address arrangements with appropriate agencies for emergencies.

NAPS ESP COL 2.1-2

Under the Commonwealth of Virginia's Radiological Emergency Response Plan (COVRERP) (Reference 2.1-201), the Virginia Department of Game and Inland Fisheries is responsible for warning people in boats and assisting in traffic control of boats on Lake Anna in the vicinity of NAPS. This arrangement is documented in the COVRERP, Appendix 1.

2.1.3 Population Distribution

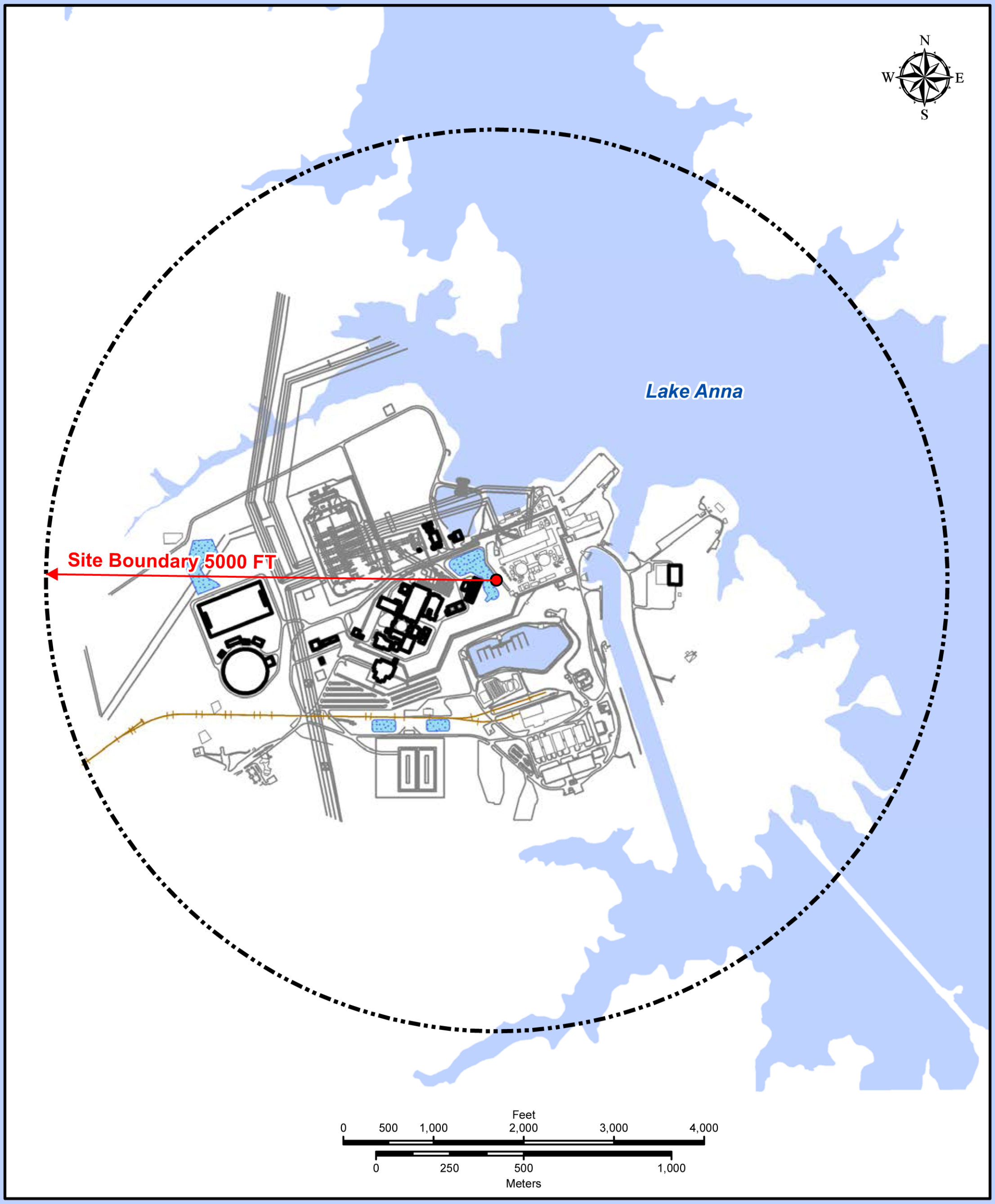
NAPS COL 2.0-4-A

The information needed to address DCD COL Item 2.0-4-A is included in SSAR Section 2.1.3, which is incorporated by reference.

Section 2.1 References

2.1-201 Commonwealth of Virginia's Radiological Emergency Response Plan (COVRERP), May 2007.

NAPS COL 2.0-3-A **Figure 2.1-1R Site Boundary**

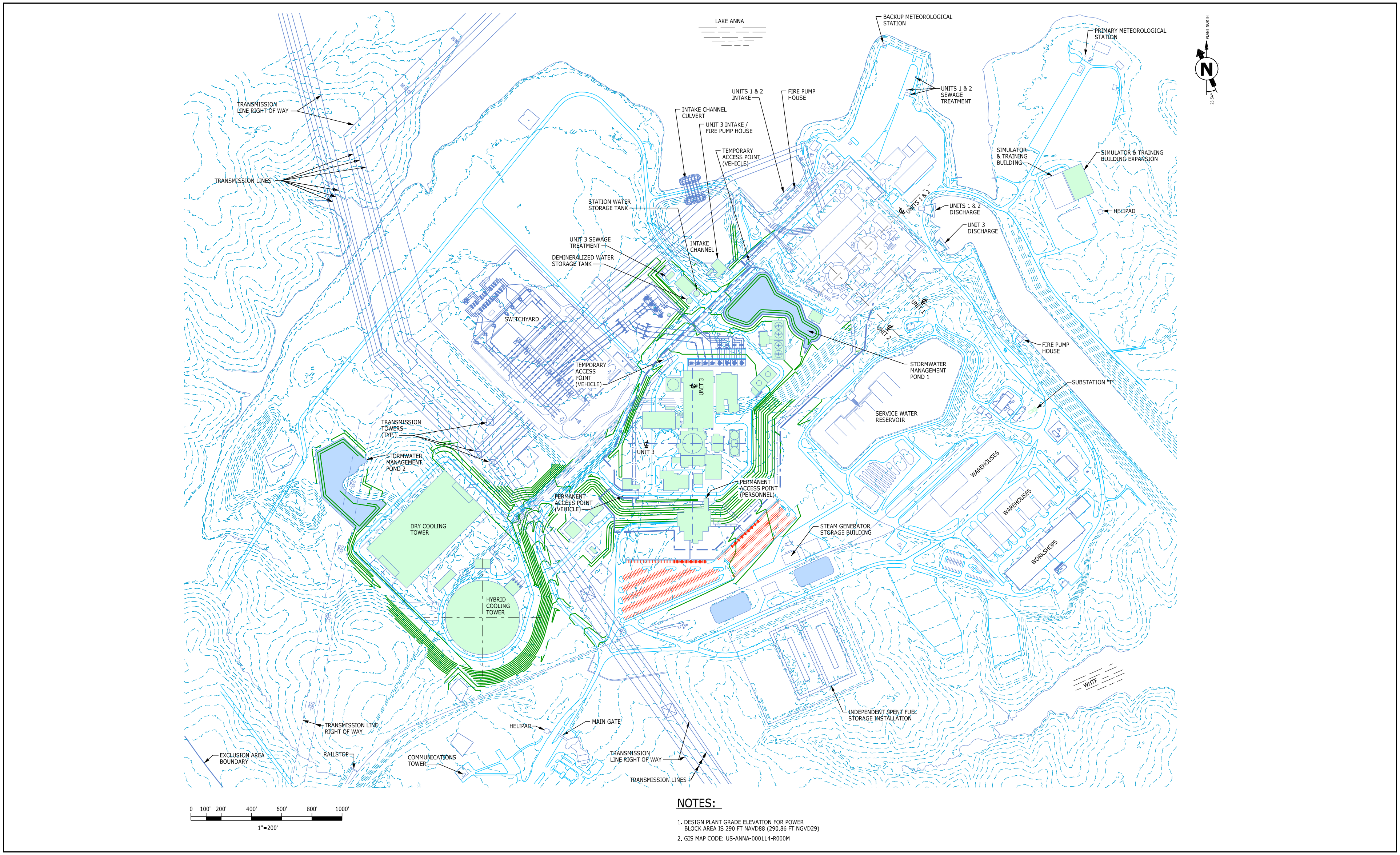


North Anna: Site Boundary

Railroad
Exclusion Area Boundary
Planned Structure
Existing Structure
Storm Water Pond
Waterbody

GIS Map Code: US-ANNA-000119-R000J

Figure 2.1-201 Site Plan with Topography



2.2 Nearby Industrial, Transportation, and Military Facilities

NAPS COL 2.0-5-A

The information needed to address DCD COL Item 2.0-5-A is included in SSAR Sections 2.2.1 and 2.2.2, which are incorporated by reference with the following supplements. SSAR Section 3.5.1.6 is also incorporated by reference, with no supplements.

2.2.2.1 Industrial Facilities

The first paragraph of this SSAR section is supplemented as follows with information on nearby industrial facilities.

NAPS ESP COL 2.2-1

Since the SSAR was submitted, no hazardous industrial facilities have been added at the 2.51 km^2 (620 acres) industrial development near the Unit 3 EAB. The industrial site poses no hazard to Unit 3.

2.2.2.6.1 Airports

The first paragraph of this SSAR section is supplemented as follows with information to identify an additional airport in the vicinity of Unit 3.

NAPS COL 2.0-5-A

A third airport within 16.1 km (10 mi) of the Unit 3 site opened in 2007. Table 2.2-201 provides operations-related information. The location is shown with other nearby airports in Figure 2.2-201. Because this is a small private airport, it is not expected to grow substantially in the foreseeable future.

After the fourth paragraph of this SSAR section, a new paragraph is added to describe the additional airport in the vicinity of Unit 3.

Seven Gables a private landing strip with an unlighted 457 m (1500 ft) turf runway, is approximately 7.7 mi north-northwest of the site. It is not licensed for commercial use and with only three small aircraft based on the field (one single-engine airplane, one helicopter, and one ultralight), the expected volume of traffic is very light. (Reference 2.2-201)

2.2.2.6.2 Airways

The first paragraph of this SSAR section is supplemented as follows with information to identify an additional military training flight in the vicinity of NAPS.

NAPS COL 2.0-5-A

One civil airway (V223) and four military training routes (IR714, IR720, IR760/VR1754, and VR1755) pass near the Unit 3 site as shown in Figure 2.2-201, which is based on the Washington Sectional Aeronautical Chart issued in 2013 (Reference 2.2-202). The U.S. Department of the Navy projected a total of 306 flight operations for the 2007/2008 year for three of the four routes (Reference 2.2-203), as compared to the SSAR assumption of 6000 flights per year. No data were projected for airway IR720 for the 2007/2008 year. As a result, the number of military training flights assumed in the SSAR remains bounding.

The second paragraph of this SSAR section is supplemented as follows with information on distances from military training flight routes to Unit 3.

The centerlines of two of the military training routes, IR714 and IR760/VR1754 are 11.5 mi across and lie within 1.6 km (1 mi) of the Unit 3 site. The centerlines of the remaining two military training routes, VR1755 and IR720, are more than 12.9 km (8 mi) from Unit 3.

2.2.3 Evaluation of Potential Accidents

NAPS COL 2.0-6-A

The information needed to address DCD COL Item 2.0-6-A is included in SSAR Section 2.2.3, which is incorporated by reference with the following supplements.

2.2.3.1.1 Truck Traffic

Add the following at the end of this section.

NAPS COL 2.0-6-A

An evaluation was performed to determine the potential impact of a postulated accident involving an 8500 gallon gasoline delivery truck. In accordance with RG 1.91, Revision 2, to calculate the equivalent TNT mass, the evaluation takes into consideration the mass of flammable vapor that could potentially contribute to a postulated explosion at the gasoline truck's location.

The gasoline truck makes on-site deliveries to refill the Units 1 and 2 underground gasoline storage tank. The closest point of the on-site

delivery truck route is approximately 1033 ft from the nearest Unit 3 safety-related structure (this distance is bounding for the distance to the Radwaste Building, which is considered in accordance with RG 1.143). For a full gasoline truck entering the site, the calculated safe distance to 1 psi is 747 ft, based on a postulated catastrophic failure and ensuing vapor cloud (i.e., the truck spills its total contents and forms a traveling vapor cloud). For a gasoline truck leaving the site, the calculated safe distance to 1 psi is 272 ft, based on a postulated explosion at the truck's location anywhere along the route (i.e., the truck is full of gasoline vapor at the upper flammability limit (UFL)). The methodology used to calculate the safe distance to 1 psi is described in Section 2.2.3.1.3. Because the calculated safe distances do not exceed the separation distances between the point of explosion and the Unit 3 safety-related structures or Radwaste Building, there is no threat posed from a postulated accident involving a gasoline delivery truck.

NAPS ESP COL 2.2-2

2.2.3.1.3 On-Site Chemicals

The chemical materials stored on-site at Units 1, 2, and 3 are identified in Table 2.2-202. This table also identifies storage locations and the quantity of each chemical/material. Properties relative to the hazards of each chemical and the results of a screening analysis based on these hazardous properties are provided in Table 2.2-203. The on-site chemicals with the potential to be flammable or explosive are evaluated for possible effects on Unit 3 safety-related SSCs and the Radwaste Building (in accordance with RG 1.143).

Table 2.2-203 lists the chemicals determined to require a flammable vapor cloud or explosion analysis at Unit 3 as: hydrogen (gas and liquid) and Nalco H-130. Table 2.2-203 lists the chemicals determined to require analysis at Units 1 and 2 as: acetone, ammonium hydroxide (30 percent), Nalco H-130, hydrogen, and carboline #2 paint thinner. Additionally, an 8500 gallon gasoline delivery truck is analyzed for the consequences of a postulated accident. The methodology used to analyze these chemicals is described later in this section.

For each of these chemicals, the minimum safe separation distances resulting from source explosions and flammable vapor clouds (delayed ignition) were determined for comparison with the actual distance from the storage location to the nearest Unit 3 safety-related SSC.

For source explosions, the separation distance for the storage of explosive materials is determined according to RG 1.91 and FM Global Guidelines for Evaluating the Effects of Vapor Cloud Explosions Using a TNT Equivalency Method (Reference 2.2-204).

Per RG 1.91, 7 kPa (1 psi) is a conservative value of peak positive incident overpressure, below which no significant damage to safety-related SSCs would be expected. The minimum safe separation distance for an explosive hazard is the distance from the location of storage to the point where an explosion results in less than a 7 kPa (1 psi) peak incident pressure. For chemicals stored as atmospheric liquids, a volume of vapor equal to the empty volume of the largest storage vessel was considered available for combustion and an explosion yield factor of 100 percent was used to address the possibility of an in-vessel confined explosion. This is conservative because only that small portion of the vapor within the flammability limits would be available for combustion and potential explosion. For flammable chemicals stored cryogenically or in a gaseous state, the entire mass of chemical is assumed to explode.

The two minimum safe separation distances for a flammable vapor cloud (thermal exposure hazard and/or explosion overpressure hazard) were determined for all identified flammable and/or explosive chemicals (except gaseous hydrogen, due to its buoyancy) for their potential to form an unconfined vapor cloud. Flammable materials in all storage states (atmospheric liquid, liquefied compressed gas, cryogenic gas, or atmospheric gas) can form an unconfined vapor cloud. Such a vapor cloud is assumed to drift towards Unit 3 before ignition occurs. Because a vapor cloud disperses as it travels downwind, there may be parts of a cloud where the vapor concentration is in the flammable range. These portions of a vapor cloud, between the lower flammability limit (LFL) and UFL, are assumed to burn when the cloud reaches an ignition source. The speed of the flame front through the vapor cloud determines whether the event is a deflagration or a detonation.

When a deflagration occurs, the hazard is from thermal exposure of the nearby surfaces from heat generated by the fire. A deflagration is assumed to be possible up to the point where the vapor cloud reaches the lower flammability limit of the material. The minimum safe separation distance for flammability hazard (thermal exposure) is the maximum

distance from the storage site (the spill site) to the location where the vapor cloud can exist and still be between the UFL and the LFL.

Because a detonation would generate an explosive force, the possibility of a vapor cloud detonation is evaluated for each flammable material. The RG 1.91 limit of 7 kPa (1 psi) is again used as a conservative value of peak positive incident overpressure, below which no significant damage to safety-related SSCs would be expected. The minimum safe separation distance for a vapor cloud explosion hazard is the distance from the storage site (the spill site) to the location where the assumed detonation of the traveled vapor cloud results in a peak incident pressure of no more than 7 kPa (1 psi).

In determining these distances for each material, the following model and conservative assumptions were also used. The on-site chemicals in Table 2.2-202 with an identified flammability range were modeled using the Areal Locations of Hazardous Atmospheres (ALOHA) air dispersion model (Reference 2.2-205). ALOHA is used to determine the distances where the vapor cloud may exist between the LFL and the UFL, presenting the possibility of ignition, detonation, and potential overpressure effects. In accordance with RG 1.206, the flammable or explosive vapor cloud analyses conducted using the ALOHA model use a spectrum of meteorological conditions (stability class, wind speed, time of day, and cloud cover) to ensure the worst-case scenario is captured. The meteorological sensitivity analysis includes the most stable meteorological class, F, allowable with the ALOHA model. Stable meteorological conditions and low wind speeds generate less turbulence. Therefore, less mixing and dilution of the formed chemical vapor cloud occurs.

The ALOHA model contains several options for release depending on the storage conditions and physical properties of the flammable chemicals analyzed. The storage conditions and the release scenario used for each chemical are discussed below:

- Atmospheric liquid: assumes catastrophic failure of the tank where the maximum volume of the storage vessel forms a 1 cm (0.4 inch) thick puddle (Reference 2.2-216).
- Compressed Gas/Cryogenic Liquid: a release of the total mass of chemical over 10 minutes, with the exception of liquid hydrogen (discussed below) (Reference 2.2-216).

Table 2.2-204 provides the safe separation distances for flammable and explosive materials in relation to the actual distance to the nearest Unit 3 safety-related structure. The results indicate that a fire or explosion from the identified hazardous chemicals and materials stored or transported at Units 1, 2, and 3 would not adversely affect the safe operation or shutdown of Unit 3 (including the Radwaste Building, in accordance with RG 1.143), with the exception of liquid hydrogen stored at Unit 3 and a 13,000 gallon liquid hydrogen delivery truck.

As shown in Table 2.2-204, for the storage of liquid hydrogen in two 6000 gallon tanks and delivery of 13,000 gallons of liquid hydrogen via a delivery truck, the distances to 1 psi of overpressure are greater than the distance to the nearest safety-related structure for both a source explosion and a vapor cloud explosion.

In the case of liquid hydrogen, an analysis was performed, in accordance with RG 1.91, based on the capability of the safety-related structures (and the Radwaste Building, in accordance with RG 1.143) to withstand blast effects associated with the detonation of liquid hydrogen. The explosion at the tank site was analyzed using the Electric Power Research Institute (EPRI) recommended methods in NP-5283-SR-A, "Guidelines for Permanent BWR Hydrogen Water Chemistry Installations - 1987 Revision," Appendix B (Reference 2.2-217). The EPRI method used is based on a reinforced concrete wall at least 1.5 ft thick, a tensile steel factor between 120 psi and 300 psi, and the minimum static lateral load capacities for the tornado intensity region in which the plant is located. The properties used for the nearest safety-related structure (the Fuel Building) and Radwaste Building are 18 inches of concrete, 120 psi tensile steel factor, 3 psi of static pressure capacity, and a permissible ductility of 3.0. To determine the effects associated with a vapor cloud explosion, the ALOHA model is used to simulate the travel of the cloud and obtain the mass of hydrogen in the cloud for the determined worst-case detonation scenario modeled by ALOHA. The EPRI method is then used with the mass ALOHA provides to determine a safe separation distance. Using the methods described in this paragraph, the safe separation distances for 6000 gallons of liquid hydrogen were found to be 495 ft for a source explosion and 677 ft for a vapor cloud explosion. Both of these distances are less than the distance from the liquid hydrogen storage location to the nearest Unit 3 safety-related structure and Radwaste Building. Therefore, the storage of liquid hydrogen would not

adversely affect the safe operation or shutdown of Unit 3 (including the Radwaste Building).

The hydrogen delivery truck carrying 13,000 gallons of liquid hydrogen may come closer to the safety-related structures or Radwaste Building than the determined safe distances. A probabilistic analysis was also performed for both the 6000 gallon storage tanks and 13,000 gallon delivery truck. The results show the probability of an accident (a postulated scenario involving a 13,000 gallon delivery truck of liquid hydrogen) is sufficiently low (less than 10^{-6}/year with conservative assumptions) that this scenario need not be considered a design basis event.

2.2.3.2.2 Airways

The second and subsequent paragraphs of this SSAR section are supplemented as follows with information on effective plant areas for Unit 3 and the evaluation results.

NAPS COL 2.0-6-A

For the SSAR, which used a plant parameter envelope (PPE) approach, the type of reactor with the tallest reactor building height (71.323 m (234 ft) above grade) was evaluated. For Unit 3, the ESBWR Reactor Building, Control Building, Fuel Building, and Radwaste Building are evaluated. See DCD Figures 1.2-1 through 1.2-11 for the nuclear island (Reactor, Control, and Fuel Buildings) and DCD Figures 1.2-21 through 1.2-25 for the Radwaste Building. For flights in the civilian airway, a total effective plant area of 0.038 square miles was used in the evaluation. For flights in the military airways, a total effective plant area of 0.041 square miles was used in the evaluation.

For civil airway V223, the Unit 3 result is:

$$PFA = 1.92 \times 10^{-7}$$

For military routes, IR714, IR760/VR1754, IR720, and VR1755, the Unit 3 result is:

$$PFA = 5.74 \times 10^{-9}$$

The total of these two accident probabilities meets the NUREG-0800, Section 2.2.3 guideline and is of an order of magnitude of 10^{-7} per year.

2.2.3.3 Toxic Chemicals

The third and subsequent paragraphs of this SSAR section are supplemented as follows with updated toxic chemical information and evaluation results.

NAPS COL 2.0-5-A

The on-site chemicals at Units 1 and 2, and Unit 3 (Table 2.2-202) were evaluated to ascertain which chemicals require control room habitability analysis with respect to their potential to form a toxic vapor cloud following an accidental release, using methods provided in RG 1.78.

The on-site chemicals identified in Table 2.2-203 were modeled using the ALOHA air dispersion model (Reference 2.2-205). Deliveries of on-site chemicals were also analyzed. ALOHA calculates the maximum distance a cloud can travel before it disperses enough to fall below the IDLH or other determined toxicity limit concentration. Asphyxiating chemicals were evaluated to determine if their release resulted in the displacement of a significant fraction of the control room air - defined by the Occupational Safety and Health Administration's (OSHA) definition of an oxygen-deficient environment. Where an IDLH is unavailable for a toxic chemical, the time-weighted average (TWA) or threshold limit value (TLV), promulgated by OSHA, was used as the toxicity concentration level. The ALOHA model is used to calculate the concentration inside the control room if the distance to the IDLH limit, asphyxiating limit, oxygen-enriched limit (for storage of oxygen only), or other toxicity limit is greater than the distance to the control room.

In accordance with RG 1.206, the toxicity/asphyxiation analyses conducted using the ALOHA model use a spectrum of meteorological conditions (stability class, wind speed, time of day, and cloud cover) to ensure the worst-case scenario is represented. The meteorological sensitivity analysis includes the most stable meteorological class, F, allowable with the ALOHA model. Stable meteorological conditions and low wind speeds generate less turbulence. Therefore, less mixing and dilution of the formed chemical vapor cloud occurs.

Table 2.2-205 provides the distances to each hazardous chemical's toxic, asphyxiating, or oxygen-enriched limit as well as concentrations determined inside the control room, as applicable. Of all the hazardous chemicals analyzed, with the exception of nitrogen, oxygen, ammonium hydroxide (30 percent solution), carbon dioxide, NOVEC 1230, and a

13,000 gallon liquid hydrogen delivery truck, each had distances to their respective toxic or asphyxiating limit less than the distance to the control room. The control room concentrations for nitrogen, oxygen, ammonium hydroxide (30 percent solution), carbon dioxide, NOVEC 1230, and liquid hydrogen were below the asphyxiating or toxic limits for each hazardous chemical. Additionally, an 8500 gallon spill from a gasoline delivery truck was analyzed and determined that the distance to the IDLH is 936 ft, which is less than the distance from the closest point of the delivery route to the control room, 1078 ft. Therefore, the release of toxic or asphyxiating chemicals from permanent storage locations or an accident on a delivery route would not adversely affect the safe operation or shutdown of Unit 3.

NAPS COL 2.0-6-A

2.2.3.4 Fires

An accident in the vicinity of Unit 3 could lead to a fire, but the absence of industrial facilities, pipelines, and commercial navigation in the Unit 3 vicinity results in a low probability of chemical explosions and fires. Similarly, land transportation routes are some distance from the Unit 3 site and are unlikely to start a fire that affects Unit 3. The potential for off-site wildfires exists due to the rural nature of the NAPS site and presence of off-site vegetation to the west and south of the site.

The analysis of a wildfire near Unit 3 was performed using the methodology in NUREG-1805 (Reference 2.2-206) to determine the incident heat flux on Unit 3. The conservative assumptions in the analysis included the following:

- The wildfire is assumed to occur at plant elevation.
- The closest forest area with a significant fire line is southeast of the Unit 3 control building. The fire line is modeled as approximately 917 ft wide at a distance of 1086 ft from the nearest safety-related structure, the Unit 3 Fuel Building. The length and distance of the fire is bounded by a road east of the hybrid cooling tower.
- The wildfire burns through the forest toward Unit 3 in a uniform fire line perpendicular to the line of closest separation between the approximately 917 ft wide fire line and the Unit 3 Fuel Building. While more of the forested area could burn toward the south, using a wider fire line would increase the separation distance from the Unit 3 safety-related structures. The forest area that is burning is assumed to continuously and simultaneously burn at peak output.

The maximum incident heat flux from a wildfire at the Unit 3 Fuel Building is 1.36 kW/m^2, which would have no effect on the structure. For comparison, the level of incident radiation from the sun on the earth is approximately 1.0 kW/m^2. Given the conservatism in the assumptions and the large separation distances to safety-related structures, a wildfire originating offsite would not affect the safe operation or shutdown of Unit 3.

In addition to a potential fire in the vicinity of Unit 3, a fire involving chemicals stored on the NAPS site was considered. Table 2.2-203 lists the chemicals and shows those which are potentially flammable or explosive. The ALOHA analyses, which calculate the distance to the LFL for each flammable chemical, show that these materials are sufficiently separated from safety-related SSCs such that further analysis is not required. Table 2.2-203 and the ALOHA flammable vapor cloud (distance to LFL) results in Table 2.2-204 demonstrate that significant effects are not expected due to a fire involving onsite chemicals and fuels.

2.2.3.5 Collisions with the Unit 3 Intake Structure

The Unit 3 intake structure is located on Lake Anna in a cove behind a cofferdam that is northeast of the Unit 3 power block area as shown in Figure 2.1-201. Lake Anna has small pleasure boats used solely for recreation. There are no large boats or barges on the lake. The area around the Unit 3 intake structure is managed by Dominion as a part of the exclusion area. Due to the presence of the cofferdam, there is no potential for a collision between a boat on Lake Anna and the Unit 3 intake structure. Also, because the Unit 3 intake structure is not a safety-related structure, such a collision could not affect the safe operation or shutdown of Unit 3.

2.2.3.6 Liquid Spills Near the Intake Structure

An accidental spill of an oil or liquid in Lake Anna near the Unit 3 intake structure that may be corrosive, cryogenic, or a coagulant was considered and determined to not be credible or have a low probability of occurrence and have no consequences for the safety of Unit 3. Lake Anna has small pleasure boats for recreational use. There are no large boats or barges. The only liquids with the potential to be spilled are motor oil and gasoline fuel from a small pleasure boat. The quantities in such spills would be very small. The oil or gasoline from a spill would float on the Lake Anna surface while the openings in the Unit 3 intake channel

culverts through the cofferdam are underwater. Therefore, such spills could not affect the safe operation or shutdown of Unit 3.

2.2.3.7 **Effects of Design Basis Events**

As concluded in the previous sections, no events are identified that are likely to occur and have potential consequences that affect the safety of Unit 3. The potential consequences associated with the on-site hazards of stored chemicals are not significant. None of the scenarios are serious enough to affect the safety of Unit 3 to the extent that the guidelines in 10 CFR 100 could be exceeded. Thus, there are no accidents associated with nearby industrial, transportation, or military facilities, nor associated with on-site stored chemicals that are considered design basis events which require steps to mitigate consequences beyond the design features addressed in the evaluations summarized above, e.g., separation distances.

Section 2.2 References

2.2-201 Seven Gables Airport, AirNav.com
http://www.airnav.com/airport/2VG7
accessed June 25, 2013

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NAPS COL 2.0-5-A

Table 2.2-201 Airports Within 15 Miles of the Unit 3 Site Since the SSAR

	Number of Flight Operations						Longest Runway		
Airport	**Type**	**Distance**	**Sector**	**Commercial**	**Total[a]**	**kd^2 [b]**	**Orientation**	**Length**	**Comments**
Seven Gables	Private	7.7 miles	NNW	None	Few[c]	29,645	NNW-SSE	1500 ft	Privately owned and operated. Turf runway. No facilities. 1 single-engine plane, 1 helicopter, 1 ultralight based there.

Source: Reference 2.2-201

a. Year 2007

b. RG 1.206: d < 10 miles, k = 500; d >10 miles, k = 1000; where d is the distance in miles from the site, and k is a constant.

c. Because of the low volume of aircraft and the site's distance from the airport, the airport is considered to meet the criteria of NUREG-0800, Section 3.5.1.6.

BASIS: NEW

NAPS ESP COL 2.2-2

Table 2.2-202 North Anna On-Site Chemical Storage Locations and Quantities

Chemical/Material (Formula/Trade/State)	Location	Quantity (Largest Container)
	Unit 3	
Carbon Dioxide	CO_2 Storage Area – Outside Turbine Building (West Side)	800 gallon Tank (Cryogenic Storage Tank)
Hydrogen	Hydrogen Storage Area – Outside Turbine Building (West Side)	6000 gallon Tank (Cryogenic Storage Tank)
	Hydrogen Storage Area – Outside Turbine Building (West Side)	45,000 scf Gaseous Tube Bank
Nitrogen	Nitrogen Storage Area – Outside Reactor Building (West Side)	25,000 gallons (Cryogenic Storage Tank)
Oxygen	Hydrogen Storage Area – Outside Turbine Building (West Side)	9000 gallons (Cryogenic Storage Tank)
Trisodium Phosphate (0.72% Solution)	Aux. Boiler Building	555 gallon Tank
Sodium Sulfite (2.2% Solution)	Aux. Boiler Building	555 gallon Tank
Disodium Phosphate (0.18% Solution)	Aux Boiler Building	555 gallon Tank
Diesel Fuel	Northeast of Service Building Operation Support Center	215,400 gallon Tank
Urea (Dry Power aqua solution, 40% $(NH_2)2CO$)	Outside Diesel Generator Building	12,800 gallon Tank
Depleted Zinc Oxide (DZO) sintered pellets	Turbine Building	198 lb Dissolution Vessel
ChemTreat CL1355	Adjacent to Circulating Water Pump House/ Hybrid Cooling Tower	2500 gallon Tank
	Inside Service Water Building	300 gallon Tote

BASIS: NEW

NAPS ESP COL 2.2-2 Table 2.2-202 North Anna On-Site Chemical Storage Locations and Quantities

Chemical/Material (Formula/Trade/State)	Location	Quantity (Largest Container)
	Unit 3 *(continued)*	
ChemTreat SC2010	Adjacent to Circulating Water Pump House/ Hybrid Cooling Tower	3000 gallon Tank
	Inside Service Water Building	300 gallon Tote
	Inside Water Treatment Building	300 gallon Tote
ChemTreat CL5633	Adjacent to Circulating Water Pump House/ Hybrid Cooling Tower	6000 gallon Tank
	Inside Service Water Building	300 gallon Tote
Sodium Bromide (40% Solution)	Adjacent to Circulating Water Pump House/ Hybrid Cooling Tower	6000 gallon Tank
	Inside Service Water Building	300 gallon Tote
Sodium Bisulfite (30% Solution)	Adjacent to Circulating Water Pump House/ Hybrid Cooling Tower	1000 gallon Tank
	Inside Service Water Building	300 gallon Tote
Nalco H-130	Adjacent to Circulating Water Pump House/ Hybrid Cooling Tower	3000 gallon Tank
	Adjacent to Service Water Building	1500 gallon Tank
Sodium Hypochlorite (12.5% Solution)	Adjacent to Station Water Intake Building	10,000 gallon Tank
	Inside Water Treatment Building[(a)]	300 gallon Tote[(a)]
	Adjacent to Service Water Building	6000 gallon Tank
	Adjacent to Circulating Water Pump House/ Hybrid Cooling Tower	16,000 gallon Tank
Sodium Bicarbonate	Inside Water Treatment Building	50 lb bags

BASIS: NEW

NAPS ESP COL 2.2-2 **Table 2.2-202 North Anna On-Site Chemical Storage Locations and Quantities**

Chemical/Material (Formula/Trade/State)	Location	Quantity (Largest Container)
	Unit 3 *(continued)*	
Sodium Hydroxide (25% Solution)	Inside Water Treatment Building	300 gallon Tote
Hydrogen Peroxide (35% Solution)	Inside Water Treatment Building	300 gallon Tote
Alum (48% Solution)	Inside Water Treatment Building	1000 gallon Tank
	Units 1 & 2	
Acetone	Drum Storage adjacent to Warehouse #2	55 gallon Drum
Ammonium Hydroxide (30% Solution)	Col. 15-C of Turbine Bldg, Warehouse #7	55 gallon Drum
Blasting Media	Paint Shop, Warehouse #7	99,999 lbs
Boric Acid	Aux Bldg, Warehouse # 7	7500 gallon Tank
Carbon Dioxide	Turbine Bldg, Aux Bldg, Records Bldg, Decontamination Bldg, Fuel Oil Pump House	34,000 lbs
Diesel Fuel	Communications Shelter	1000 gallon Tank
Fuel Oil No. 2	South Corner Inside Protected Area, Service Building, Fire Pump House, Service Water Building, Vehicle Maintenance Garage, Lake Anna Spillway, Spent Fuel Storage Area	210,000 gallon Tank
Gasoline	New Emergency Vehicle Building, Vehicle Maintenance Garage	999,999 lbs
Nalco H-130	SW Chemical Addition Building	2000 gallon Tank
Halon 1301	Turbine Building, Control Room, Security, Training Center	400 lbs

BASIS: NEW

NAPS ESP COL 2.2-2 Table 2.2-202 North Anna On-Site Chemical Storage Locations and Quantities

Chemical/Material (Formula/Trade/State)	Location	Quantity (Largest Container)
	Units 1 & 2 *(continued)*	
Hydrazine (35% Solution)	Unit 1 Turbine Building	345 gallon Tote
	Unit 2 Turbine Building[b]	55 gallon Drum[b]
	Warehouse #7[b]	345 gallon Tote[b]
Hydrochloric Acid (31% Solution)	GE Water System	55 gallon Drum
	RO System[c]	25 gallon Tote[c]
Hydrogen	North of Turbine Building	700 lbs
Hydrogen Peroxide	GE Water System	250 gallon Tote
	RO System	600 gallon Tote
	Warehouse # 7	600 gallon Tote
Ion Exchange Resin	Warehouse #7, Turbine Building, Intake Structure	99,999 lbs
Isothiazolin Biocide (4.5% Solution)	Bearing Cooling Tower	400 gallon Tote
	Warehouse #7	55 gallon Drum
Lead-Acid Batteries with Sulfuric Acid	Warehouse #7, Service Bldg., SBO Diesel Building, Security Block House, PBX Building, Switchyard, Site Separation Construction Area, Information Center (NANIC), Lake Anna Spillway, Turbine Building, Training Building, Service Water Building, Spent Fuel Storage Area, and Fire Pump House near Dis. Canal	999,999 lbs
Liquid Alum (Aluminum Sulfate Solution)	Warehouse #7/RO System	1100 gallon Tank

BASIS: NEW

NAPS ESP COL 2.2-2 **Table 2.2-202 North Anna On-Site Chemical Storage Locations and Quantities**

Chemical/Material (Formula/Trade/State)	Location	Quantity (Largest Container)
	Units 1 & 2 *(continued)*	
Monoethanolamine	Unit 2 Turbine Building	345 gallon Tote
	Unit 2 Turbine Building	55 gallon Drum
	Warehouse #7	345 gallon Tote
Nitrogen	North of Clarifier Building, Admin. Annex Alley way, Bottle Shed beside Oil Storage Shed, Service Building	4500 lbs (Cryogenic Storage Tank)
NOVEC 1230	Communications Shelter	304 lbs
Oil, Hydraulic Fluid	Warehouse #5, Oil Storage Shed, Vehicle Maintenance Garage	1320 gallon Tank
Oil, Lubricating Oil	Warehouse #5, Vehicle Maintenance Garage, Oil Storage Shed, Turbine Building	16,000 gallon Tank
Oil, Mineral Oil – Dielectric Fluid	Main Transformers (MTs), Switchyard, Misc. Electrical Equipment	11,205 gallon Tank
Carboline #2	Thinner Reprocessing Facility/Paint Shop	55 gallon Drum
Carboline #33	Thinner Reprocessing Facility/Paint Shop	55 gallon Drum
Keeler & Long 700	Thinner Reprocessing Facility/Paint Shop	55 gallon Drum
Keeler & Long 1638	Thinner Reprocessing Facility/Paint Shop	55 gallon Drum
Keeler & Long 3700	Thinner Reprocessing Facility/Paint Shop	55 gallon Drum
Sodium Carbonate	Warehouse #7, Bearing Cooling Tower	99,999 lbs
Sodium Bromide (30-60% Solution)	Warehouse #7, Bearing Cooling Tower	400 gallon Tote
Sodium Hydroxide (50% Solution)	Warehouse #7, RO System	600 gallon Tote

BASIS: NEW

NAPS ESP COL 2.2-2 **Table 2.2-202 North Anna On-Site Chemical Storage Locations and Quantities**

Chemical/Material (Formula/Trade/State)	Location	Quantity (Largest Container)
	Units 1 & 2 *(continued)*	
Sodium Hypochlorite (15% Solution)	Warehouse # 7	400 gallon Tote
	Bearing Cooling Tower[(d)]	400 gallon[(d)]
Sodium Chloride	Warehouse #7, Storage Bay at NE Corner of SCOBN Bldg, GE Water Treatment System (S of Intake Structure)	99,999 lbs
Sulfuric Acid	Warehouse #7	60 gallon Tote
Zinc Chloride (65% Solution)	Turbine Building	1100 gallon Tank
Dianodic DN2472	Bearing Cooling Tower	≤3000 gallon Tank
	Unit 1 Turbine Building	3000 gallon Tank
	Warehouse #7	≤3000 gallon Tank
Methyl Pyrrolidone	Paint Shop	1 gallon Container
Methyl Isobutyl Ketone	Paint Shop	1 gallon Container
Ethylene/Diethylene Glycol	Steel drum storage at Warehouse #5, Oil Storage Shed, and vehicle maintenance garage; tote storage at Oil Storage Shed; plastic bottle/jug storage at Vehicle Maintenance Garage; other storage at Emergency Diesel Generators (4), SBO Diesel Bldg., Security Diesel Room, Lake Anna Spillway, Fire Pump House Diesel room, Service Water Building Diesel, Spent Fuel storage area diesel, and Forward access diesel near NANIC.	99,999 lbs
Sodium Bicarbonate	Warehouse #7, Sewage Treatment System, GE Water Treatment System	99,999 lbs

BASIS: NEW

NAPS ESP COL 2.2-2

Table 2.2-202 North Anna On-Site Chemical Storage Locations and Quantities

Chemical/Material (Formula/Trade/State)	Location	Quantity (Largest Container)
	Units 1 & 2 *(continued)*	
Soft Lead	Warehouse #9	99,999 lbs
Butanone	Paint Shop	55 gallon Drum

(a) Bounded for quantity and distance by sodium hypochlorite located at the Station Water Intake Building and Service Water Building.
(b) Bounded for quantity and distance by the 345 gallon hydrazine tote located in the Turbine Building.
(c) Bounded for quantity and distance by the 55 gallon hydrochloric acid drum located at the GE water system trailer.
(d) Bounded for quantity and distance by the 400 gallons of sodium hypochlorite located at Warehouse 7.

BASIS: NEW

NAPS ESP COL 2.2-2

Table 2.2-203 North Anna Unit 3 On-Site Chemicals, Disposition

Chemical/Material (Formula/Trade/ State)	Toxicity Limit (IDLH)	Flammable/ Explosive?	Vapor Pressure	Disposition
		Unit 3		
Carbon Dioxide	40,000 ppm	No/No	56.5 atm (42,940 mm Hg) @68°F	Toxicity Analysis
Hydrogen (cryogenic)	Asphyxiant	Yes (4% - 75%)/Yes	29.030 psi (1501 mm Hg) @-418°F	Flammable/Explosive Vapor Cloud Analysis Toxicity Analysis (as Asphyxiant) Source Explosion Analysis
Nitrogen	Asphyxiant	No/No	65.820 psi (3404 mm Hg) @-294°F	Toxicity Analysis (as Asphyxiant)
Oxygen	Oxygen-enriched[(1)]	No/No	36.260 psi (1875 mm Hg) @-280°F	Toxicity Analysis (oxygen-enriched)
Trisodium Phosphate (0.72% Solution)	None Established	No/No	Not Pertinent (solid)	No Further Analysis Required[(2)]
Sodium Sulfite (2.2% Solution)	None Established	No/No	Not Pertinent (solid)	No Further Analysis Required[(3)]
Disodium Phosphate (0.18% Solution)	None Established	No/No	Not Pertinent (solid)	No Further Analysis Required[(4)]
Diesel Fuel	None Established	Yes (1.3% - 6%)/Yes	0.042 psi (2.17 mm Hg) @70°F	No Further Analysis Required[(5)]
Urea (Dry Power aqua solution, 40% $(NH_2)2CO$)	None Established	No/No	Not Pertinent (solid)	No Further Analysis Required[(6)]
Depleted Zinc Oxide (DZO) sintered pellets	None Established	No/No	Not Pertinent (solid)	No Further Analysis Required[(7)]
Sodium Bromide (40% Solution)	None Established	No/No	Not Pertinent (solid)	No Further Analysis Required[(8)]

BASIS: NEW

NAPS ESP COL 2.2-2

Table 2.2-203 North Anna Unit 3 On-Site Chemicals, Disposition

Chemical/Material (Formula/Trade/ State)	Toxicity Limit (IDLH)	Flammable/ Explosive?	Vapor Pressure	Disposition
		Unit 3 *(continued)*		
Sodium Bisulfite (30% Solution)	None Established	No/No	Not Pertinent (solid)	No Further Analysis Required[9]
Nalco H-130	3300 ppm[10]	Yes (3.3% - 19%)/Yes[10]	30 mm Hg @77°F	Flammable/Explosive Vapor Cloud Analysis Toxicity Analysis (as Asphyxiant) Source Explosion Analysis
ChemTreat CL1355	None Established	Yes (2.4% - 8.02%)/Yes[11]	3 mm Hg @68°F[11]	No Further Analysis Required[5][11]
ChemTreat SC2010	None Established	No/No	Not Pertinent (solid)	No Further Analysis Required[12]
ChemTreat CL5633	None Established	No/No	Not Pertinent (solid)	No Further Analysis Required[13]
Sodium Hypochlorite (12.5% Solution)	10 ppm as Cl_2	No/No	None Established	Toxicity Analysis[14]
Sodium Hydroxide (25% Solution)	10 mg/m^3	No/No	0 mm Hg @68°F	No Further Analysis Required[5][16]
Hydrogen Peroxide (35% Solution)	75 ppm	No/No	5 mm Hg @86°F	No Further Analysis Required[5]
Alum (48% Solution)	None Established	No/No	None Established	No Further Analysis Required[14]
Sodium Bicarbonate	None Established	No/No	Not Pertinent (solid)	No Further Analysis Required[15]

BASIS: NEW

NAPS ESP COL 2.2-2 **Table 2.2-203 North Anna Unit 3 On-Site Chemicals, Disposition**

Chemical/Material (Formula/Trade/ State)	Toxicity Limit (IDLH)	Flammable/ Explosive?	Vapor Pressure	Disposition
		Units 1 & 2		
Acetone	2500 ppm	Yes (2.6% - 12.8%)/Yes	195 mm Hg @70°F	Flammable/Explosive Vapor Cloud Analysis Toxicity Analysis Source Explosion Analysis
Ammonium Hydroxide (30% Solution)	300 ppm(18)	Yes (15% - 28%)/Yes	8.5 atm (6460 mm Hg) @68°F(16)	Flammable/Explosive Vapor Cloud Analysis Toxicity Analysis Source Explosion Analysis
Blasting Media	Not Applicable	Not Applicable	Not Pertinent (solid)	No Further Analysis Required(18)
Boric Acid	Not Established	No/No	Not Pertinent (solid)	No Further Analysis Required(19)
Carbon Dioxide	40,000 ppm	No/No	56.5 atm (42,940 mm Hg) @68°F	Toxicity Analysis
Diesel Fuel	Not Established	Yes (1.3% - 6%)/Yes	0.042 psi (2.17 mm Hg) @70°F	No Further Analysis Required(5)
Fuel Oil No. 2	Not Established	Yes (1.3% - 6%)/Yes	0.042 psi (2.17 mm Hg) @70°F	No Further Analysis Required(5)
Gasoline	None Established	Yes (1.4% - 7.4%)/Yes	38 – 300 mm Hg @68°F	No Further Analysis Required(20)
Nalco H-130	3300 ppm(10)	Yes (3.3% - 19%)/Yes	30 mm Hg @77°F	Flammable/Explosive Vapor Cloud Analysis Toxicity Analysis Source Explosion Analysis
Halon 1301	40,000 ppm	No/No	> 1 atm (760 mm Hg) @68°F	Toxicity Analysis
Hydrazine (35% Solution)	50 ppm	Yes (4.7% - 100%)/Yes	11.4 mm Hg @70°F	Flammable/Explosive Vapor Cloud Analysis Toxicity Analysis Source Explosion Analysis

BASIS: NEW

NAPS ESP COL 2.2-2 **Table 2.2-203 North Anna Unit 3 On-Site Chemicals, Disposition**

Chemical/Material (Formula/Trade/ State)	Toxicity Limit (IDLH)	Flammable/ Explosive?	Vapor Pressure	Disposition
		Units 1 & 2 *(continued)*		
Hydrochloric Acid (31% Solution)	50 ppm	No/No	40.5 atm (30,780 mm Hg) @68°F[22]	Toxicity Analysis
Hydrogen (gas)	Asphyxiant	Yes (4.0% - 75%)/Yes	29.030 psi (1501 mm Hg) @-418°F	Source Explosion Analysis[22]
Hydrogen Peroxide	75 ppm	No/No	5 mm Hg @68°F	No Further Analysis Required[5]
Ion Exchange Resin	None established	No/No	Not Pertinent (solid)	No Further Analysis Required[23]
Isothiazolin Biocide (4.5% Solution)	0.076 mg/m^3 TWA	No/No	Same as water	No Further Analysis Required[24]
Lead-Acid Batteries with Sulfuric Acid	None established	No/No	Not pertinent (solid)	No Further Analysis Required[25]
Liquid Alum (Aluminum Sulfate Solution)	None established	No/No	None established	No Further Analysis Required[14]
Monoethanolamine	30 ppm	Yes (3% - 23.5%)/Yes	0.4 mm Hg @68°F	No Further Analysis Required[5]
Nitrogen	Asphyxiant	No/No	65.82 psi (3404 mm Hg) @-294°F	Toxicity Analysis (as Asphyxiant)
NOVEC 1230	150 ppm TWA	No/No	244 mm Hg @20°C	Toxicity Analysis
Oil, Hydraulic Fluid	5 mg/m^3 TWA	Yes (Limits not established)/No	< 0.01 mm Hg @20°C	No Further Analysis Required[5]
Oil, Lubricating Oil	None established	Yes (Limits not established)/No	0.042 psi (2.17 mm Hg) @70°F	No Further Analysis Required[5]

BASIS: NEW

NAPS ESP COL 2.2-2 **Table 2.2-203 North Anna Unit 3 On-Site Chemicals, Disposition**

Chemical/Material (Formula/Trade/ State)	Toxicity Limit (IDLH)	Flammable/ Explosive?	Vapor Pressure	Disposition
		Units 1 & 2 *(continued)*		
Oil, Mineral Oil – Dielectric Fluid	2500 mg/m^3	Yes (Limits not established)/No	0.042 psi (2.17 mm Hg) @70°F	No Further Analysis Required(5)
Carboline #2	20 ppm TLV-TWA	Yes (1.3% - 10.1%)/Yes	36.3 mm Hg	Flammable/Explosive Vapor Cloud Analysis Toxicity Analysis Source Explosion Analysis(26)
Carboline #33	20 ppm TLV-TWA	Yes (1.3% - 12.7%)/ Yes	4.2 mm Hg @20°C	No Further Analysis Required(5)
Keeler & Long 700	25 ppm TWA	Yes (0.9% LFL, UFL not established)/Yes	3 mm Hg @Room Temperature	No Further Analysis Required(5)
Keeler & Long 1638	25 ppm TWA	Yes (Limits not established)/No	0 mm Hg @20°C	No Further Analysis Required(5)
Keeler & Long 3700	20 ppm TWA	Yes (1.1% LFL, UFL not established)/Yes	6.3 mm Hg @Room Temperature	No Further Analysis Required(5)
Sodium Carbonate	None established	No/No	Not Pertinent (solid)	No Further Analysis Required(27)
Sodium Bromide (30-60% Solution)	None established	No/No	None established	No Further Analysis Required(8)
Sodium Hydroxide (50% Solution)	10 mg/m^3	No/No	0 mm Hg @68°F	No Further Analysis Required(16)
Sodium Hypochlorite (15% Solution)	10 ppm as Cl_2	No/No	None established	Toxicity analysis

BASIS: NEW

NAPS ESP COL 2.2-2 **Table 2.2-203 North Anna Unit 3 On-Site Chemicals, Disposition**

Chemical/Material (Formula/Trade/ State)	Toxicity Limit (IDLH)	Flammable/ Explosive?	Vapor Pressure	Disposition
		Units 1 & 2 *(continued)*		
Sodium Chloride	None established	No/No	1 mm Hg @1589°F	No Further Analysis Required (28)
Sulfuric Acid	15 mg/m^3	No/No	0.001 mm Hg @68°F	No Further Analysis Required (5)
Zinc Chloride (65% Solution)	None established	No/No	None established	No Further Analysis Required (29)
Dianodic DN2472	None established	No/No	18 mm Hg	No Further Analysis Required (30)
Methyl Pyrrolidone	25 ppm TWA	Yes (1.3% - 9.5%)/Yes	0 kPa (0 mm Hg) @20°C	No Further Analysis Required (5)
Methyl Isobutyl Ketone	500 ppm	Yes (1.2% - 8.0%)/Yes	16 mm Hg @68°F	No Further Analysis Required (31)
Ethylene/Diethylene Glycol	None established	Yes (3.2% - 15.3%)/Yes	0.06 mm Hg @68°F	No Further Analysis Required (5)
Sodium Bicarbonate	None established	No/No	Not pertinent (solid)	No Further Analysis Required (15)
Soft Lead	None established	No/No	Not pertinent (solid)	No Further Analysis Required (32)
Butanone	3000 ppm	Yes (1.4% - 11.4%)/ Yes	78 mm Hg @68°F	No Further Analysis Required (33)

(1) The oxygen-enriched limit is 235,000 ppm as defined by OSHA.

(2) Trisodium phosphate, in its pure form, is a noncombustible solid and, therefore, has a very low vapor pressure. There is no toxicity limit established for this chemical. Therefore, an air dispersion hazard is not a likely route of exposure.

(3) Sodium sulfite, in its pure form, is a noncombustible solid and, therefore, has a very low vapor pressure. There is no toxicity limit established for this chemical. Therefore, an air dispersion hazard is not a likely route of exposure.

(4) Disodium phosphate, in its pure form, is a noncombustible solid and, therefore, has a very low vapor pressure. There is no toxicity limit established for this chemical. Therefore, an air dispersion hazard is not a likely route of exposure.

(5) According to RG 1.78, if a substance's vapor pressure is below 10 torr (approximately 10 mm Hg), the vapor pressure is sufficiently low such that the formation of a vapor cloud is not a likely event. Therefore, an air dispersion hazard is not a likely exposure route.

(6) Urea, in its pure form, is a noncombustible solid and, therefore, has a very low vapor pressure. There is no toxicity limit established for this chemical. Therefore, an air dispersion hazard is not a likely route of exposure.

NAPS ESP COL 2.2-2 **Table 2.2-203 North Anna Unit 3 On-Site Chemicals, Disposition**

(1) Zinc oxide, in its pure form, is a noncombustible solid and, therefore, has a very low vapor pressure. There is no toxicity limit established for this chemical. Therefore, an air dispersion hazard is not a likely route of exposure.

(8) Sodium bromide, in its pure form, is a noncombustible solid and, therefore, has a very low vapor pressure. There is no toxicity limit established for this chemical. Therefore, an air dispersion hazard is not a likely route of exposure.

(9) Sodium bisulfite, in its pure form, is a noncombustible solid and, therefore, has a very low vapor pressure. There is no toxicity limit established for this chemical. Therefore, an air dispersion hazard is not a likely route of exposure.

(10) The IDLH limit is for pure ethanol, the main hazardous component of Nalco H-130. Additionally, the flammability limits provided are for pure ethanol.

(11) The main hazardous constituent of ChemTreat CL1355 is polyacrylic acid. Properties given are for polyacrylic acid.

(12) The hazardous component of ChemTreat SC2010 is fumaric acid. Fumaric acid, in its pure form, is a noncombustible solid and, therefore, has a very low vapor pressure. There is no toxicity limit established for this chemical. Therefore, an air dispersion hazard is not a likely route of exposure.

(13) The two hazardous components of ChemTreat CL5633 are fumaric acid and citric acid. Both of these chemicals, in their pure form, are noncombustible solids and, therefore, have very low vapor pressures. Therefore, an air dispersion hazard is not a likely route of exposure.

(14) Aluminum sulfate (Alum), in its pure form, is a noncombustible solid and, therefore, has a very low vapor pressure. There is no toxicity limit established for this chemical. The MSDS documentation provided by CHRIS describes it as a gray-white solid. Therefore, an air dispersion hazard is not a likely exposure route.

(15) Sodium bicarbonate, in its pure form, is a crystalline white noncombustible solid and, therefore, has a very low vapor pressure. No toxicity limit is established for this chemical. Therefore, an air dispersion hazard is not a likely route of exposure.

(16) Sodium hydroxide, in its pure form, is a noncombustible solid and, therefore, has a very low vapor pressure. The IDLH documentation provided by NIOSH provides the following description of the substance—“colorless to white, odorless solid (flakes, beads, granular form)” and provides the following basis for establishing the 10 mg/m^3 IDLH limit for the solid form—“the revised IDLH for sodium hydroxide is 10-mg/m^3 based on acute inhalation toxicity data for workers [Ott et al. 1977]” where the reference for Ott et al. gives the following description “Mortality among employees chronically exposed to caustic dust”. Thus, this toxicity limit was established for the exposure to the solid form is not applicable to the solution. Therefore, an air dispersion hazard is not a likely route of exposure.

(17) The toxic limit and vapor pressure provided for the 30% ammonium hydroxide solution is that of pure anhydrous ammonia.

(18) Blasting media is a noncombustible solid and, therefore, has a very low vapor pressure. Thus, an air dispersion hazard is not a likely route of exposure.

(19) Boric acid, in its pure form, is a noncombustible solid and, therefore, has a very low vapor pressure. No toxicity limit is established for this chemical. Therefore, an air dispersion hazard is not a likely route of exposure.

(20) The gasoline storage tank is underground. Because of the underground confinement, formation of a flammable vapor cloud is not a credible scenario. No further analysis is required.

(21) The vapor pressure provided is for pure hydrogen chloride.

(22) Modeling a vapor cloud for gaseous hydrogen is not appropriate due to the buoyancy of hydrogen gas (the vapor specific gravity of hydrogen is 0.067). That is, any release from a tube or bank would rapidly rise and not create a traveling vapor cloud. Therefore, the source explosion analysis is the bounding analysis for gaseous hydrogen.

BASIS: NEW

NAPS ESP COL 2.2-2

Table 2.2-203 North Anna Unit 3 On-Site Chemicals, Disposition

(23) Ion exchange resins are typically found as solid beads and, therefore, have a very low vapor pressure. No toxicity limit is established for this chemical. Therefore, an air dispersion hazard is not a likely route of exposure.

(24) The partial vapor pressure of the regulated substance (isothiazolin) is sufficiently low that no further analysis is required. The partial vapor pressure is calculated using the methodology provided in the EPA's Risk Management Program Guidance.

(25) Batteries are solid and contain small amounts of sulfuric acid; therefore, an air dispersion hazard is not a likely exposure route.

(26) Carboline #2's main hazardous constituents are methyl ethyl ketone and toluene. As a result, Carbonline #2 is analyzed both as pure methyl ethyl ketone and pure toluene.

(27) Sodium carbonate, in its pure form, is a noncombustible solid and, therefore, has a very low vapor pressure. There is no toxicity limit established for this chemical. Therefore, an air dispersion hazard is not a likely route of exposure.

(28) Sodium chloride, common table salt, is a noncombustible solid and, therefore, has a very low vapor pressure. No toxicity limit is established for this chemical. Therefore, an air dispersion hazards is not a likely route of exposure.

(29) Zinc chloride is a noncombustible crystalline white solid and, therefore, has a very low vapor pressure. No toxicity limit is established for this chemical. Therefore, an air dispersion hazards is not a likely route of exposure.

(30) All hazardous constituents of Dianodic DN2472 are noncombustible solids in their pure form. No toxicity limit is established for this chemical. Therefore, an air dispersion hazard is not a likely route of exposure.

(31) RG 1.78 specifies no further analysis is required if the quantity of chemical is less than 20 lbs.

(32) Lead, in its pure form, is a noncombustible solid and, therefore, has a very low vapor pressure. No toxicity limit in air is established for this chemical. Therefore, an air dispersion hazard is not a likely route of exposure.

(33) Butanone is a synonym used for methyl ethyl ketone. Because Carbon #2 is analyzed in the calculation as pure methyl ethyl ketone, it is bounding for the analysis of the butanone.

References: 2.2-204, 2.2-208, 2.2-218, 2.2-219, 2.2-220, 2.2-221, 2.2-222, 2.2-223, 2.2-224, 2.2-225, 2.2-226, 2.2-227, 2.2-228, 2.2-229, 2.2-230, 2.2-231, 2.2-232, 2.2-233, 2.2-234, 2.2-235, 2.2-236.

BASIS: NEW

NAPS ESP COL 2.2-2

Table 2.2-204 Source Explosions, Flammable Vapor Clouds, and Vapor Cloud Explosions (Delayed Ignition)

Chemical Evaluated	Quantity	Distance to Nearest Safety-Related Structure for Unit 3 (ft)	Distance to 1 psi – Source Explosions (ft)	Distance to Lower Flammability Limit (ft)	Distance to 1 psi – Vapor Cloud Explosion (Delayed Ignition) (ft)
		Unit 3			
Hydrogen (cryogenic liquid)	2 x 6000 gallons[(a)]	750	2009[(c)]	651	1662[(d)]
Hydrogen (gaseous)	45,000 scf	774	724	N/A	N/A
Nalco H-130 (Circulating Water Pump House)	3000 gallons	1315	174	45	147
Nalco H-130 (Service Water Building)	1500 gallons	638	138	75	63
Hydrogen (cryogenic liquid) Delivery Truck	13,000 gallons	750	2600[(e)]	924	2262[(e)]
		Units 1 & 2			
Acetone	55 gallons	2214	44	36	132
Ammonium Hydroxide (30% Solution)	55 gallons	1228	23	39	78
Nalco H-130	2000 gallons	1406	152	51	111
Hydrazine (35% Solution)	345 gallons	1228	117	<33	No Explosion
Hydrogen (gaseous)	700 lbs	1821	1039	N/A	N/A
Carboline #2 (as toluene)	55 gallons	1683	47	< 33	< 33
Carboline #2 (as methyl ethyl ketone)	55 gallons	1683	48	< 33	No Explosion
Gasoline Delivery Truck[(b)]	8500 gallons	1033	272	315	747

BASIS: NEW

NAPS ESP COL 2.2-2

Table 2.2-204 Source Explosions, Flammable Vapor Clouds, and Vapor Cloud Explosions (Delayed Ignition)

(a) The hydrogen tanks are connected in such a way that the failure of one tank will not lead to a total release of the second tank. Therefore, only one tank is analyzed.

(b) Gasoline is not an available chemical in ALOHA, therefore the selection of n-Heptane as a surrogate for gasoline is common in the determination of the octane rating of fuel as noted in the study, *The Oxidation of a Gasoline Fuel Surrogate in the Negative Temperature Coefficient Region* (Reference 2.2-239). Additionally, in another study, *Evaporation of hydrocarbon compounds, including gasoline and diesel fuel, on heated metal surfaces,* the evaporation curves over a range of temperatures for n-Heptane and gasoline were shown to be similar and at temperatures below 80˚C, the evaporation of n-Heptane occurred at a faster rate, reflecting the fact that gasoline has several components with higher boiling points (Reference 2.2-237). Therefore, it was conservatively assumed that the entire quantity of gasoline stored is n-Heptane, and, therefore, available to form a vapor cloud at the evaporation rate of n-Heptane.

(c) The distance to 1 psi is greater than the distance from hydrogen storage to the nearest Unit 3 safety-related structure using the RG 1.91 methodology. As a result, using methods in EPRI's "Guidelines for Permanent BWR Hydrogen Water Chemistry Installations – 1987 Revision," Appendix B (Reference 2.2-217), an analysis which considers the capability of the safety-related structures to withstand blast/missile effects was employed. This analysis is presented in Section 2.2.3.1.3.

(d) The distance to 1 psi is greater than the distance from hydrogen storage to the nearest Unit 3 safety-related structure using the ALOHA model 90% yield factor. As a result, using methods in EPRI's "Guidelines for Permanent BWR Hydrogen Water Chemistry Installations – 1987 Revision," Appendix B (Reference 2.2-217), an analysis which considers the capability of the safety-related structures to withstand blast/missile effects was employed. This analysis is presented in Section 2.2.3.1.3.

(e) The distance to 1 psi is greater than the distance from hydrogen storage to the nearest Unit 3 safety-related structure. As a result, using methods in EPRI's "Guidelines for Permanent BWR Hydrogen Water Chemistry Installations – 1987 Revision," Appendix B (Reference 2.2-217), an analysis which considers the capability of the safety-related structures to withstand blast/missile effects was employed. This analysis is presented in Section 2.2.3.1.3.

NAPS ESP COL 2.2-2 **Table 2.2-205 Toxic Vapor Clouds**

Chemical Evaluated	Quantity	IDLH	Distance to Unit 3 Control Room (ft)	Distance to Toxic Limit (ft)	Control Room Concentration (ppm)[a]
		Unit 3			
Carbon Dioxide (cryogenic liquid)	800 gallons	40,000	887	798	-
Hydrogen (cryogenic liquid)	2 x 6000 gallons[g]	71,400[b]	1004	906	-
Nitrogen (cryogenic liquid)	25,000 gallons	71,400[b]	806	2130	26,800
Oxygen (cryogenic liquid)	9000 gallons	235,000[c]	1009	1446	26,600
Sodium Hypochlorite (Circulating Water Pump House)	16,000 gallons	10	1542	444	-
Sodium Hypochlorite (Service Water Building)	6000 gallons	10	638	276	-
Sodium Hypochlorite (Station Water Intake)	10,000 gallons	10	1030	354	-
Nalco H-130 (Circulating Water Pump House)	3000 gallons	3300	1542	219	-
Nalco H-130 (Service Water Building)	1500 gallons	3300	638	189	-
Hydrogen (cryogenic liquid) Delivery Truck	13,000 gallons	71,400[b]	1004	1311	9570
		Units 1 & 2			
Acetone	55 gallons	2500	2214	102	-
Ammonium Hydroxide (30% Solution)	55 gallons	300	1228	1278	26.7
Carbon Dioxide	34,000 lbs	40,000	1146	1446	5330
Nalco H-130	2000 gallons	3300	1406	177	-

BASIS: NEW

NAPS ESP COL 2.2-2 **Table 2.2-205 Toxic Vapor Clouds**

Chemical Evaluated	Quantity	IDLH	Distance to Unit 3 Control Room (ft)	Distance to Toxic Limit (ft)	Control Room Concentration (ppm)[a]
		Units 1 & 2 *(continued)*			
Halon 1301	400 lbs	40,000	1228	72	-
Hydrazine (35% Solution)	345 gallons	50	1228	849	-
Hydrochloric Acid (31%)	55 gallons	50	1628	438	-
Nitrogen (cryogenic liquid)	4500 lbs	71,400[b]	1146	618	-
NOVEC 1230	304 lbs	150[d]	858	1065[f]	13.1
Carboline #2 (as toluene)	55 gallons	500	1683	99	-
Carboline #2 (as methyl ethyl ketone)	55 gallons	3000	1683	60	-
Sodium Hypochlorite (15% solution)	400 gallons	10	1769	54	-
Gasoline Delivery Truck	8500 gallons	750[e]	1078	936	-

NAPS ESP COL 2.2-2

Table 2.2-205 Toxic Vapor Clouds

(a) The control room concentration is only calculated if the distance to the chemical's toxic, asphyxiating, or oxygen-enriched limit exceeds the distance to the control room.

(b) Asphyxiating limit.

(c) Oxygen-enriched limit.

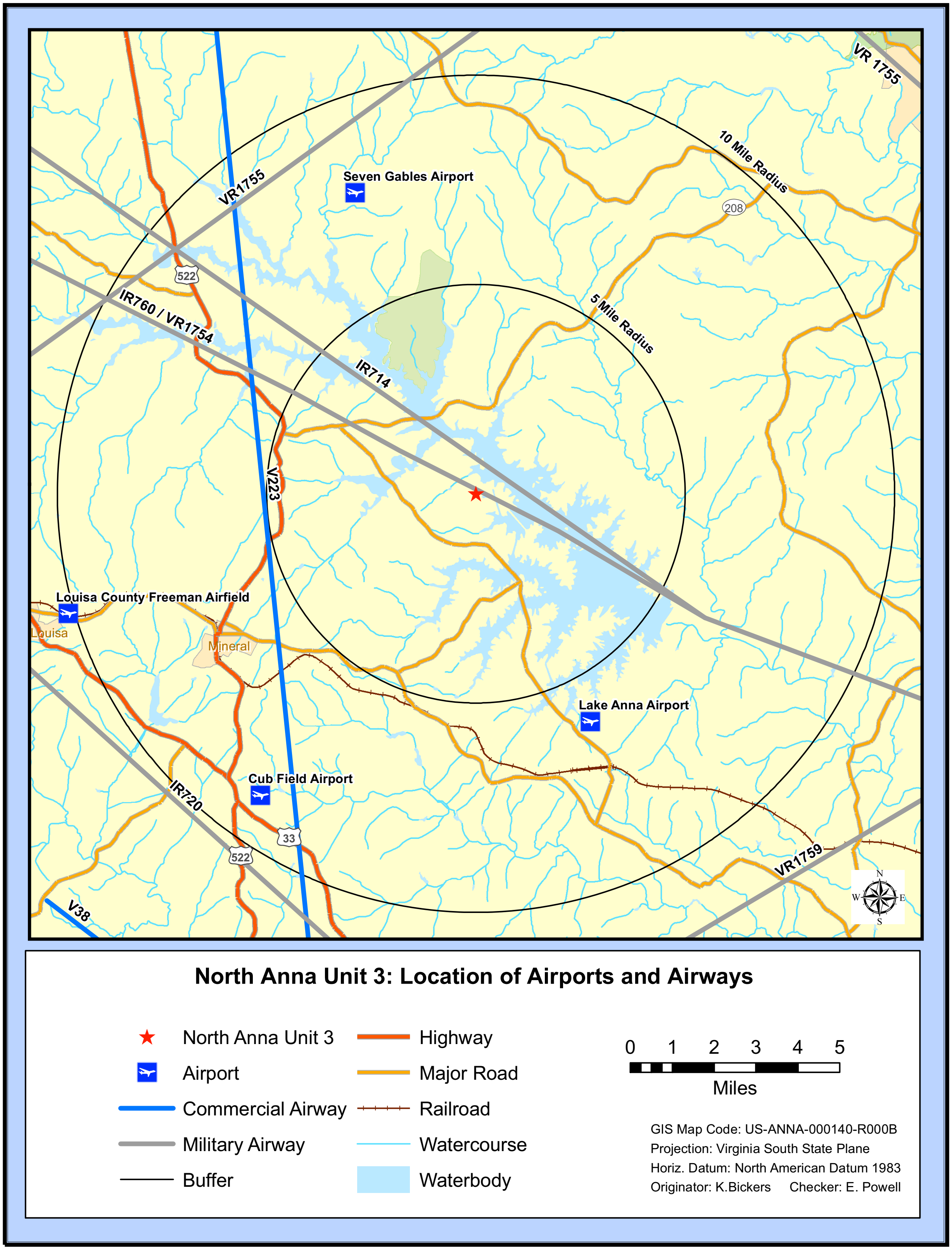
(d) Time-weighted average (TWA) exposure limit.

(e) Gasoline is not an available chemical in ALOHA, therefore the selection of n-Heptane as a surrogate for gasoline is common in the determination of the octane rating of fuel as noted in the study, *The Oxidation of a Gasoline Fuel Surrogate in the Negative Temperature Coefficient Region* (Reference 2.2-239). Additionally, in another study, *Evaporation of hydrocarbon compounds, including gasoline and diesel fuel, on heated metal surfaces,* the evaporation curves over a range of temperatures for n-Heptane and gasoline were shown to be similar and at temperatures below 80˚C, the evaporation of n-Heptane occurred at a faster rate, reflecting the fact that gasoline has several components with higher boiling points (Reference 2.2-237). Therefore, it was conservatively assumed that the entire quantity of gasoline stored was modeled as n-Heptane, and therefore available to form a vapor cloud at the evaporation rate of n-Heptane.

(f) NOVEC 1230 does not exist in the ALOHA chemical library, and not enough information is provided in the material safety data sheets to run the chemical as a heavy gas in ALOHA, as appropriate. However, the molecular weight is available and all that is required to run the Gaussian dispersion model. To ensure that the worst-case scenario is captured, Table 7 of the EPA's Risk Management Program Guidance (RMP) (Reference 2.2-238) is used to determine the toxic endpoint distance for a heavy gas. This table yields a toxic endpoint of less than 0.1 miles (528 feet) for NOVEC 1230's TWA of 150 ppm (1.93 mg/L). 1065 feet was calculated using the ALOHA Gaussian model for NOVEC 1230 as a lighter than air gas.

(g) The hydrogen tanks are not interconnected in a way such that the release of one tank will cause the release of the other. Therefore, analysis of only one tank is required.

NAPS COL 2.0-5-A **Figure 2.2-201 Civilian and Military Airway Routes in NAPS Vicinity**



2.3 Meteorology

2.3.1 Regional Climatology

NAPS COL 2.0-7-A

The information needed to address the DCD COL Item 2.0-7-A is included in SSAR Section 2.3.1, which is incorporated by reference with the following supplement.

2.3.1.2 General Climate

This SSAR section is supplemented by inserting, as the third paragraph, the following information about temperature extremes.

NAPS COL 2.0-7-A

The Unit 3 site characteristic value for the 0 percent exceedance minimum dry bulb temperature is -21°F (SSAR Table 2.3-5) from the Louisa Cooperative observing site (SSAR Reference 10). This is the most severe minimum temperature that has been observed in the site region and is used as the Unit 3 site characteristic value for this 0 percent exceedance value because it is more extreme than the calculated 100-year return value of -19°F (SSAR Table 2.3-18) at Richmond, Virginia (SSAR References 42, 43, and 44).

Using the International Station Meteorological Climate Summary for Richmond (Reference 2.3-207), dry-bulb temperatures ranging from -31.6°C (-25°F) to 38.3°C (101°F), were plotted in 1.1°C (2°F) intervals with their maximum observed coincident wet-bulb temperatures to obtain a corresponding curve. Extrapolating the curve to 42.8°C (109°F), which is the 100-year return value for maximum dry-bulb temperature, the 100-year return value for coincident wet-bulb temperature was determined to be 24.4°C (76°F). That is, 24.4°C (76°F) is the coincident wet-bulb temperature corresponding to the 100-year return period value for maximum dry-bulb temperature.

The Unit 3 site characteristic values used in the comparisons to the DCD Control Room Habitability Area (CRHA) transient room temperature analysis parameters were determined to be: “Maximum Average Dry Bulb Temperature for 0 percent Exceedance Maximum Temperature Day” at 93.6°F, “Minimum Average Dry Bulb Temperature for 0 percent Exceedance Minimum Temperature Day” at -3°F, and “Maximum High Humidity Average Wet Bulb Globe Temperature Index for 0 percent Exceedance Maximum Wet Bulb Temperature Day” at 81.4°F. These values were calculated using the methodology in DCD

Sections 3H.3.2.1.1 through 3H.3.2.1.3. The date and hour of occurrence for the 0 percent exceedance values of dry bulb and wet bulb temperatures from Richmond from 1973–2002 (SSAR References 43 and 44) were used to determine the magnitude of dry and wet-bulb temperature ranges for the calculation of the Unit 3 site characteristics. That is, for Figure 2.3-202, the day and hour on which the historical maximum hourly dry bulb temperature of 104.9°F occurred is used to establish the range around the 0 percent exceedance value. Similarly, for Figure 2.3-203, the day and hour on which the historical minimum hourly dry bulb temperature of -5.1°F occurred is used to establish the range around the 0 percent exceedance value. For Figure 2.3-204, the day and hour on which the historical maximum non-coincident wet bulb temperature of 84.9°F occurred is used to establish the range around the 0 percent exceedance value.

The 0 percent exceedance values identified as the Unit 3 site characteristic values in Table 2.0-201 were then applied as the 0 percent exceedance maximum/minimum values in the calculation. For the 0 percent exceedance maximum dry bulb temperature, the 100-year return period temperature of 109°F was used. For the 0 percent exceedance minimum dry bulb temperature, the historic minimum daily dry bulb temperature of -21°F was used. For the 0 percent exceedance non-coincident maximum wet bulb temperature, the 100-year return maximum wet bulb temperature of 88°F was used and because it exceeded the coincident dry bulb temperature of 86°F for the historic maximum non-coincident wet bulb temperature of 84.9°F, a coincident dry bulb temperature of 88°F was used, in which case the atmosphere was assumed to be saturated.

2.3.1.3.1 Extreme Winds

This SSAR section is supplemented with information to address wind speeds used for part of the Unit 3 design as follows.

NAPS COL 2.0-7-A

Nonsafety-related structures, not included as part of the certified design, are designed in accordance with Part I of the Virginia Uniform Statewide Building Code (Reference 2.3-204), which incorporates by reference the International Building Code (IBC) (Reference 2.3-205). The applicable edition of the IBC invokes Section 6 of American Society of Civil Engineers (ASCE) Standard No. 7 (Reference 2.3-206). ASCE 7,

Section 6.5.4, Figure 6.1, defines the basic wind speed for such structures. Unit 3 is not in a Special Wind Region.

The basic wind speed for Unit 3 nonsafety-related structures, not included in the certified design, is 40 m/s (90 mph). This design value is defined in Reference 2.3-206 as a 3-second gust at 10 m (33 ft) above the ground that has a 2 percent annual probability of being exceeded (i.e., the 50-year mean recurrence interval).

Using the methodology specified in RG 1.221, it was determined that the nominal 3-second gust wind speed that can be expected to occur at the Unit 3 site with an exceedance probability of 10^{-7} per year is 140 mph at 10 meters (33 feet) above ground level. The 3-second gust wind speed was determined based on digitizing the contours on Figure 3 of RG 1.221 and overlaying the Unit 3 site location.

2.3.1.3.2 Tornadoes

Add the following after the last paragraph of this SSAR section to address Unit 3 site tornado characteristics.

NAPS ESP VAR 2.3-1

The Unit 3 site tornado characteristics that apply to Unit 3 structures designed to withstand tornado loads are provided in Table 2.3-225. These Unit 3 site characteristic values for tornadoes are based on Region II in RG 1.76

2.3.1.3.4 Precipitation Extremes

Add a paragraph after the fourth paragraph of this SSAR section to address the site snowfall characteristics.

Table 2.3-224 summarizes maximum snowfall event depths, maximum snowpack depths, and estimated 100-year return values for snowfall event depths for selected stations in the Unit 3 site area. For the available periods of record, Piedmont Research Station and Fredericksburg logged the maximum snowfall event amounts which measured 25.5 inches for both sites for January 8, 1996, and January 28, 1922, respectively (Reference 2.2-208). Using the same reference, comparable maxima were observed at the other area stations ranging from 19.0 to 24.0 inches, many associated with the same snowstorm (January 8, 1996). The estimated 100-year return value for the maximum snowfall event amount is 26.5 inches in the Unit 3 site area. This estimate is based on the higher snowfall amount from either the 1-day

total or from the 2-day snowfall total. Two-day totals account for events that persist across calendar days.

The seventh paragraph of this SSAR section is supplemented as follows with information to address the 48-hour PMWP event.

The highest 48-hour PMWP value for the Unit 3 site area is associated with the month of December (SSAR Reference 47) with a value of 21.3 inches and weight of 110.8 lbf/ft^2. This precipitation value was estimated based on a logarithmic interpolation from the 6-hour, 24-hour, and 72-hour per 10-square mile area values shown in Figures 25, 37, and 47, respectively of SSAR Reference 47.

The last paragraph in this SSAR section is supplemented as follows with information to address ice and winter precipitation for Unit 3 safety-related structures.

NAPS COL 2.0-7-A

As Section 2.4.7.6 indicates, the design features that demonstrate acceptable roof structure performance are described in DCD Appendix 3G, e.g., for the reactor building, see DCD Section 3G.1.5.

2.3.2 Local Meteorology

NAPS COL 2.0-8-A

The information needed to address the DCD COL Item 2.0-8-A is included in SSAR Section 2.3.2, which is incorporated by reference with the following supplements.

2.3.2.3 Potential Influence of the Plant and the Facilities on Local Meteorology

The fourth paragraph of this SSAR section is revised as follows with information to address the impacts of cooling tower operations.

NAPS COL 2.0-8-A

The convective and conductive heat losses to the atmosphere resulting from the operation of the Unit 3 closed cycle, hybrid and dry cooling tower system dissipate rapidly through continuous mixing with the surrounding moving air mass. Therefore, any increase in overall ambient

temperature is very localized to the NAPS site and does not affect the ambient atmospheric and ground temperature beyond the NAPS site.

The sixth paragraph of this SSAR section is revised to address the engineering performed to consider potential impacts of Unit 3 cooling tower operations as follows.

NAPS ESP COL 2.3-1

The impact on the design and operation of Unit 3 from any cooling-tower-induced increase in the local ambient air temperature, or moisture and salt content, has been considered in the location and separation of wet cooling towers relative to electrical transmission lines and electrical equipment, including transformers and switchyard. Also, the separation of the wet and dry towers from Unit 3 buildings considered potential effects on air ambient conditions at HVAC air intakes, including consideration of prevailing winds. The site layout shown in Figure 2.1-201 ensures minimal impacts on Unit 3 operation from local increases in ambient air temperature, moisture content, and moisture and salt deposition resulting from the operation of the Unit 3 cooling towers, including wet cooling tower drift and plume condensation.

2.3.2.3.1 Salt Deposition and Moisture

The potential impacts on Unit 3 plant design and operation due to salt deposition, fogging, and icing from the CIRC hybrid cooling tower and from the Plant Service Water System (PSWS) cooling tower were assessed using the Seasonal/Annual Cooling Tower Impact (SACTI) computer code (Reference 2.3-202). See Section 10.4.5.8 for further description of the hybrid cooling tower design and see Section 9.2.1.2 for the service water cooling tower design.

a. **Salt Deposition**

Both the CIRC and service water cooling towers were modeled using SACTI and analyzed individually. The outputs were then added using Geographic Information System (GIS) technology. The following assumptions were made in the SACTI models for the cooling towers:

- Drift loss is 0.001 percent for the CIRC cooling tower, and 0.0005 percent for the service water cooling tower
- Total dissolved solids concentration of the cooling water is 9.44×10^{-4} g/cm^3 for the CIRC cooling tower (9 cycles) and 5.86×10^{-4} g/cm^3 for the service water cooling tower (4 cycles)
- Salt density is 2.17 g/cm^3

Salt deposition from evaporative cooling towers has the potential to build up on bushings of electrical equipment such as Unit 3 transformers, switchyard equipment, and transmission lines (see Figure 8.2-202). A highest deposition rate of 0.00015 mg/cm^2-month is predicted to occur near the north fence of the switchyard during the fall and winter seasons. The transmission lines and Unit 3 transformers have lower predicted maximum deposition rates. Many months of buildup at this rate would be needed before such deposits would accumulate to 0.03 mg/cm^2, which is the lower end of the “Light Contamination Level” range defined by the applicable IEEE standard (Reference 2.3-203). However, due to the service water cooling tower location with respect to prevailing wind directions, and natural wash off from local precipitation, total deposits are not expected to reach a level requiring attention. Therefore, cooling tower plume generated salt deposits are not expected to adversely affect any electrical equipment at the North Anna Site.

b. **Moisture**

Added humidity and potential moisture impacts due to CIRC hybrid cooling tower and service water cooling tower operation are predicted by the hours of fogging and icing produced by each tower as determined in the SACTI analysis. The following assumptions were used in the analysis:

- Plume abatement is not accounted for in the SACTI model.
- Total airflow for wet and dry sections of the CIRC hybrid cooling tower is considered.
- The CIRC hybrid cooling tower is modeled as one cell with a combined flow rate of all fans.

A maximum of 1.5 hours of fogging per year in any direction due to cooling tower operation is predicted for the CIRC hybrid cooling tower; with no fogging predicted for the service water cooling tower. Because the HVAC intakes, onsite transmission lines, switchyard equipment, and transformers are designed for outdoor operations, which include environmental conditions such as rain, fog and snow, added fog and moisture from cooling tower plumes are not expected to have an adverse affect on these plant features. Both cooling towers incorporate plume-limiting technology; therefore, the predicted annual hours of fogging due to cooling tower operation are conservative. Additionally, the SACTI analysis predicts no icing will occur.

2.3.2.3.2 Ambient Air Temperature Increases

In addition to the CIRC hybrid cooling tower and service water cooling tower, the CIRC dry cooling tower was considered when evaluating the potential for local ambient air temperature increases. The evaluation was based on the following assumptions:

- CIRC hybrid cooling tower height is 55 m (180 ft).
- CIRC dry cooling tower height is 19.8 m (65 ft).
- Service water cooling tower height is 20.4 m (67 ft).
- The emergency air intakes' height is approximately 7.8 m (25.6 ft).
- Exhaust plume temperatures of the CIRC hybrid and dry cooling towers are no greater than the maximum inlet water temperature of 50.2°C (122.3°F).
- Exhaust plume temperature of the service water cooling tower is no greater than the maximum inlet water temperature of 39.2°C (102.5°F).

The Unit 3 maximum dry bulb temperature for 0 percent exceedance (based on a 100-year return) is 42.8°C (109°F). As shown in DCD Table 3.2-1, the Control Building HVAC systems supporting safety-related areas and functions, i.e., the Control Room Habitability Area HVAC Subsystem (CRHAVS) and Emergency Filter Units of the Control Building HVAC System (CBVS), are classified as Safety Class 3 and are the only HVAC subsystems with safety class components, other than isolation equipment. Operation of the CRHAVS maintains the control room habitability area (CRHA) within the temperature and relative humidity ranges in DCD Table 9.4-1, which shows the limiting outside air design condition temperature for the CRHAVS, i.e., at the emergency air intakes, is 47.2°C (117°F) dry bulb.

A cooling tower plume would need to raise the local ambient temperature associated with the surrounding air mass at the emergency air intakes by more than 4.4°C (8°F) to exceed the design value. However, cooling tower plume temperatures are higher than the local ambient air temperatures, so buoyancy causes the thermal plume to rise under low wind conditions; whereas, high wind conditions that could direct a plume towards the intakes, would result in rapid air dispersion and mixing that cools the plume. Because the Unit 3 emergency air intakes are at a lower elevation than the exhaust plenums of the CIRC hybrid and dry cooling towers, and because the emergency air intakes are located

approximately 500 m (1640 ft) from the CIRC towers, the thermal plumes from the towers are not expected to raise the local ambient air temperatures at the emergency air intakes above the design value. The maximum inlet water temperature of 39.2°C (102.6°F) for the service water cooling tower is lower than the limiting outside air design condition temperature of 47.2°C (117°F) for the emergency air intakes. Therefore, exhaust from the service water cooling tower will not adversely affect the CRHAVS due to increases in surrounding ambient air temperature.

Similarly, the exhausts from the cooling towers are not expected to affect local ambient air temperatures near Unit 3 electrical equipment, including the transformers and switchyard equipment, which are at lower elevations than the Unit 3 MCR HVAC intakes. As with the HVAC intakes, high wind conditions that could direct a plume towards the outdoor electrical equipment would result in rapid air dispersion and mixing that cools the plume. Therefore, exhausts from the cooling towers will not adversely affect such Unit 3 electrical equipment due to increases in surrounding ambient air temperature.

2.3.3 Onsite Meteorological Measurements Program

NAPS COL 2.0-9-A

The information needed to address the DCD COL Item 2.0-9-A is included in SSAR Section 2.3.3, which is incorporated by reference with the following supplement.

2.3.3.1.2 Location, Elevation, and Exposure of Instruments

The second paragraph of this SSAR section is supplemented as follows with information to address the acceptability of distances from Unit 3 to the wind measurement towers.

NAPS COL 2.0-9-A

The highest building at the Unit 3 site is the Turbine Building at 170.6 ft above finished ground level grade as shown in DCD Table 2B-1 and DCD Figure 1.2-20. The primary meteorological measurements tower is located about 733.4 m (2406 ft) east of the plant facility boundary. Since the primary tower is located more than 10 building heights away from the tallest building at the Unit 3 site, the Unit 3 Turbine Building does not influence the meteorological measurements. The backup meteorological tower is located about 744 m (2440 ft) away from the highest building. Therefore, the Turbine Building also does not influence the meteorological measurements taken at the backup meteorological measurements tower.

NAPS COL 2.0-10-A

2.3.4 Short-Term (Accident) Diffusion Estimates

The information needed to address the DCD COL Item 2.0-10-A is included in SSAR Section 2.3.4, which is incorporated by reference with the following supplements.

2.3.4.1 Basis

The eighth paragraph of this SSAR section is supplemented as follows with information to address the wake influence zone of tall buildings at the Unit 3 site.

NAPS COL 2.0-10-A

As described in SSAR Section 2.1, the EAB is the perimeter of a 5000-foot-radius circle from the center of the containment of the third of the four originally proposed units. The highest building at the Unit 3 site is the Turbine Building which is 170.6 ft above finished ground level grade as shown in DCD Table 2B-1. Therefore, the closest point on the EAB is more than 10 building heights away from the Unit 3 power block buildings which could have postulated fission product releases. As a result, the entire EAB is located beyond the wake influence zone that can be induced by tall buildings, e.g., the Unit 3 Turbine Building or Reactor Building.

NAPS ESP COL 2.3-2

2.3.4.3 Atmospheric Dispersion Factors for On-Site Doses

Onsite χ/Q values for use in evaluating potential doses from Unit 3 postulated release locations (sources) to on-site receptor locations are based on the Unit 3 plant layout shown in DCD Figure 2A-1. The meteorological data used in evaluating on-site doses is the same data used for the accident condition dose calculations in SSAR Section 2.3.4. The χ/Q values for the control room and technical support center were calculated using the ARCON96 computer code in accordance with guidance as documented in RG 1.194. The source and receptor combinations are shown in Tables 2.3-201 through 2.3-204, and Tables 2.3-206 and 2.3-207. DCD Figure 2A-1 shows the locations of postulated accidental releases from Unit 3 and the Unit 3 receptor locations.

NAPS COL 2.0-11-A

2.3.5 Long-Term (Routine) Diffusion Estimates

The information needed to address DCD COL Item 2.0-11-A is included in SSAR Section 2.3.5, which is incorporated by reference with the following supplements and variances.

2.3.5.1 Basis

The third through sixth paragraphs of this SSAR section are supplemented as follows with information to address the receptors near the Unit 3 site.

NAPS ESP COL 2.3-3

The following input data and assumptions were used in the XOQDOQ modeling of routine releases from the vent stacks of the Reactor Building (RB-VS), Turbine Building (TB-VS), and Radwaste Building (RW-VS); and from the CIRC cooling tower:

- Meteorological Data: Three-year combined (1996–1998) onsite joint frequency distribution of wind speed, wind direction, and atmospheric stability.
- Type of Release: Mixed mode (RB-VS, TB-VS, and RW-VS) and ground level (CIRC cooling tower).
- Wind Sensor Height: 10 m (33 ft).
- Vertical Temperature Difference from instruments at: 10 m (33 ft) and 48.4 m (158.9 ft).
- Number of Wind Speed Categories: 7.
- Release Height: 52.77 m (173.09 ft) for RB-VS, 71.3 m (234.0 ft) for TB-VS, 18.15 m (59.59 ft) for RW-VS, 0.0 m (0.0 ft) for CIRC cooling tower.
- Building Height: 46.1 m (151.2 ft) effective height of TB for RB-VS and TB-VS releases, 12.15 m (39.89 ft) for RW-VS release, and 0.0 m (0.0 ft) for CIRC Cooling Tower.
- Minimum Turbine Building Cross-Sectional Area: 3098 m^2 (33,347 ft^2).
- Stack Average Velocity: 17.78 m/s (58.33 ft/s) for RB-VS, TB-VS, and RW-VS.
- Stack Inside Diameter: 2.40 m (7.9 ft) for RB-VS, 1.95 m (6.4 ft) for TB-VS, 1.34 m (4.4 ft) for RW-VS, 0.0 m (0.0 ft) for CIRC cooling tower.
- The distance for each sensitive receptor in each direction was assumed to occur at the distance for the nearest residence for releases from the RB, TB, and RW vent stacks. The distances from the CIRC cooling tower to potential receptors at the EAB are provided in Table 2.3-226.

Two sets of χ/Q and D/Q values were calculated. One analysis was performed for releases from the RB, TB, and RW vent stacks using distances from the plant facility boundary in Figure 2.0-205 to the EAB. These releases were based on the release heights and exit velocities for each building's vent stack as provided in DCD Table 2B-1. An additional analysis was performed for ground level releases from the CIRC cooling tower.

For the RB-VS, TB-VS, and RW-VS dispersion analyses, the Turbine Building was used to determine the minimum building cross-sectional area for evaluating building downwash effects. The height of this building is approximately 52 m (170.6 ft) and as the tallest building within the plant facility boundary, this building creates the largest wake. Because the Turbine Building is close enough to each of the three stacks, each will experience wake effects (dispersion) due to the Turbine Building. Also, because the Turbine Building is taller than the other buildings within the plant facility boundary, the building-induced turbulence for the Turbine Building effectively envelops the wakes from the other lower height structures. Therefore, only the Turbine Building wake was considered and was based on the Turbine Building cross-sectional area. A width of 67.2 m (220.5 ft) at the base of the building and a minimum building cross-sectional area of 3098 m^2 (33,347 ft^2) were used to determine χ/Q and D/Q estimates. This minimum Turbine Building area was divided by the width at the base to obtain the effective height, which accounts for the irregular shape of the top of the Turbine Building. An effective Turbine Building height of 46.1 m (151.2 ft) was used for modeling the releases from both the RB-VS and TB-VS. For Unit 3, the χ/Q and D/Q values were found to depend on building height but not cross-sectional area. Because building height is a more sensitive input than the cross-sectional area, and there is a large difference in the heights of the Turbine Building and the Radwaste Building, the Radwaste Building height of 12.15 m (39.89 ft) was used to ensure conservative results.

The annual Radiological Environmental Monitoring Program (Reference 2.3-201) was reviewed to determine if the distances of any of the nearest receptors modeled for the SSAR have changed. The results are documented in Table 2.3-15R based on a subsequent review and plotting of receptor locations using GIS technology. This process provided improved distance accuracy for these receptors. The results show the closest receptor to be a residence in the NW direction at a

distance of 1.28 km (4207 ft). The evaluation assumed conservatively, that each receptor (meat animal, vegetable garden, residence) is at the distance to the closest receptor and that the closest receptor is the residence in the NW direction at the previously determined distance of 1.20 km (3930 ft or 0.74 mi). Therefore, for the purposes of the atmospheric dispersion analysis and the subsequent dose evaluations, one of each type of receptor was assumed to be at 1.20 km (3930 ft or 0.74 mi) in each compass direction. The maximum annual average χ/Q value calculated for releases from the plant facility boundary for the nearest residence, vegetable garden, and meat animal, all assumed at 1.20 km (3930 ft or 0.74 mi), is 8.30E-7 sec/m^3 in the NNE direction.

The maximum D/Q for these receptors is 4.4E-9 m^{-2} in the S direction. The maximum annual χ/Q (no decay, undepleted) at the EAB is 8.1×10^{-7} sec/m^3; at a distance of 1.42 km (0.88 mile) to the NNE of the plant facility boundary from Table 2.3-16R. The maximum D/Q for the EAB is 5.5E-9 m^{-2} in the S direction.

NAPS ESP VAR 2.0-1a

The results are summarized in Table 2.3-16R which presents the maximum calculated χ/Qs and D/Qs for sensitive receptors. The values at various distances from the site are addressed in the tables described below.

Add the following at the end of this SSAR section to address annual average χ/Q and D/Q estimates.

NAPS COL 2.0-11-A

Long-term (annual average) χ/Q and D/Q estimates generated by the XOQDOQ model are also presented for each directional sector at twenty-two specific distances, as well as for ten distance segments. Table 2.3-208 presents the no decay and undepleted χ/Q estimates for the RB, TB, and RW vent stack releases at various downwind distances between 0.4 km (0.25 mi) and 80.5 km (50 mi). Table 2.3-216 provides corresponding values for the CIRC cooling tower releases. Table 2.3-209 presents the no decay and undepleted χ/Q estimates for the RB, TB, and RW vent stack releases for various distance segments out to 80.5 km (50 mi). Table 2.3-217 provides corresponding values for the CIRC cooling tower releases.

Table 2.3-210 presents the 2.26-day decay (for short-lived noble gases) and undepleted χ/Q estimates at the same downwind distances for the RB, TB, and RW vent stack releases. Table 2.3-218 provides

corresponding values for the CIRC cooling tower releases. Table 2.3-211 presents the 2.26-day decay and undepleted χ/Q estimates for the same distance segments for the RB, TB, and RW vent stack releases. Table 2.3-219 provides corresponding values for the CIRC cooling tower releases.

Table 2.3-212 presents the 8 day decay (for all iodines released to the atmosphere) and depleted χ/Q estimates at the same downwind distances for the RB, TB, and RW vent stack releases. Table 2.3-220 provides corresponding values for the CIRC cooling tower releases. Table 2.3-213 presents the 8 day decay and depleted χ/Q estimates for the same distance segments for the RB, TB, and RW vent stack releases. Table 2.3-221 provides corresponding values for the CIRC cooling tower releases.

Table 2.3-214 presents the D/Q estimates for the same downwind distances for the RB, TB, and RW vent stack releases. Table 2.3-222 provides corresponding values for the CIRC cooling tower releases. Table 2.3-215 presents the D/Q estimates for the same distance segments for the RB, TB, and RW vent stack releases. Table 2.3-223 provides corresponding values for the CIRC cooling tower releases.

Section 2.3 References

2.3-201 Dominion North Anna Power Station 2006 Annual Radiological Environmental Operating Report, prepared by Dominion North Anna Power Station, January 2006-December 2006.

2.3-202 SACTI User's Manual: Cooling-Tower-Plume Prediction Code, EPRI CS-3403-CCM, April 1984.

2.3-203 Institute of Electrical and Electronics Engineers, Std C57.19.100, "IEEE Guide for Application of Power Apparatus Bushings."

2.3-204 Virginia Uniform Statewide Building Code, Part I (Virginia Construction Code), Virginia Board of Housing and Community Development.

2.3-205 International Building Code, International Code Council, Inc.

2.3-206 Minimum Design Loads for Buildings and Other Structures, American Society of Civil Engineers Standard No. 7 (ASCE 7).

2.3-207 International Station Meteorological Climate Summary, Fleet Numerical Meteorology and Oceanography Detachment, National Climatic Data Center, and USAFETAC OL-A, Version 4.0, September 1996.

2.3-208 U.S. Department of Commerce, “United States Snow Climatology,” National Climatic Data Center, NOAA, available at http://www.ncdc.noaa.gov/ussc/index.jsp accessed on March 16, 2010.

NAPS ESP COL 2.3-3

Table 2.3-15R Source to Receptor Distances

Type[3]	Direction from Unit 3 (True North)	Distance from Plant Facility Boundary (ft)[1]	Distance from Plant Facility Boundary (miles/km)[1]
		Vegetation	
Veg	S	5605	1.06/1.71
Veg	SSW	22877	4.33/6.97
Veg	SW	17254	3.27/5.26
Veg	WSW	No Receptor	No Receptor
Veg	W	14891	2.82/4.54
Veg	WNW	7608	1.44/2.32
Veg	NW	No Receptor	No Receptor
Veg	NNW	11399	2.16/3.47
Veg	N	13672	2.59/4.17
Veg	NNE	17318	3.28/5.28
Veg	NE	5029	0.95/1.53
Veg	ENE	13272	2.51/4.05
Veg	E	8519	1.61/2.60
Veg	ESE	11826	2.24/3.60
Veg	SE	4658	0.88/1.42
Veg	SSE	4609	0.87/1.40
		Meat Animal	
Meat	S	8712	1.65/2.66
Meat	SSW	9476	1.79/2.89
Meat	SW	6468	1.23/1.97
Meat	WSW	No Receptor	No Receptor
Meat	W	20424	3.87/6.23
Meat	WNW	21339	4.04/6.50
Meat	NW	No Receptor	No Receptor
Meat	NNW	No Receptor	No Receptor

NAPS ESP COL 2.3-3

Table 2.3-15R Source to Receptor Distances

Type[3]	Direction from Unit 3 (True North)	Distance from Plant Facility Boundary (ft)[1]	Distance from Plant Facility Boundary (miles/km)[1]
Meat Animal (continued)			
Meat	N	11441	2.17/3.49
Meat	NNE	7868	1.49/2.40
Meat	NE	7940	1.50/2.42
Meat	ENE	14428	2.73/4.40
Meat	E	19631	3.72/5.98
Meat	ESE	7058	1.34/2.15
Meat	SE	7711	1.46/2.35
Meat	SSE	10445	1.98/3.18
Resident			
Res	S	4339	0.82/1.32
Res	SSW	4575	0.87/1.39
Res	SW	6468	1.23/1.97
Res	WSW	6107	1.16/1.86
Res	W	5263	1.00/1.60
Res	WNW	5421	1.03/1.65
Res	NW	4207	0.80/1.28
Res	NNW	4587	0.87/1.40
Res	N	4846	0.92/1.48
Res	NNE	5695	1.08/1.74
Res	NE	5029	0.95/1.53
Res	ENE	8748	1.66/2.67
Res	E	7158	1.36/2.18
Res	ESE	7506	1.42/2.29
Res	SE	4830	0.91/1.47
Res	SSE	4394	0.83/1.34

NAPS ESP COL 2.3-3

Table 2.3-15R Source to Receptor Distances

Type[3]	Direction from Unit 3 (True North)	Distance from Plant Facility Boundary (ft)[1]	Distance from Plant Facility Boundary (miles/km)[1]
Site Boundary (Exclusion Area Boundary)			
EAB	S	3274	0.62/0.99
EAB	SSW	3009	0.57/0.92
EAB	SW	2851	0.54/087
EAB	WSW	2903	0.55/0.88
EAB	W	2851	0.54/0.87
EAB	WNW	2956	0.56/0.90
EAB	NW	3274	0.62/0.99
EAB	NNW	3802	0.72/1.16
EAB	N	4593	0.87/1.40
EAB	NNE	4646	0.88/1.42
EAB	NE	4751	0.90/1.45
EAB	ENE	4806	0.91/1.47
EAB	E	4698	0.89/1.43
EAB	ESE	4646	0.88/1.42
EAB	SE	4383	0.83/1.34
EAB	SSE	3855	0.73/1.17

Notes:
1. Distances are from the plant facility boundary. See Figure 2.0-205.
2. Not used.
3. No milk cows or goats within a 5-mile radius of NAPS.

NAPS ESP COL 2.3-3
NAPS ESP VAR 2.0-1

Table 2.3-16R XOQDOQ Predicted Maximum χ/Q and D/Q Values at Specific Points of Interest

Type of Location	Structure	Release Type	Direction from Site (True North)	Distance (miles)	χ/Q (No Decay, Undepleted)	χ/Q (2.26 Day Decay, Undepleted)	χ/Q (8 Day Decay, Depleted)	D/Q
Residence	RB	Mixed	NNE	0.74	6.8E-08	6.8E-08	6.6E-08	1.8E-09 [b]
EAB	RB	Mixed	NNE	0.88	7.1E-08	7.1E08	6.9E-08	1.7E-09 [a]
Meat Animal	RB	Mixed	NNE	0.74	6.8E-08	6.8E-08	6.6E-08	1.8E-09 [b]
Veg. Garden	RB	Mixed	NNE	0.74	6.8E-08	6.8E-08	6.6E-08	1.8E-09 [b]
Residence	TB	Mixed	NNE	0.74	5.5E-08	5.5E-08	5.3E-08	1.8E-09
EAB	TB	Mixed	NNE	0.88	5.2E-08	5.2E-08	5.0E-08	1.6E-09 [c]
Meat Animal	TB	Mixed	NNE	0.74	5.5E-08	5.5E-08	5.3E-08	1.8E-09
Veg. Garden	TB	Mixed	NNE	0.74	5.5E-08	5.5E-08	5.3E-08	1.8E-09
Residence	RW	Mixed	NNE	0.74	8.3E-07	8.3E-07	8.2E-07	4.4E-09 [e]
EAB	RW	Mixed	NNE	0.88	8.1E-07	8.1E-07	8.0E-07	5.5E-09 [d]
Meat Animal	RW	Mixed	NNE	0.74	8.3E-07	8.3E-07	8.2E-07	4.4E-09 [e]
Veg. Garden	RW	Mixed	NNE	0.74	8.3E-07	8.3E-07	8.2E-07	4.4E-09 [e]
Residence	CIRC CT	Ground	ESE	0.74	6.3E-06	6.2E-06	5.6E-06	1.1E-08 [g]
EAB	CIRC CT	Ground	W	0.34	6.4E-06	6.4E-06	6.0E-06	2.1E-08 [f]
Meat Animal	CIRC CT	Ground	ESE	0.74	6.3E-06	6.2E-06	5.6E-06	1.1E-08 [g]
Veg. Garden	CIRC CT	Ground	ESE	0.74	6.3E-06	6.2E-06	5.6E-06	1.1E-08 [g]

NAPS ESP COL 2.3-3
NAPS ESP VAR 2.0-1

Table 2.3-16R XOQDOQ Predicted Maximum χ/Q and D/Q Values at Specific Points of Interest

Notes:
χ/Q – sec/m^3
D/Q – 1/m^2

RB – Reactor Building
TB – Turbine Building
RW – Radwaste Building
CIRC CT – CIRC Cooling Tower

a - Direction South and South-Southeast at distances of 0.62 and 0.73 mi, respectively, for maximum D/Q for EAB.
b - Direction North-Northeast and Southeast at distances of 0.74 mi for maximum D/Q for Residence, Meat Animal and Veg. Garden.
c - Direction North-Northeast and South-Southeast at distances of 0.88 and 0.73 mi, respectively, for maximum D/Q for EAB.
d – Direction South at distance of 0.62 mi for maximum D/Q for EAB.
e - Direction South at distance of 0.74 mi for maximum D/Q for Residence, Meat Animal and Veg. Garden.
f - Direction South at distance of 0.43 mi for maximum D/Q for EAB.
g - Direction North-Northeast at distance of 0.74 mi for maximum D/Q for Residence, Meat Animal and Veg. Garden.

Table 2.3-17R [Deleted]

NAPS ESP COL 2.3-2

Table 2.3-201 Unit 3 Reactor Building χ/Q Results (sec/m³)

Source/Receptor[1]	0–2 hr	2–8 hr	8–24 hr	1–4 d	4–30 d
RB to CBL[2]	1.73E-03	1.18E-03	4.13E-04	3.48E-04	2.82E-04
RB-VS to CBL[2]	9.10E-04	6.35E-04	2.37E-04	1.73E-04	1.42E-04
RB to EN[3]	1.12E-03	8.01E-04	2.75E-04	2.29E-04	1.94E-04
RB to ES[3]	1.11E-03	8.04E-04	3.00E-04	2.38E-04	1.93E-04
RB to N[3]	1.19E-03	8.21E-04	3.18E-04	2.55E-04	2.05E-04
RB-VS to ES[3]	6.68E-04	4.60E-04	1.73E-04	1.23E-04	1.05E-04
RB-VS to N[3]	7.28E-04	5.04E-04	1.89E-04	1.35E-04	1.14E-04
RB to TSCB[4]	2.30E-04	1.79E-04	7.54E-05	5.84E-05	4.57E-05
RB to TSCA[4]	2.41E-04	1.85E-04	7.43E-05	5.90E-05	4.78E-05

Note 1: See DCD Figure 2A-1 for building source and intake locations.

Note 2: These results are for confirmation of the Reactor Building to Control Room Unfiltered Inleakage χ/Q values.

Note 3: These results are for confirmation of the Reactor Building to Control Room Intake χ/Q values.

Note 4: These results are for confirmation of the Reactor Building to Technical Support Center Intake and Inleakage χ/Q values.

NAPS ESP COL 2.3-2

Table 2.3-202 Unit 3 Turbine Building χ/Q Results (sec/m^3)

Source/Receptor[4]	0–2 hr	2–8 hr	8–24 hr	1–4 d	4–30 d
TB to CBL[1]	7.24E-04	3.60E-04	1.64E-04	1.25E-04	9.91E-05
TB-TD to CBL[1]	2.50E-04	2.21E-04	8.87E-05	5.84E-05	4.48E-05
TB-VS to CBL[1]	3.18E-04	2.60E-04	1.04E-04	7.49E-05	5.63E-05
TB to EN[2]	7.80E-04	3.77E-04	1.71E-04	1.43E-04	1.10E-04
TB to ES[2]	5.77E-04	3.13E-04	1.33E-04	1.08E-04	8.34E-05
TB to N[2]	5.47E-04	2.99E-04	1.29E-04	1.03E-04	7.96E-05
TB-TD to EN[2]	2.42E-04	2.09E-04	8.50E-05	5.64E-05	4.54E-05
TB-VS to EN[2]	3.50E-04	2.92E-04	1.22E-04	8.22E-05	6.87E-05
TB-VS to N[2]	2.67E-04	2.20E-04	9.25E-05	6.19E-05	5.05E-05
TB to TSCB[3]	7.13E-04	4.15E-04	1.42E-04	1.37E-04	1.18E-04
TB to TSCA[3]	6.48E-04	3.99E-04	1.43E-04	1.28E-04	1.10E-04
TB-TD to TSCB[3]	5.78E-04	4.07E-04	1.81E-04	1.23E-04	1.11E-04

Note 1: These results are for confirmation of the Turbine Building to Control Room Unfiltered Inleakage χ/Q values.

Note 2: These results are for confirmation of the Turbine Building to Control Room Intake χ/Q values.

Note 3: These results are for confirmation of the Turbine Building to Technical Support Center Intake and Inleakage χ/Q values.

Note 4: See DCD Figure 2A-1 for building source and intake locations.

NAPS ESP COL 2.3-2

Table 2.3-203 Unit 3 PCCS/Reactor Building Roof χ/Q Results (sec/m³)

Source/Receptor[4]	0–2 hr	2–8 hr	8–24 hr	1–4 d	4–30 d
PCCS to CBL[1]	1.58E-03	1.33E-03	5.58E-04	3.97E-04	3.34E-04
PCCS to EN[2]	1.31E-03	9.32E-04	3.66E-04	2.71E-04	2.19E-04
PCCS to ES[2]	1.07E-03	8.28E-04	3.52E-04	2.56E-04	2.08E-04
PCCS to N[2]	1.08E-03	8.52E-04	3.73E-04	2.60E-04	2.18E-04
PCCS to TSCB[3]	3.44E-04	2.79E-04	1.14E-04	8.57E-05	6.64E-05
PCCS to TSCA[3]	3.61E-04	2.85E-04	1.15E-04	8.79E-05	6.76E-05

Note 1: These results are for confirmation of the Passive Containment Cooling System (PCCS) to Control Room Unfiltered Inleakage χ/Q values.

Note 2: These results are for confirmation of the Passive Containment Cooling System to Control Room Intake χ/Q values.

Note 3: These results are for confirmation of the Passive Containment Cooling System to Technical Support Center Intake and Inleakage χ/Q values.

Note 4: See DCD Figure 2A-1 for building source and intake locations.

NAPS ESP COL 2.3-2

Table 2.3-204 Unit 3 Fuel Building χ/Q Results (sec/m^3)

Source/Receptor[3]	0–2 hr	2–8 hr	8–24 hr	1–4 d	4–30 d
FB to CBL[1]	2.23E-03	1.56E-03	5.64E-04	4.95E-04	4.30E-04
FB to EN[2]	1.11E-03	8.34E-04	3.08E-04	2.55E-04	2.23E-04
FB to ES[2]	1.55E-03	1.17E-03	4.05E-04	3.40E-04	2.98E-04
FB to N[2]	1.98E-03	1.44E-03	5.15E-04	4.23E-04	3.64E-04

Note 1: These results are for confirmation of the Fuel Building to Control Room Unfiltered Inleakage χ/Q values.

Note 2: These results are for confirmation of the Fuel Building to Control Room Intake χ/Q values.

Note 3: See DCD Figure 2A-1 for building source and intake locations.

Table 2.3-205 [Deleted]

NAPS ESP COL 2.3-2

Table 2.3-206 Unit 3 HELB Blowout Panels/Reactor Building χ/Q Results (sec/m^3)

Source/Receptor[3]	0–2 hr	2–8 hr	8–24 hr	1–4 d	4–30 d
BPN to CBL[1]	4.12E-03	3.28E-03	1.35E-03	9.88E-04	7.69E-04
BPS to CBL[1]	4.38E-03	3.36E-03	1.32E-03	1.01E-03	8.15E-04
BPN to EN[2]	2.76E-03	2.18E-03	9.05E-04	6.64E-04	5.70E-04
BPN to ES[2]	2.03E-03	1.59E-03	7.12E-04	5.22E-04	4.06E-04
BPN to N[2]	1.91E-03	1.55E-03	6.59E-04	4.83E-04	3.81E-04
BPS to EN[2]	2.13E-03	1.59E-03	6.11E-04	4.75E-04	4.03E-04
BPS to ES[2]	2.76E-03	2.04E-03	7.78E-04	5.81E-04	5.14E-04
BPS to N[2]	3.34E-03	2.51E-03	9.54E-04	7.00E-04	6.30E-04

Note 1: These results are for confirmation of the High Energy Line Break (HELB) Blowout Panels/Reactor Building to Control Room Unfiltered Inleakage χ/Q values.

Note 2: These results are for confirmation of the HELB Blowout Panels/Reactor Building to Control Room Intake χ/Q values.

Note 3: See DCD Figure 2A-1 for building source and intake locations.

NAPS ESP COL 2.3-2

Table 2.3-207 Unit 3 Cross Unit χ/Q Results (sec/m^3)

Source/Receptor	0–2 hr	2–8 hr	8–24 hr	1–4 d	4–30 d
Unit 1/2 Release to Unit 3	5.13E-05	3.67E-05	1.36E-05	9.95E-06	7.51E-06

NAPS COL 2.0-11-A

Table 2.3-208 Long-Term χ/Q (sec/m³) for Routine Releases at Distances Between 0.25 to 50 Miles, No Decay, Undepleted

1USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE: 7/ 8/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
EXIT RB - MIXED MODE RELEASE - NO PURGE RELEASES
NO DECAY, UNDEPLETED

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	0.250	0.500	0.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	1.215E-07	6.850E-08	6.533E-08	7.487E-08	8.482E-08	8.163E-08	7.439E-08	6.675E-08	5.975E-08	5.363E-08	4.836E-08
SSW	5.450E-08	3.120E-08	3.230E-08	4.172E-08	5.403E-08	5.532E-08	5.227E-08	4.804E-08	4.377E-08	3.981E-08	3.628E-08
SW	4.108E-08	2.332E-08	2.410E-08	3.227E-08	4.374E-08	4.576E-08	4.381E-08	4.064E-08	3.728E-08	3.411E-08	3.122E-08
WSW	3.446E-08	2.254E-08	2.357E-08	2.932E-08	3.737E-08	3.866E-08	3.708E-08	3.459E-08	3.193E-08	2.937E-08	2.703E-08
W	4.658E-08	2.971E-08	2.844E-08	3.446E-08	4.328E-08	4.447E-08	4.252E-08	3.961E-08	3.656E-08	3.366E-08	3.100E-08
WNW	4.676E-08	3.794E-08	3.545E-08	3.894E-08	4.490E-08	4.478E-08	4.207E-08	3.868E-08	3.533E-08	3.224E-08	2.949E-08
NW	2.899E-08	2.013E-08	1.912E-08	2.602E-08	3.864E-08	4.243E-08	4.170E-08	3.930E-08	3.643E-08	3.358E-08	3.093E-08
NNW	3.068E-08	1.997E-08	1.382E-08	1.696E-08	2.674E-08	3.105E-08	3.171E-08	3.072E-08	2.908E-08	2.724E-08	2.542E-08
N	8.469E-08	4.920E-08	3.659E-08	4.590E-08	7.175E-08	8.282E-08	8.430E-08	8.149E-08	7.702E-08	7.208E-08	6.720E-08
NNE	1.495E-07	8.914E-08	6.988E-08	7.852E-08	1.039E-07	1.125E-07	1.110E-07	1.054E-07	9.853E-08	9.149E-08	8.481E-08
NE	1.070E-07	5.723E-08	4.874E-08	5.915E-08	8.211E-08	8.991E-08	8.903E-08	8.467E-08	7.917E-08	7.353E-08	6.817E-08
ENE	7.397E-08	3.692E-08	2.785E-08	3.128E-08	4.206E-08	4.634E-08	4.640E-08	4.461E-08	4.213E-08	3.948E-08	3.688E-08
E	8.171E-08	3.661E-08	2.533E-08	3.063E-08	4.870E-08	5.852E-08	6.186E-08	6.179E-08	6.007E-08	5.760E-08	5.485E-08
ESE	1.130E-07	5.568E-08	4.030E-08	4.415E-08	6.015E-08	6.798E-08	6.973E-08	6.847E-08	6.586E-08	6.273E-08	5.948E-08
SE	1.522E-07	8.406E-08	5.817E-08	5.493E-08	5.937E-08	5.990E-08	5.768E-08	5.439E-08	5.084E-08	4.738E-08	4.416E-08
SSE	1.199E-07	7.853E-08	6.419E-08	6.486E-08	6.805E-08	6.486E-08	5.942E-08	5.379E-08	4.862E-08	4.404E-08	4.005E-08

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	4.383E-08	2.875E-08	2.063E-08	1.253E-08	8.675E-09	6.485E-09	5.099E-09	4.155E-09	3.477E-09	2.970E-09	2.579E-09
SSW	3.316E-08	2.233E-08	1.624E-08	1.000E-08	6.972E-09	5.232E-09	4.125E-09	3.367E-09	2.822E-09	2.413E-09	2.097E-09
SW	2.865E-08	1.954E-08	1.432E-08	8.907E-09	6.247E-09	4.710E-09	3.726E-09	3.051E-09	2.563E-09	2.196E-09	1.912E-09
WSW	2.492E-08	1.730E-08	1.281E-08	8.065E-09	5.702E-09	4.323E-09	3.434E-09	2.822E-09	2.378E-09	2.043E-09	1.782E-09
W	2.862E-08	2.000E-08	1.491E-08	9.498E-09	6.780E-09	5.182E-09	4.145E-09	3.426E-09	2.902E-09	2.505E-09	2.195E-09
WNW	2.707E-08	1.862E-08	1.378E-08	8.734E-09	6.239E-09	4.774E-09	3.823E-09	3.164E-09	2.682E-09	2.318E-09	2.033E-09
NW	2.853E-08	1.985E-08	1.477E-08	9.404E-09	6.722E-09	5.144E-09	4.121E-09	3.409E-09	2.890E-09	2.497E-09	2.189E-09
NNW	2.370E-08	1.706E-08	1.293E-08	8.397E-09	6.059E-09	4.665E-09	3.752E-09	3.114E-09	2.646E-09	2.289E-09	2.010E-09
N	6.261E-08	4.498E-08	3.404E-08	2.206E-08	1.590E-08	1.223E-08	9.824E-09	8.145E-09	6.913E-09	5.977E-09	5.244E-09
NNE	7.870E-08	5.597E-08	4.222E-08	2.732E-08	1.970E-08	1.516E-08	1.219E-08	1.012E-08	8.598E-09	7.440E-09	6.533E-09
NE	6.325E-08	4.493E-08	3.387E-08	2.189E-08	1.578E-08	1.214E-08	9.763E-09	8.102E-09	6.884E-09	5.958E-09	5.232E-09
ENE	3.446E-08	2.515E-08	1.931E-08	1.280E-08	9.376E-09	7.306E-09	5.933E-09	4.965E-09	4.248E-09	3.698E-09	3.265E-09
E	5.207E-08	4.012E-08	3.186E-08	2.202E-08	1.657E-08	1.317E-08	1.086E-08	9.196E-09	7.949E-09	6.982E-09	6.211E-09
ESE	5.632E-08	4.337E-08	3.468E-08	2.442E-08	1.871E-08	1.511E-08	1.263E-08	1.083E-08	9.467E-09	8.399E-09	7.540E-09
SE	4.125E-08	3.040E-08	2.370E-08	1.623E-08	1.225E-08	9.805E-09	8.151E-09	6.963E-09	6.069E-09	5.374E-09	4.817E-09
SSE	3.660E-08	2.486E-08	1.831E-08	1.157E-08	8.267E-09	6.338E-09	5.090E-09	4.224E-09	3.593E-09	3.114E-09	2.739E-09

0VENT AND BUILDING PARAMETERS:

RELEASE HEIGHT	(METERS)	52.77	REP. WIND HEIGHT	(METERS)	10.0
DIAMETER	(METERS)	2.40	BUILDING HEIGHT	(METERS)	46.1
EXIT VELOCITY	(METERS)	17.78	BLDG.MIN.CRS.SEC.AREA	(SQ.METERS)	3098.0
			HEAT EMISSION RATE	(CAL/SEC)	0.0

0AT THE RELEASE HEIGHT:		AT THE MEASURED WIND HEIGHT (10.0 METERS):		
VENT RELEASE MODE	WIND SPEED (METERS/SEC)	VENT RELEASE MODE	WIND SPEED (METERS/SEC) STABLE CONDITIONS	WIND SPEED (METERS/SEC) UNSTABLE/NEUTRAL CONDITIONS
ELEVATED	LESS THAN 3.556	ELEVATED	LESS THAN 3.556	LESS THAN 3.556
MIXED	BETWEEN 3.556 AND 17.780	MIXED	BETWEEN 3.556 AND 17.780	BETWEEN 3.556 AND 17.780
GROUND LEVEL	ABOVE 17.780	GROUND LEVEL	ABOVE 17.780	ABOVE 17.780

Note: Directions are True North.

BASIS: ESBWR COLA

NAPS COL 2.0-11-A **Table 2.3-208 Long-Term χ/Q (sec/m^3) for Routine Releases at Distances Between 0.25 to 50 Miles, No Decay, Undepleted**

1USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE: 7/ 8/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
EXIT TB - MIXED MODE RELEASE - NO PURGE RELEASES
NO DECAY, UNDEPLETED

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	0.250	0.500	0.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	1.147E-07	5.912E-08	4.785E-08	5.254E-08	6.329E-08	6.493E-08	6.190E-08	5.730E-08	5.244E-08	4.784E-08	4.366E-08
SSW	5.197E-08	2.729E-08	2.301E-08	2.804E-08	3.902E-08	4.298E-08	4.271E-08	4.064E-08	3.793E-08	3.511E-08	3.241E-08
SW	3.866E-08	2.069E-08	1.738E-08	2.166E-08	3.127E-08	3.515E-08	3.541E-08	3.402E-08	3.200E-08	2.980E-08	2.765E-08
WSW	3.221E-08	1.974E-08	1.770E-08	2.053E-08	2.708E-08	2.984E-08	3.005E-08	2.900E-08	2.742E-08	2.567E-08	2.393E-08
W	4.366E-08	2.686E-08	2.209E-08	2.471E-08	3.166E-08	3.437E-08	3.432E-08	3.299E-08	3.113E-08	2.912E-08	2.714E-08
WNW	4.287E-08	3.378E-08	2.939E-08	2.983E-08	3.313E-08	3.400E-08	3.304E-08	3.124E-08	2.916E-08	2.707E-08	2.508E-08
NW	2.612E-08	1.808E-08	1.485E-08	1.724E-08	2.515E-08	2.947E-08	3.062E-08	3.006E-08	2.873E-08	2.710E-08	2.541E-08
NNW	2.768E-08	1.883E-08	1.150E-08	1.104E-08	1.605E-08	2.010E-08	2.199E-08	2.242E-08	2.203E-08	2.123E-08	2.025E-08
N	7.522E-08	4.563E-08	2.991E-08	2.954E-08	4.271E-08	5.325E-08	5.813E-08	5.918E-08	5.811E-08	5.597E-08	5.335E-08
NNE	1.330E-07	8.002E-08	5.611E-08	5.368E-08	6.653E-08	7.601E-08	7.916E-08	7.836E-08	7.555E-08	7.187E-08	6.789E-08
NE	9.706E-08	5.066E-08	3.734E-08	3.839E-08	5.136E-08	6.011E-08	6.316E-08	6.278E-08	6.065E-08	5.775E-08	5.459E-08
ENE	6.623E-08	3.337E-08	2.189E-08	2.066E-08	2.601E-08	3.028E-08	3.202E-08	3.209E-08	3.127E-08	3.002E-08	2.859E-08
E	7.219E-08	3.341E-08	2.009E-08	1.895E-08	2.721E-08	3.485E-08	3.916E-08	4.096E-08	4.122E-08	4.060E-08	3.951E-08
ESE	1.009E-07	5.030E-08	3.241E-08	2.978E-08	3.669E-08	4.301E-08	4.613E-08	4.694E-08	4.640E-08	4.515E-08	4.354E-08
SE	1.348E-07	7.571E-08	4.873E-08	4.191E-08	4.236E-08	4.353E-08	4.323E-08	4.185E-08	3.992E-08	3.779E-08	3.563E-08
SSE	1.092E-07	6.871E-08	5.128E-08	4.905E-08	5.158E-08	5.106E-08	4.843E-08	4.502E-08	4.149E-08	3.815E-08	3.508E-08

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	3.995E-08	2.689E-08	1.951E-08	1.196E-08	8.316E-09	6.229E-09	4.903E-09	3.997E-09	3.346E-09	2.859E-09	2.482E-09
SSW	2.993E-08	2.072E-08	1.526E-08	9.498E-09	6.653E-09	5.007E-09	3.954E-09	3.231E-09	2.710E-09	2.319E-09	2.016E-09
SW	2.563E-08	1.800E-08	1.336E-08	8.405E-09	5.927E-09	4.483E-09	3.553E-09	2.913E-09	2.450E-09	2.101E-09	1.830E-09
WSW	2.229E-08	1.590E-08	1.191E-08	7.578E-09	5.384E-09	4.093E-09	3.258E-09	2.680E-09	2.260E-09	1.943E-09	1.697E-09
W	2.528E-08	1.812E-08	1.366E-08	8.782E-09	6.297E-09	4.825E-09	3.866E-09	3.199E-09	2.712E-09	2.342E-09	2.054E-09
WNW	2.328E-08	1.654E-08	1.244E-08	8.012E-09	5.772E-09	4.440E-09	3.569E-09	2.961E-09	2.515E-09	2.177E-09	1.912E-09
NW	2.378E-08	1.728E-08	1.313E-08	8.545E-09	6.177E-09	4.761E-09	3.832E-09	3.181E-09	2.704E-09	2.341E-09	2.056E-09
NNW	1.922E-08	1.457E-08	1.134E-08	7.563E-09	5.537E-09	4.303E-09	3.483E-09	2.904E-09	2.477E-09	2.150E-09	1.893E-09
N	5.061E-08	3.835E-08	2.983E-08	1.989E-08	1.456E-08	1.131E-08	9.148E-09	7.625E-09	6.499E-09	5.638E-09	4.961E-09
NNE	6.398E-08	4.769E-08	3.687E-08	2.450E-08	1.793E-08	1.393E-08	1.128E-08	9.413E-09	8.031E-09	6.974E-09	6.141E-09
NE	5.145E-08	3.831E-08	2.958E-08	1.962E-08	1.434E-08	1.113E-08	9.008E-09	7.512E-09	6.407E-09	5.562E-09	4.897E-09
ENE	2.713E-08	2.078E-08	1.637E-08	1.115E-08	8.300E-09	6.534E-09	5.346E-09	4.498E-09	3.866E-09	3.378E-09	2.992E-09
E	3.818E-08	3.112E-08	2.549E-08	1.825E-08	1.401E-08	1.128E-08	9.389E-09	8.010E-09	6.965E-09	6.146E-09	5.490E-09
ESE	4.180E-08	3.354E-08	2.737E-08	1.966E-08	1.522E-08	1.237E-08	1.039E-08	8.942E-09	7.839E-09	6.972E-09	6.273E-09
SE	3.358E-08	2.532E-08	1.988E-08	1.363E-08	1.028E-08	8.212E-09	6.817E-09	5.816E-09	5.066E-09	4.483E-09	4.017E-09
SSE	3.235E-08	2.250E-08	1.672E-08	1.064E-08	7.612E-09	5.835E-09	4.683E-09	3.884E-09	3.300E-09	2.858E-09	2.512E-09

0VENT AND BUILDING PARAMETERS:

RELEASE HEIGHT	(METERS)	71.30	REP. WIND HEIGHT	(METERS)	10.0
DIAMETER	(METERS)	1.95	BUILDING HEIGHT	(METERS)	46.1
EXIT VELOCITY	(METERS)	17.78	BLDG.MIN.CRS.SEC.AREA	(SQ.METERS)	3098.0
			HEAT EMISSION RATE	(CAL/SEC)	0.0

0AT THE RELEASE HEIGHT: / AT THE MEASURED WIND HEIGHT (10.0 METERS):

VENT RELEASE MODE	WIND SPEED (METERS/SEC)	/	VENT RELEASE MODE	WIND SPEED (METERS/SEC) STABLE CONDITIONS	WIND SPEED (METERS/SEC) UNSTABLE/NEUTRAL CONDITIONS
ELEVATED	LESS THAN 3.556	/	ELEVATED	LESS THAN 3.556	LESS THAN 3.556
MIXED	BETWEEN 3.556 AND 17.780	/	MIXED	BETWEEN 3.556 AND 17.780	BETWEEN 3.556 AND 17.780
GROUND LEVEL	ABOVE 17.780	/	GROUND LEVEL	ABOVE 17.780	ABOVE 17.780

Note: Directions are True North.

BASIS: ESBWR COLA

NAPS COL 2.0-11-A

Table 2.3-208 Long-Term χ/Q (sec/m^3) for Routine Releases at Distances Between 0.25 to 50 Miles, No Decay, Undepleted

1USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE: 7/ 8/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
EXIT RW - MIXED MODE RELEASE - NO PURGE RELEASES
NO DECAY, UNDEPLETED

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	0.250	0.500	0.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	4.844E-07	6.182E-07	5.603E-07	4.643E-07	3.205E-07	2.342E-07	1.799E-07	1.435E-07	1.179E-07	9.905E-08	8.477E-08
SSW	2.297E-07	3.873E-07	3.876E-07	3.361E-07	2.419E-07	1.803E-07	1.401E-07	1.126E-07	9.300E-08	7.846E-08	6.736E-08
SW	1.697E-07	3.091E-07	3.224E-07	2.856E-07	2.097E-07	1.579E-07	1.234E-07	9.962E-08	8.253E-08	6.981E-08	6.006E-08
WSW	1.596E-07	2.633E-07	2.729E-07	2.446E-07	1.836E-07	1.401E-07	1.105E-07	8.982E-08	7.478E-08	6.350E-08	5.480E-08
W	2.000E-07	3.041E-07	3.141E-07	2.830E-07	2.145E-07	1.650E-07	1.309E-07	1.070E-07	8.944E-08	7.624E-08	6.603E-08
WNW	2.354E-07	3.130E-07	3.158E-07	2.791E-07	2.047E-07	1.541E-07	1.206E-07	9.759E-08	8.106E-08	6.876E-08	5.932E-08
NW	1.336E-07	2.669E-07	3.093E-07	2.852E-07	2.142E-07	1.624E-07	1.276E-07	1.035E-07	8.613E-08	7.317E-08	6.320E-08
NNW	1.171E-07	1.822E-07	2.302E-07	2.242E-07	1.771E-07	1.373E-07	1.093E-07	8.935E-08	7.477E-08	6.378E-08	5.527E-08
N	3.015E-07	4.889E-07	6.154E-07	5.966E-07	4.680E-07	3.614E-07	2.867E-07	2.338E-07	1.953E-07	1.663E-07	1.439E-07
NNE	5.542E-07	7.330E-07	8.292E-07	7.768E-07	5.965E-07	4.573E-07	3.615E-07	2.944E-07	2.456E-07	2.090E-07	1.808E-07
NE	3.734E-07	5.766E-07	6.652E-07	6.245E-07	4.801E-07	3.686E-07	2.918E-07	2.379E-07	1.987E-07	1.692E-07	1.465E-07
ENE	2.362E-07	2.966E-07	3.475E-07	3.367E-07	2.693E-07	2.115E-07	1.700E-07	1.401E-07	1.181E-07	1.013E-07	8.829E-08
E	2.329E-07	3.308E-07	4.676E-07	4.984E-07	4.349E-07	3.566E-07	2.946E-07	2.477E-07	2.119E-07	1.840E-07	1.619E-07
ESE	3.469E-07	4.174E-07	5.311E-07	5.529E-07	4.899E-07	4.128E-07	3.495E-07	2.999E-07	2.610E-07	2.300E-07	2.049E-07
SE	5.038E-07	4.266E-07	4.331E-07	4.099E-07	3.408E-07	2.813E-07	2.359E-07	2.014E-07	1.747E-07	1.537E-07	1.367E-07
SSE	4.906E-07	4.915E-07	4.473E-07	3.818E-07	2.765E-07	2.091E-07	1.648E-07	1.343E-07	1.123E-07	9.581E-08	8.309E-08

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	7.364E-08	4.244E-08	2.852E-08	1.623E-08	1.088E-08	7.982E-09	6.198E-09	5.007E-09	4.162E-09	3.538E-09	3.060E-09
SSW	5.867E-08	3.406E-08	2.298E-08	1.313E-08	8.811E-09	6.466E-09	5.022E-09	4.057E-09	3.373E-09	2.866E-09	2.479E-09
SW	5.240E-08	3.062E-08	2.075E-08	1.191E-08	8.028E-09	5.908E-09	4.600E-09	3.723E-09	3.100E-09	2.638E-09	2.284E-09
WSW	4.794E-08	2.827E-08	1.925E-08	1.113E-08	7.540E-09	5.569E-09	4.348E-09	3.528E-09	2.944E-09	2.510E-09	2.177E-09
W	5.795E-08	3.461E-08	2.380E-08	1.395E-08	9.541E-09	7.103E-09	5.582E-09	4.553E-09	3.818E-09	3.269E-09	2.846E-09
WNW	5.192E-08	3.077E-08	2.109E-08	1.234E-08	8.446E-09	6.295E-09	4.951E-09	4.042E-09	3.392E-09	2.906E-09	2.532E-09
NW	5.536E-08	3.289E-08	2.258E-08	1.323E-08	9.051E-09	6.741E-09	5.299E-09	4.324E-09	3.627E-09	3.106E-09	2.704E-09
NNW	4.854E-08	2.907E-08	2.003E-08	1.178E-08	8.070E-09	6.014E-09	4.729E-09	3.859E-09	3.236E-09	2.771E-09	2.413E-09
N	1.262E-07	7.523E-08	5.168E-08	3.026E-08	2.067E-08	1.537E-08	1.206E-08	9.825E-09	8.228E-09	7.037E-09	6.119E-09
NNE	1.586E-07	9.453E-08	6.498E-08	3.811E-08	2.606E-08	1.940E-08	1.524E-08	1.243E-08	1.042E-08	8.917E-09	7.759E-09
NE	1.285E-07	7.680E-08	5.288E-08	3.107E-08	2.128E-08	1.586E-08	1.247E-08	1.017E-08	8.533E-09	7.307E-09	6.362E-09
ENE	7.790E-08	4.748E-08	3.312E-08	1.980E-08	1.371E-08	1.031E-08	8.159E-09	6.696E-09	5.643E-09	4.853E-09	4.241E-09
E	1.441E-07	9.044E-08	6.428E-08	3.936E-08	2.769E-08	2.105E-08	1.681E-08	1.390E-08	1.179E-08	1.019E-08	8.948E-09
ESE	1.844E-07	1.204E-07	8.783E-08	5.563E-08	4.001E-08	3.091E-08	2.501E-08	2.090E-08	1.789E-08	1.559E-08	1.378E-08
SE	1.229E-07	8.005E-08	5.832E-08	3.692E-08	2.656E-08	2.054E-08	1.663E-08	1.390E-08	1.190E-08	1.038E-08	9.177E-09
SSE	7.306E-08	4.410E-08	3.061E-08	1.823E-08	1.263E-08	9.501E-09	7.530E-09	6.188E-09	5.221E-09	4.496E-09	3.934E-09

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0VENT AND BUILDING PARAMETERS:
    RELEASE HEIGHT  (METERS)   18.15                 REP. WIND HEIGHT       (METERS)       10.0
    DIAMETER        (METERS)    1.34                 BUILDING HEIGHT        (METERS)       12.1
    EXIT VELOCITY   (METERS)   17.78                 BLDG.MIN.CRS.SEC.AREA  (SQ.METERS)  3098.0
                                                     HEAT EMISSION RATE     (CAL/SEC)       0.0
0AT THE RELEASE HEIGHT:                          /  AT THE MEASURED WIND HEIGHT ( 10.0 METERS):
 VENT RELEASE MODE   WIND SPEED (METERS/SEC)     /  VENT RELEASE MODE   WIND SPEED (METERS/SEC)       WIND SPEED (METERS/SEC)
                                                 /                      STABLE CONDITIONS             UNSTABLE/NEUTRAL CONDITIONS
    ELEVATED         LESS THAN  3.556            /     ELEVATED         LESS THAN  3.556              LESS THAN  3.556
    MIXED            BETWEEN     3.556 AND 17.780 /    MIXED            BETWEEN     3.556 AND 17.780  BETWEEN     3.556 AND 17.780
    GROUND LEVEL     ABOVE     17.780            /     GROUND LEVEL     ABOVE     17.780              ABOVE     17.780
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Note: Directions are True North.

NAPS COL 2.0-11-A

Table 2.3-209 Long-Term χ/Q (sec/m^3) for Routine Releases Along Various Distance Segments, No Decay, Undepleted

1USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE: 7/ 8/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
EXIT RB - MIXED MODE RELEASE - NO PURGE RELEASES
NO DECAY, UNDEPLETED
0CHI/Q (SEC/METER CUBED) FOR EACH SEGMENT

SEGMENT BOUNDARIES IN MILES FROM THE SITE

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	7.027E-08	8.119E-08	7.326E-08	5.942E-08	4.824E-08	2.849E-08	1.261E-08	6.515E-09	4.166E-09	2.975E-09
SSW	3.625E-08	5.187E-08	5.139E-08	4.348E-08	3.617E-08	2.203E-08	1.004E-08	5.253E-09	3.376E-09	2.417E-09
SW	2.756E-08	4.209E-08	4.306E-08	3.703E-08	3.112E-08	1.925E-08	8.929E-09	4.726E-09	3.058E-09	2.200E-09
WSW	2.590E-08	3.616E-08	3.651E-08	3.171E-08	2.694E-08	1.700E-08	8.069E-09	4.335E-09	2.828E-09	2.045E-09
W	3.140E-08	4.185E-08	4.188E-08	3.633E-08	3.090E-08	1.965E-08	9.493E-09	5.193E-09	3.432E-09	2.508E-09
WNW	3.756E-08	4.352E-08	4.144E-08	3.511E-08	2.941E-08	1.835E-08	8.746E-09	4.784E-09	3.169E-09	2.320E-09
NW	2.241E-08	3.752E-08	4.093E-08	3.616E-08	3.083E-08	1.952E-08	9.404E-09	5.155E-09	3.415E-09	2.499E-09
NNW	1.658E-08	2.648E-08	3.114E-08	2.885E-08	2.532E-08	1.670E-08	8.366E-09	4.672E-09	3.118E-09	2.291E-09
N	4.353E-08	7.093E-08	8.278E-08	7.642E-08	6.694E-08	4.404E-08	2.199E-08	1.225E-08	8.155E-09	5.983E-09
NNE	7.800E-08	1.021E-07	1.092E-07	9.783E-08	8.453E-08	5.491E-08	2.724E-08	1.518E-08	1.013E-08	7.447E-09
NE	5.525E-08	8.047E-08	8.752E-08	7.859E-08	6.794E-08	4.409E-08	2.184E-08	1.216E-08	8.112E-09	5.963E-09
ENE	3.139E-08	4.157E-08	4.567E-08	4.183E-08	3.676E-08	2.462E-08	1.272E-08	7.309E-09	4.968E-09	3.701E-09
E	3.019E-08	4.905E-08	6.094E-08	5.962E-08	5.463E-08	3.910E-08	2.179E-08	1.315E-08	9.195E-09	6.983E-09
ESE	4.543E-08	6.008E-08	6.876E-08	6.541E-08	5.927E-08	4.239E-08	2.417E-08	1.508E-08	1.083E-08	8.397E-09
SE	6.248E-08	5.862E-08	5.695E-08	5.053E-08	4.404E-08	2.983E-08	1.612E-08	9.797E-09	6.962E-09	5.374E-09
SSE	6.768E-08	6.592E-08	5.862E-08	4.835E-08	3.995E-08	2.456E-08	1.160E-08	6.353E-09	4.231E-09	3.117E-09

0AVERAGE EFFECTIVE STACK HEIGHT IN METERS FOR EACH SEGMENT

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	1.039E+02	1.039E+02	1.039E+02	1.039E+02	1.039E+02	1.039E+02	1.039E+02	1.039E+02	1.039E+02	1.039E+02
SSW	1.091E+02	1.091E+02	1.091E+02	1.091E+02	1.091E+02	1.091E+02	1.091E+02	1.091E+02	1.091E+02	1.091E+02
SW	1.111E+02	1.111E+02	1.111E+02	1.111E+02	1.111E+02	1.111E+02	1.111E+02	1.111E+02	1.111E+02	1.111E+02
WSW	1.144E+02	1.144E+02	1.144E+02	1.144E+02	1.144E+02	1.144E+02	1.144E+02	1.144E+02	1.144E+02	1.144E+02
W	1.138E+02	1.139E+02	1.139E+02	1.139E+02	1.139E+02	1.139E+02	1.139E+02	1.139E+02	1.139E+02	1.139E+02
WNW	1.100E+02	1.100E+02	1.100E+02	1.100E+02	1.100E+02	1.100E+02	1.100E+02	1.100E+02	1.100E+02	1.100E+02
NW	1.061E+02	1.061E+02	1.061E+02	1.061E+02	1.061E+02	1.061E+02	1.061E+02	1.061E+02	1.061E+02	1.061E+02
NNW	1.090E+02	1.090E+02	1.090E+02	1.090E+02	1.090E+02	1.090E+02	1.090E+02	1.090E+02	1.090E+02	1.090E+02
N	1.069E+02	1.069E+02	1.069E+02	1.069E+02	1.069E+02	1.069E+02	1.069E+02	1.069E+02	1.069E+02	1.069E+02
NNE	1.023E+02	1.023E+02	1.023E+02	1.023E+02	1.023E+02	1.023E+02	1.023E+02	1.023E+02	1.023E+02	1.023E+02
NE	1.005E+02	1.005E+02	1.005E+02	1.005E+02	1.005E+02	1.005E+02	1.005E+02	1.005E+02	1.005E+02	1.005E+02
ENE	9.853E+01	9.854E+01	9.854E+01	9.854E+01	9.854E+01	9.854E+01	9.854E+01	9.854E+01	9.854E+01	9.854E+01
E	9.598E+01	9.599E+01	9.599E+01	9.599E+01	9.599E+01	9.599E+01	9.599E+01	9.599E+01	9.599E+01	9.599E+01
ESE	9.461E+01	9.461E+01	9.461E+01	9.461E+01	9.461E+01	9.461E+01	9.461E+01	9.461E+01	9.461E+01	9.461E+01
SE	1.016E+02	1.016E+02	1.016E+02	1.016E+02	1.016E+02	1.016E+02	1.016E+02	1.016E+02	1.016E+02	1.016E+02
SSE	1.050E+02	1.050E+02	1.050E+02	1.050E+02	1.050E+02	1.050E+02	1.050E+02	1.050E+02	1.050E+02	1.050E+02

Note: Directions are True North.

NAPS COL 2.0-11-A

Table 2.3-209 Long-Term χ/Q (sec/m^3) for Routine Releases Along Various Distance Segments, No Decay, Undepleted

1USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE: 7/ 8/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
EXIT TB - MIXED MODE RELEASE - NO PURGE RELEASES
NO DECAY, UNDEPLETED
0CHI/Q (SEC/METER CUBED) FOR EACH SEGMENT

SEGMENT BOUNDARIES IN MILES FROM THE SITE

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	5.244E-08	6.163E-08	6.087E-08	5.207E-08	4.352E-08	2.651E-08	1.202E-08	6.255E-09	4.008E-09	2.864E-09
SSW	2.619E-08	3.834E-08	4.196E-08	3.763E-08	3.229E-08	2.034E-08	9.513E-09	5.025E-09	3.239E-09	2.322E-09
SW	2.002E-08	3.086E-08	3.479E-08	3.174E-08	2.754E-08	1.763E-08	8.405E-09	4.496E-09	2.920E-09	2.104E-09
WSW	1.941E-08	2.685E-08	2.957E-08	2.721E-08	2.384E-08	1.555E-08	7.566E-09	4.103E-09	2.686E-09	1.946E-09
W	2.431E-08	3.132E-08	3.380E-08	3.089E-08	2.704E-08	1.773E-08	8.760E-09	4.834E-09	3.204E-09	2.345E-09
WNW	3.056E-08	3.279E-08	3.258E-08	2.896E-08	2.500E-08	1.621E-08	8.000E-09	4.447E-09	2.965E-09	2.179E-09
NW	1.663E-08	2.532E-08	3.009E-08	2.849E-08	2.531E-08	1.688E-08	8.512E-09	4.767E-09	3.185E-09	2.343E-09
NNW	1.292E-08	1.673E-08	2.166E-08	2.184E-08	2.016E-08	1.417E-08	7.502E-09	4.304E-09	2.907E-09	2.152E-09
N	3.324E-08	4.447E-08	5.725E-08	5.760E-08	5.311E-08	3.729E-08	1.973E-08	1.131E-08	7.631E-09	5.643E-09
NNE	6.034E-08	6.788E-08	7.800E-08	7.495E-08	6.762E-08	4.650E-08	2.433E-08	1.394E-08	9.420E-09	6.979E-09
NE	4.076E-08	5.237E-08	6.220E-08	6.015E-08	5.436E-08	3.735E-08	1.949E-08	1.114E-08	7.519E-09	5.566E-09
ENE	2.389E-08	2.672E-08	3.159E-08	3.103E-08	2.847E-08	2.023E-08	1.104E-08	6.530E-09	4.500E-09	3.380E-09
E	2.254E-08	2.877E-08	3.873E-08	4.091E-08	3.934E-08	3.019E-08	1.798E-08	1.125E-08	8.006E-09	6.146E-09
ESE	3.522E-08	3.796E-08	4.562E-08	4.608E-08	4.337E-08	3.263E-08	1.940E-08	1.234E-08	8.935E-09	6.970E-09
SE	5.170E-08	4.278E-08	4.276E-08	3.966E-08	3.551E-08	2.474E-08	1.353E-08	8.206E-09	5.816E-09	4.483E-09
SSE	5.416E-08	5.079E-08	4.777E-08	4.123E-08	3.498E-08	2.212E-08	1.065E-08	5.848E-09	3.890E-09	2.861E-09

0AVERAGE EFFECTIVE STACK HEIGHT IN METERS FOR EACH SEGMENT

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	1.130E+02	1.131E+02	1.131E+02	1.131E+02	1.131E+02	1.131E+02	1.131E+02	1.131E+02	1.131E+02	1.131E+02
SSW	1.174E+02	1.174E+02	1.174E+02	1.174E+02	1.174E+02	1.174E+02	1.174E+02	1.174E+02	1.174E+02	1.174E+02
SW	1.190E+02	1.190E+02	1.190E+02	1.190E+02	1.190E+02	1.190E+02	1.190E+02	1.190E+02	1.190E+02	1.190E+02
WSW	1.217E+02	1.217E+02	1.217E+02	1.217E+02	1.217E+02	1.217E+02	1.217E+02	1.217E+02	1.217E+02	1.217E+02
W	1.214E+02	1.214E+02	1.214E+02	1.214E+02	1.214E+02	1.214E+02	1.214E+02	1.214E+02	1.214E+02	1.214E+02
WNW	1.184E+02	1.184E+02	1.184E+02	1.184E+02	1.184E+02	1.184E+02	1.184E+02	1.184E+02	1.184E+02	1.184E+02
NW	1.155E+02	1.155E+02	1.155E+02	1.155E+02	1.155E+02	1.155E+02	1.155E+02	1.155E+02	1.155E+02	1.155E+02
NNW	1.180E+02	1.180E+02	1.180E+02	1.180E+02	1.180E+02	1.180E+02	1.180E+02	1.180E+02	1.180E+02	1.180E+02
N	1.163E+02	1.163E+02	1.163E+02	1.163E+02	1.163E+02	1.163E+02	1.163E+02	1.163E+02	1.163E+02	1.163E+02
NNE	1.124E+02	1.124E+02	1.124E+02	1.124E+02	1.124E+02	1.124E+02	1.124E+02	1.124E+02	1.124E+02	1.124E+02
NE	1.110E+02	1.110E+02	1.110E+02	1.110E+02	1.110E+02	1.110E+02	1.110E+02	1.110E+02	1.110E+02	1.110E+02
ENE	1.094E+02	1.094E+02	1.094E+02	1.094E+02	1.094E+02	1.094E+02	1.094E+02	1.094E+02	1.094E+02	1.094E+02
E	1.077E+02	1.077E+02	1.077E+02	1.077E+02	1.077E+02	1.077E+02	1.077E+02	1.077E+02	1.077E+02	1.077E+02
ESE	1.065E+02	1.065E+02	1.065E+02	1.065E+02	1.065E+02	1.065E+02	1.065E+02	1.065E+02	1.065E+02	1.065E+02
SE	1.118E+02	1.118E+02	1.118E+02	1.118E+02	1.118E+02	1.118E+02	1.118E+02	1.118E+02	1.118E+02	1.118E+02
SSE	1.141E+02	1.141E+02	1.141E+02	1.141E+02	1.141E+02	1.141E+02	1.141E+02	1.141E+02	1.141E+02	1.141E+02

Note: Directions are True North.

NAPS COL 2.0-11-A

Table 2.3-209 Long-Term χ/Q (sec/m^3) for Routine Releases Along Various Distance Segments, No Decay, Undepleted

1USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE: 7/ 8/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
EXIT RW - MIXED MODE RELEASE - NO PURGE RELEASES
NO DECAY, UNDEPLETED
0CHI/Q (SEC/METER CUBED) FOR EACH SEGMENT

DIRECTION FROM SITE	SEGMENT BOUNDARIES IN MILES FROM THE SITE									
	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	5.305E-07	3.141E-07	1.798E-07	1.180E-07	8.488E-08	4.319E-08	1.658E-08	8.042E-09	5.025E-09	3.546E-09
SSW	3.646E-07	2.355E-07	1.398E-07	9.306E-08	6.743E-08	3.461E-08	1.340E-08	6.514E-09	4.072E-09	2.873E-09
SW	3.031E-07	2.035E-07	1.231E-07	8.257E-08	6.011E-08	3.107E-08	1.215E-08	5.950E-09	3.736E-09	2.644E-09
WSW	2.582E-07	1.778E-07	1.101E-07	7.478E-08	5.484E-08	2.863E-08	1.134E-08	5.606E-09	3.540E-09	2.515E-09
W	2.981E-07	2.077E-07	1.304E-07	8.942E-08	6.606E-08	3.499E-08	1.418E-08	7.145E-09	4.567E-09	3.275E-09
WNW	2.989E-07	1.987E-07	1.203E-07	8.110E-08	5.938E-08	3.117E-08	1.255E-08	6.331E-09	4.054E-09	2.912E-09
NW	2.891E-07	2.070E-07	1.273E-07	8.616E-08	6.325E-08	3.330E-08	1.345E-08	6.780E-09	4.337E-09	3.112E-09
NNW	2.169E-07	1.699E-07	1.088E-07	7.475E-08	5.530E-08	2.938E-08	1.197E-08	6.048E-09	3.870E-09	2.776E-09
N	5.789E-07	4.492E-07	2.855E-07	1.952E-07	1.440E-07	7.609E-08	3.076E-08	1.546E-08	9.855E-09	7.050E-09
NNE	7.845E-07	5.747E-07	3.602E-07	2.456E-07	1.809E-07	9.563E-08	3.873E-08	1.951E-08	1.247E-08	8.933E-09
NE	6.274E-07	4.626E-07	2.907E-07	1.986E-07	1.466E-07	7.767E-08	3.156E-08	1.595E-08	1.020E-08	7.320E-09
ENE	3.314E-07	2.586E-07	1.691E-07	1.180E-07	8.831E-08	4.786E-08	2.006E-08	1.036E-08	6.713E-09	4.860E-09
E	4.509E-07	4.142E-07	2.924E-07	2.115E-07	1.619E-07	9.074E-08	3.971E-08	2.113E-08	1.393E-08	1.020E-08
ESE	5.155E-07	4.697E-07	3.465E-07	2.603E-07	2.047E-07	1.201E-07	5.584E-08	3.098E-08	2.093E-08	1.560E-08
SE	4.213E-07	3.297E-07	2.342E-07	1.743E-07	1.366E-07	7.991E-08	3.707E-08	2.058E-08	1.392E-08	1.038E-08
SSE	4.280E-07	2.699E-07	1.644E-07	1.123E-07	8.315E-08	4.454E-08	1.849E-08	9.547E-09	6.203E-09	4.503E-09

0AVERAGE EFFECTIVE STACK HEIGHT IN METERS FOR EACH SEGMENT

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	4.715E+01	4.715E+01	4.715E+01	4.715E+01	4.715E+01	4.715E+01	4.715E+01	4.715E+01	4.715E+01	4.715E+01
SSW	5.025E+01	5.025E+01	5.025E+01	5.025E+01	5.025E+01	5.025E+01	5.025E+01	5.025E+01	5.025E+01	5.025E+01
SW	5.144E+01	5.144E+01	5.144E+01	5.144E+01	5.144E+01	5.144E+01	5.144E+01	5.144E+01	5.144E+01	5.144E+01
WSW	5.333E+01	5.333E+01	5.333E+01	5.333E+01	5.333E+01	5.333E+01	5.333E+01	5.333E+01	5.333E+01	5.333E+01
W	5.314E+01	5.314E+01	5.314E+01	5.314E+01	5.314E+01	5.314E+01	5.314E+01	5.314E+01	5.314E+01	5.314E+01
WNW	5.123E+01	5.123E+01	5.123E+01	5.123E+01	5.123E+01	5.123E+01	5.123E+01	5.123E+01	5.123E+01	5.123E+01
NW	4.959E+01	4.959E+01	4.959E+01	4.959E+01	4.959E+01	4.959E+01	4.959E+01	4.959E+01	4.959E+01	4.959E+01
NNW	5.165E+01	5.165E+01	5.165E+01	5.165E+01	5.165E+01	5.165E+01	5.165E+01	5.165E+01	5.165E+01	5.165E+01
N	5.048E+01	5.048E+01	5.048E+01	5.048E+01	5.048E+01	5.048E+01	5.048E+01	5.048E+01	5.048E+01	5.048E+01
NNE	4.757E+01	4.757E+01	4.757E+01	4.757E+01	4.757E+01	4.757E+01	4.757E+01	4.757E+01	4.757E+01	4.757E+01
NE	4.661E+01	4.661E+01	4.661E+01	4.661E+01	4.661E+01	4.661E+01	4.661E+01	4.661E+01	4.661E+01	4.661E+01
ENE	4.568E+01	4.568E+01	4.568E+01	4.568E+01	4.568E+01	4.568E+01	4.568E+01	4.568E+01	4.568E+01	4.568E+01
E	4.497E+01	4.497E+01	4.497E+01	4.497E+01	4.497E+01	4.497E+01	4.497E+01	4.497E+01	4.497E+01	4.497E+01
ESE	4.402E+01	4.402E+01	4.402E+01	4.402E+01	4.402E+01	4.402E+01	4.402E+01	4.402E+01	4.402E+01	4.402E+01
SE	4.705E+01	4.705E+01	4.705E+01	4.705E+01	4.705E+01	4.705E+01	4.705E+01	4.705E+01	4.705E+01	4.705E+01
SSE	4.805E+01	4.805E+01	4.805E+01	4.805E+01	4.805E+01	4.805E+01	4.805E+01	4.805E+01	4.805E+01	4.805E+01

Note: Directions are True North.

BASIS: ESBWR COLA

NAPS COL 2.0-11-A **Table 2.3-210 Long-Term χ/Q (sec/m^3) for Routine Releases at Distances Between 0.25 to 50 Miles, 2.260 Day Decay, Undepleted**

1USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE: 7/ 8/2013

0XOQDOQ - North Anna COL (1996-98 Met Data)

EXIT RB - MIXED MODE RELEASE - NO PURGE RELEASES

2.260 DAY DECAY, UNDEPLETED

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	0.250	0.500	0.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	1.215E-07	6.844E-08	6.524E-08	7.472E-08	8.453E-08	8.122E-08	7.390E-08	6.619E-08	5.915E-08	5.299E-08	4.769E-08
SSW	5.448E-08	3.117E-08	3.226E-08	4.163E-08	5.383E-08	5.501E-08	5.188E-08	4.759E-08	4.327E-08	3.928E-08	3.571E-08
SW	4.106E-08	2.330E-08	2.407E-08	3.220E-08	4.356E-08	4.548E-08	4.345E-08	4.022E-08	3.682E-08	3.361E-08	3.070E-08
WSW	3.445E-08	2.252E-08	2.353E-08	2.925E-08	3.721E-08	3.842E-08	3.677E-08	3.422E-08	3.151E-08	2.892E-08	2.655E-08
W	4.656E-08	2.967E-08	2.839E-08	3.437E-08	4.309E-08	4.418E-08	4.215E-08	3.919E-08	3.609E-08	3.314E-08	3.045E-08
WNW	4.674E-08	3.789E-08	3.538E-08	3.883E-08	4.469E-08	4.447E-08	4.169E-08	3.825E-08	3.485E-08	3.173E-08	2.895E-08
NW	2.897E-08	2.010E-08	1.908E-08	2.594E-08	3.845E-08	4.213E-08	4.131E-08	3.884E-08	3.593E-08	3.304E-08	3.036E-08
NNW	3.066E-08	1.994E-08	1.379E-08	1.690E-08	2.658E-08	3.078E-08	3.134E-08	3.028E-08	2.859E-08	2.671E-08	2.485E-08
N	8.464E-08	4.913E-08	3.651E-08	4.575E-08	7.132E-08	8.212E-08	8.336E-08	8.037E-08	7.576E-08	7.071E-08	6.574E-08
NNE	1.494E-07	8.904E-08	6.976E-08	7.831E-08	1.034E-07	1.117E-07	1.099E-07	1.041E-07	9.707E-08	8.990E-08	8.312E-08
NE	1.070E-07	5.717E-08	4.866E-08	5.900E-08	8.171E-08	8.926E-08	8.817E-08	8.365E-08	7.802E-08	7.229E-08	6.685E-08
ENE	7.393E-08	3.688E-08	2.780E-08	3.120E-08	4.185E-08	4.598E-08	4.592E-08	4.403E-08	4.147E-08	3.875E-08	3.611E-08
E	8.167E-08	3.657E-08	2.528E-08	3.054E-08	4.840E-08	5.798E-08	6.112E-08	6.087E-08	5.900E-08	5.641E-08	5.356E-08
ESE	1.130E-07	5.562E-08	4.024E-08	4.404E-08	5.982E-08	6.741E-08	6.895E-08	6.751E-08	6.475E-08	6.149E-08	5.814E-08
SE	1.522E-07	8.396E-08	5.807E-08	5.479E-08	5.909E-08	5.946E-08	5.710E-08	5.370E-08	5.006E-08	4.653E-08	4.324E-08
SSE	1.199E-07	7.844E-08	6.409E-08	6.472E-08	6.778E-08	6.447E-08	5.895E-08	5.325E-08	4.802E-08	4.340E-08	3.937E-08

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	4.314E-08	2.803E-08	1.991E-08	1.185E-08	8.047E-09	5.896E-09	4.543E-09	3.627E-09	2.975E-09	2.490E-09	2.119E-09
SSW	3.258E-08	2.170E-08	1.561E-08	9.408E-09	6.415E-09	4.709E-09	3.631E-09	2.900E-09	2.377E-09	1.988E-09	1.690E-09
SW	2.810E-08	1.896E-08	1.373E-08	8.344E-09	5.717E-09	4.210E-09	3.253E-09	2.601E-09	2.135E-09	1.787E-09	1.520E-09
WSW	2.442E-08	1.674E-08	1.225E-08	7.522E-09	5.187E-09	3.835E-09	2.972E-09	2.381E-09	1.957E-09	1.640E-09	1.396E-09
W	2.804E-08	1.936E-08	1.426E-08	8.857E-09	6.165E-09	4.594E-09	3.583E-09	2.888E-09	2.384E-09	2.007E-09	1.715E-09
WNW	2.652E-08	1.802E-08	1.318E-08	8.154E-09	5.684E-09	4.244E-09	3.317E-09	2.679E-09	2.217E-09	1.869E-09	1.600E-09
NW	2.794E-08	1.921E-08	1.412E-08	8.781E-09	6.127E-09	4.577E-09	3.579E-09	2.891E-09	2.392E-09	2.018E-09	1.727E-09
NNW	2.311E-08	1.641E-08	1.227E-08	7.750E-09	5.441E-09	4.076E-09	3.190E-09	2.576E-09	2.130E-09	1.794E-09	1.533E-09
N	6.108E-08	4.329E-08	3.233E-08	2.039E-08	1.430E-08	1.070E-08	8.372E-09	6.757E-09	5.584E-09	4.701E-09	4.017E-09
NNE	7.693E-08	5.401E-08	4.022E-08	2.535E-08	1.781E-08	1.336E-08	1.047E-08	8.466E-09	7.011E-09	5.913E-09	5.062E-09
NE	6.187E-08	4.340E-08	3.230E-08	2.036E-08	1.430E-08	1.073E-08	8.414E-09	6.808E-09	5.642E-09	4.762E-09	4.079E-09
ENE	3.364E-08	2.422E-08	1.834E-08	1.182E-08	8.422E-09	6.382E-09	5.042E-09	4.103E-09	3.415E-09	2.893E-09	2.485E-09
E	5.070E-08	3.849E-08	3.012E-08	2.022E-08	1.477E-08	1.140E-08	9.126E-09	7.507E-09	6.303E-09	5.377E-09	4.648E-09
ESE	5.489E-08	4.166E-08	3.283E-08	2.244E-08	1.669E-08	1.308E-08	1.062E-08	8.837E-09	7.498E-09	6.457E-09	5.628E-09
SE	4.028E-08	2.927E-08	2.250E-08	1.497E-08	1.098E-08	8.532E-09	6.888E-09	5.714E-09	4.837E-09	4.159E-09	3.621E-09
SSE	3.591E-08	2.411E-08	1.754E-08	1.082E-08	7.546E-09	5.644E-09	4.422E-09	3.580E-09	2.970E-09	2.510E-09	2.154E-09

0VENT AND BUILDING PARAMETERS:

RELEASE HEIGHT	(METERS)	52.77	REP. WIND HEIGHT	(METERS)	10.0
DIAMETER	(METERS)	2.40	BUILDING HEIGHT	(METERS)	46.1
EXIT VELOCITY	(METERS)	17.78	BLDG.MIN.CRS.SEC.AREA	(SQ.METERS)	3098.0
			HEAT EMISSION RATE	(CAL/SEC)	0.0

0AT THE RELEASE HEIGHT: / AT THE MEASURED WIND HEIGHT (10.0 METERS):

VENT RELEASE MODE	WIND SPEED (METERS/SEC)	/	VENT RELEASE MODE	WIND SPEED (METERS/SEC) STABLE CONDITIONS	WIND SPEED (METERS/SEC) UNSTABLE/NEUTRAL CONDITIONS
ELEVATED	LESS THAN 3.556	/	ELEVATED	LESS THAN 3.556	LESS THAN 3.556
MIXED	BETWEEN 3.556 AND 17.780	/	MIXED	BETWEEN 3.556 AND 17.780	BETWEEN 3.556 AND 17.780
GROUND LEVEL	ABOVE 17.780	/	GROUND LEVEL	ABOVE 17.780	ABOVE 17.780

Note: Directions are True North.

BASIS: ESBWR COLA

NAPS COL 2.0-11-A

Table 2.3-210 Long-Term χ/Q (sec/m^3) for Routine Releases at Distances Between 0.25 to 50 Miles, 2.260 Day Decay, Undepleted

1USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE: 7/ 8/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
EXIT TB - MIXED MODE RELEASE - NO PURGE RELEASES
2.260 DAY DECAY, UNDEPLETED

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	0.250	0.500	0.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	1.147E-07	5.906E-08	4.779E-08	5.244E-08	6.308E-08	6.462E-08	6.150E-08	5.682E-08	5.191E-08	4.727E-08	4.306E-08
SSW	5.195E-08	2.726E-08	2.297E-08	2.798E-08	3.888E-08	4.275E-08	4.240E-08	4.026E-08	3.750E-08	3.464E-08	3.192E-08
SW	3.865E-08	2.067E-08	1.735E-08	2.161E-08	3.114E-08	3.495E-08	3.513E-08	3.368E-08	3.161E-08	2.937E-08	2.719E-08
WSW	3.220E-08	1.972E-08	1.767E-08	2.048E-08	2.697E-08	2.966E-08	2.980E-08	2.870E-08	2.707E-08	2.529E-08	2.351E-08
W	4.364E-08	2.683E-08	2.204E-08	2.464E-08	3.153E-08	3.415E-08	3.404E-08	3.264E-08	3.073E-08	2.867E-08	2.666E-08
WNW	4.285E-08	3.373E-08	2.932E-08	2.974E-08	3.298E-08	3.378E-08	3.276E-08	3.090E-08	2.878E-08	2.665E-08	2.464E-08
NW	2.610E-08	1.806E-08	1.482E-08	1.719E-08	2.503E-08	2.927E-08	3.034E-08	2.972E-08	2.834E-08	2.668E-08	2.496E-08
NNW	2.766E-08	1.880E-08	1.147E-08	1.100E-08	1.596E-08	1.993E-08	2.175E-08	2.211E-08	2.167E-08	2.083E-08	1.981E-08
N	7.517E-08	4.557E-08	2.985E-08	2.945E-08	4.247E-08	5.282E-08	5.750E-08	5.839E-08	5.718E-08	5.492E-08	5.221E-08
NNE	1.329E-07	7.992E-08	5.602E-08	5.354E-08	6.623E-08	7.548E-08	7.841E-08	7.743E-08	7.447E-08	7.065E-08	6.658E-08
NE	9.702E-08	5.061E-08	3.728E-08	3.830E-08	5.114E-08	5.971E-08	6.258E-08	6.205E-08	5.980E-08	5.680E-08	5.356E-08
ENE	6.620E-08	3.333E-08	2.186E-08	2.061E-08	2.589E-08	3.006E-08	3.171E-08	3.170E-08	3.080E-08	2.949E-08	2.801E-08
E	7.216E-08	3.338E-08	2.006E-08	1.890E-08	2.706E-08	3.455E-08	3.871E-08	4.037E-08	4.051E-08	3.979E-08	3.860E-08
ESE	1.009E-07	5.025E-08	3.236E-08	2.971E-08	3.651E-08	4.268E-08	4.564E-08	4.631E-08	4.566E-08	4.429E-08	4.259E-08
SE	1.348E-07	7.561E-08	4.865E-08	4.181E-08	4.218E-08	4.324E-08	4.282E-08	4.135E-08	3.934E-08	3.713E-08	3.492E-08
SSE	1.092E-07	6.862E-08	5.119E-08	4.894E-08	5.138E-08	5.077E-08	4.806E-08	4.458E-08	4.100E-08	3.761E-08	3.451E-08

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	3.932E-08	2.622E-08	1.884E-08	1.132E-08	7.721E-09	5.670E-09	4.375E-09	3.497E-09	2.870E-09	2.404E-09	2.047E-09
SSW	2.941E-08	2.015E-08	1.467E-08	8.940E-09	6.127E-09	4.512E-09	3.486E-09	2.787E-09	2.287E-09	1.915E-09	1.629E-09
SW	2.516E-08	1.746E-08	1.282E-08	7.880E-09	5.430E-09	4.012E-09	3.108E-09	2.489E-09	2.045E-09	1.714E-09	1.459E-09
WSW	2.185E-08	1.539E-08	1.139E-08	7.074E-09	4.904E-09	3.637E-09	2.824E-09	2.267E-09	1.865E-09	1.564E-09	1.333E-09
W	2.478E-08	1.755E-08	1.307E-08	8.198E-09	5.735E-09	4.286E-09	3.350E-09	2.704E-09	2.235E-09	1.883E-09	1.610E-09
WNW	2.282E-08	1.602E-08	1.190E-08	7.488E-09	5.266E-09	3.954E-09	3.103E-09	2.513E-09	2.084E-09	1.761E-09	1.510E-09
NW	2.330E-08	1.673E-08	1.257E-08	7.987E-09	5.638E-09	4.242E-09	3.334E-09	2.703E-09	2.244E-09	1.897E-09	1.627E-09
NNW	1.875E-08	1.403E-08	1.076E-08	6.986E-09	4.976E-09	3.763E-09	2.964E-09	2.406E-09	1.997E-09	1.687E-09	1.446E-09
N	4.939E-08	3.693E-08	2.834E-08	1.839E-08	1.310E-08	9.908E-09	7.805E-09	6.334E-09	5.257E-09	4.442E-09	3.806E-09
NNE	6.258E-08	4.606E-08	3.515E-08	2.276E-08	1.623E-08	1.229E-08	9.702E-09	7.890E-09	6.562E-09	5.555E-09	4.769E-09
NE	5.035E-08	3.703E-08	2.824E-08	1.826E-08	1.301E-08	9.851E-09	7.775E-09	6.324E-09	5.261E-09	4.455E-09	3.827E-09
ENE	2.651E-08	2.002E-08	1.556E-08	1.032E-08	7.469E-09	5.720E-09	4.553E-09	3.727E-09	3.117E-09	2.650E-09	2.284E-09
E	3.719E-08	2.988E-08	2.413E-08	1.677E-08	1.251E-08	9.778E-09	7.905E-09	6.552E-09	5.534E-09	4.745E-09	4.118E-09
ESE	4.077E-08	3.225E-08	2.594E-08	1.810E-08	1.361E-08	1.074E-08	8.760E-09	7.322E-09	6.234E-09	5.384E-09	4.705E-09
SE	3.282E-08	2.441E-08	1.890E-08	1.260E-08	9.240E-09	7.173E-09	5.787E-09	4.798E-09	4.061E-09	3.493E-09	3.042E-09
SSE	3.175E-08	2.183E-08	1.604E-08	9.965E-09	6.964E-09	5.212E-09	4.084E-09	3.306E-09	2.742E-09	2.318E-09	1.989E-09

0VENT AND BUILDING PARAMETERS:

RELEASE HEIGHT	(METERS)	71.30	REP. WIND HEIGHT	(METERS)	10.0
DIAMETER	(METERS)	1.95	BUILDING HEIGHT	(METERS)	46.1
EXIT VELOCITY	(METERS)	17.78	BLDG.MIN.CRS.SEC.AREA	(SQ.METERS)	3098.0
			HEAT EMISSION RATE	(CAL/SEC)	0.0

0AT THE RELEASE HEIGHT:		/	AT THE MEASURED WIND HEIGHT (10.0 METERS):		
VENT RELEASE MODE	WIND SPEED (METERS/SEC)	/	VENT RELEASE MODE	WIND SPEED (METERS/SEC) STABLE CONDITIONS	WIND SPEED (METERS/SEC) UNSTABLE/NEUTRAL CONDITIONS
ELEVATED	LESS THAN 3.556	/	ELEVATED	LESS THAN 3.556	LESS THAN 3.556
MIXED	BETWEEN 3.556 AND 17.780	/	MIXED	BETWEEN 3.556 AND 17.780	BETWEEN 3.556 AND 17.780
GROUND LEVEL	ABOVE 17.780	/	GROUND LEVEL	ABOVE 17.780	ABOVE 17.780

Note: Directions are True North.

NAPS COL 2.0-11-A

Table 2.3-210 Long-Term χ/Q (sec/m^3) for Routine Releases at Distances Between 0.25 to 50 Miles, 2.260 Day Decay, Undepleted

1USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE: 7/ 8/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
EXIT RW - MIXED MODE RELEASE - NO PURGE RELEASES
2.260 DAY DECAY, UNDEPLETED

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	0.250	0.500	0.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	4.842E-07	6.176E-07	5.592E-07	4.630E-07	3.190E-07	2.326E-07	1.783E-07	1.420E-07	1.164E-07	9.758E-08	8.334E-08
SSW	2.296E-07	3.868E-07	3.867E-07	3.350E-07	2.407E-07	1.790E-07	1.387E-07	1.113E-07	9.168E-08	7.718E-08	6.611E-08
SW	1.696E-07	3.087E-07	3.216E-07	2.846E-07	2.085E-07	1.566E-07	1.221E-07	9.835E-08	8.129E-08	6.859E-08	5.887E-08
WSW	1.595E-07	2.630E-07	2.722E-07	2.437E-07	1.824E-07	1.389E-07	1.093E-07	8.860E-08	7.357E-08	6.231E-08	5.364E-08
W	1.999E-07	3.037E-07	3.133E-07	2.819E-07	2.132E-07	1.635E-07	1.295E-07	1.055E-07	8.798E-08	7.480E-08	6.461E-08
WNW	2.353E-07	3.125E-07	3.150E-07	2.780E-07	2.034E-07	1.527E-07	1.193E-07	9.626E-08	7.976E-08	6.749E-08	5.808E-08
NW	1.335E-07	2.664E-07	3.084E-07	2.840E-07	2.128E-07	1.610E-07	1.262E-07	1.021E-07	8.475E-08	7.181E-08	6.188E-08
NNW	1.170E-07	1.819E-07	2.294E-07	2.232E-07	1.758E-07	1.359E-07	1.078E-07	8.793E-08	7.338E-08	6.242E-08	5.394E-08
N	3.013E-07	4.880E-07	6.133E-07	5.938E-07	4.645E-07	3.577E-07	2.830E-07	2.302E-07	1.917E-07	1.628E-07	1.405E-07
NNE	5.539E-07	7.318E-07	8.268E-07	7.735E-07	5.924E-07	4.530E-07	3.572E-07	2.900E-07	2.413E-07	2.048E-07	1.767E-07
NE	3.732E-07	5.758E-07	6.633E-07	6.220E-07	4.769E-07	3.652E-07	2.884E-07	2.344E-07	1.953E-07	1.659E-07	1.433E-07
ENE	2.361E-07	2.961E-07	3.465E-07	3.352E-07	2.673E-07	2.093E-07	1.678E-07	1.379E-07	1.159E-07	9.917E-08	8.615E-08
E	2.327E-07	3.302E-07	4.660E-07	4.959E-07	4.314E-07	3.527E-07	2.904E-07	2.434E-07	2.076E-07	1.798E-07	1.577E-07
ESE	3.467E-07	4.166E-07	5.293E-07	5.502E-07	4.860E-07	4.083E-07	3.445E-07	2.947E-07	2.557E-07	2.246E-07	1.995E-07
SE	5.036E-07	4.259E-07	4.318E-07	4.081E-07	3.383E-07	2.784E-07	2.328E-07	1.981E-07	1.713E-07	1.502E-07	1.332E-07
SSE	4.904E-07	4.909E-07	4.463E-07	3.805E-07	2.749E-07	2.073E-07	1.630E-07	1.325E-07	1.105E-07	9.405E-08	8.135E-08

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	7.225E-08	4.120E-08	2.739E-08	1.525E-08	1.001E-08	7.181E-09	5.456E-09	4.312E-09	3.507E-09	2.917E-09	2.468E-09
SSW	5.744E-08	3.298E-08	2.199E-08	1.227E-08	8.047E-09	5.769E-09	4.377E-09	3.454E-09	2.805E-09	2.329E-09	1.968E-09
SW	5.124E-08	2.958E-08	1.980E-08	1.109E-08	7.292E-09	5.235E-09	3.976E-09	3.139E-09	2.550E-09	2.118E-09	1.789E-09
WSW	4.681E-08	2.725E-08	1.832E-08	1.032E-08	6.806E-09	4.897E-09	3.724E-09	2.943E-09	2.393E-09	1.988E-09	1.679E-09
W	5.656E-08	3.334E-08	2.262E-08	1.291E-08	8.594E-09	6.227E-09	4.763E-09	3.782E-09	3.087E-09	2.574E-09	2.181E-09
WNW	5.070E-08	2.967E-08	2.007E-08	1.144E-08	7.635E-09	5.545E-09	4.250E-09	3.382E-09	2.766E-09	2.311E-09	1.962E-09
NW	5.406E-08	3.172E-08	2.150E-08	1.228E-08	8.191E-09	5.948E-09	4.559E-09	3.627E-09	2.966E-09	2.478E-09	2.104E-09
NNW	4.723E-08	2.789E-08	1.895E-08	1.083E-08	7.215E-09	5.227E-09	3.997E-09	3.172E-09	2.588E-09	2.156E-09	1.826E-09
N	1.229E-07	7.223E-08	4.893E-08	2.787E-08	1.851E-08	1.339E-08	1.022E-08	8.107E-09	6.607E-09	5.500E-09	4.656E-09
NNE	1.546E-07	9.092E-08	6.167E-08	3.521E-08	2.344E-08	1.699E-08	1.300E-08	1.033E-08	8.430E-09	7.029E-09	5.960E-09
NE	1.254E-07	7.394E-08	5.024E-08	2.875E-08	1.918E-08	1.392E-08	1.067E-08	8.482E-09	6.933E-09	5.787E-09	4.911E-09
ENE	7.579E-08	4.553E-08	3.130E-08	1.818E-08	1.223E-08	8.931E-09	6.870E-09	5.479E-09	4.488E-09	3.751E-09	3.187E-09
E	1.399E-07	8.648E-08	6.053E-08	3.595E-08	2.453E-08	1.808E-08	1.401E-08	1.124E-08	9.252E-09	7.764E-09	6.617E-09
ESE	1.789E-07	1.150E-07	8.259E-08	5.067E-08	3.530E-08	2.643E-08	2.072E-08	1.678E-08	1.392E-08	1.176E-08	1.008E-08
SE	1.193E-07	7.654E-08	5.489E-08	3.366E-08	2.346E-08	1.757E-08	1.378E-08	1.117E-08	9.267E-09	7.831E-09	6.715E-09
SSE	7.135E-08	4.250E-08	2.910E-08	1.687E-08	1.137E-08	8.320E-09	6.416E-09	5.129E-09	4.212E-09	3.529E-09	3.005E-09

0VENT AND BUILDING PARAMETERS:

RELEASE HEIGHT	(METERS)	18.15	REP. WIND HEIGHT	(METERS)	10.0
DIAMETER	(METERS)	1.34	BUILDING HEIGHT	(METERS)	12.1
EXIT VELOCITY	(METERS)	17.78	BLDG.MIN.CRS.SEC.AREA	(SQ.METERS)	3098.0
			HEAT EMISSION RATE	(CAL/SEC)	0.0

0AT THE RELEASE HEIGHT: / AT THE MEASURED WIND HEIGHT (10.0 METERS):

VENT RELEASE MODE	WIND SPEED (METERS/SEC)	/	VENT RELEASE MODE	WIND SPEED (METERS/SEC) STABLE CONDITIONS	WIND SPEED (METERS/SEC) UNSTABLE/NEUTRAL CONDITIONS
ELEVATED	LESS THAN 3.556	/	ELEVATED	LESS THAN 3.556	LESS THAN 3.556
MIXED	BETWEEN 3.556 AND 17.780	/	MIXED	BETWEEN 3.556 AND 17.780	BETWEEN 3.556 AND 17.780
GROUND LEVEL	ABOVE 17.780	/	GROUND LEVEL	ABOVE 17.780	ABOVE 17.780

Note: Directions are True North.

NAPS COL 2.0-11-A

Table 2.3-211 Long-Term χ/Q (sec/m^3) for Routine Releases Along Various Distance Segments, 2.260 Day Decay, Undepleted

1USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE: 7/ 8/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
EXIT RB - MIXED MODE RELEASE - NO PURGE RELEASES
2.260 DAY DECAY, UNDEPLETED
0CHI/Q (SEC/METER CUBED) FOR EACH SEGMENT

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
	SEGMENT BOUNDARIES IN MILES FROM THE SITE									
S	7.017E-08	8.088E-08	7.277E-08	5.882E-08	4.758E-08	2.778E-08	1.195E-08	5.928E-09	3.640E-09	2.496E-09
SSW	3.618E-08	5.164E-08	5.100E-08	4.298E-08	3.561E-08	2.141E-08	9.457E-09	4.733E-09	2.909E-09	1.993E-09
SW	2.751E-08	4.189E-08	4.270E-08	3.657E-08	3.060E-08	1.867E-08	8.374E-09	4.229E-09	2.610E-09	1.791E-09
WSW	2.585E-08	3.598E-08	3.619E-08	3.130E-08	2.646E-08	1.645E-08	7.534E-09	3.850E-09	2.388E-09	1.643E-09
W	3.133E-08	4.164E-08	4.151E-08	3.585E-08	3.035E-08	1.902E-08	8.861E-09	4.609E-09	2.895E-09	2.010E-09
WNW	3.747E-08	4.329E-08	4.105E-08	3.463E-08	2.888E-08	1.776E-08	8.173E-09	4.258E-09	2.685E-09	1.873E-09
NW	2.236E-08	3.730E-08	4.054E-08	3.566E-08	3.026E-08	1.889E-08	8.789E-09	4.591E-09	2.898E-09	2.021E-09
NNW	1.654E-08	2.629E-08	3.077E-08	2.836E-08	2.476E-08	1.606E-08	7.728E-09	4.085E-09	2.581E-09	1.797E-09
N	4.342E-08	7.044E-08	8.183E-08	7.515E-08	6.549E-08	4.237E-08	2.034E-08	1.073E-08	6.772E-09	4.709E-09
NNE	7.784E-08	1.015E-07	1.081E-07	9.636E-08	8.284E-08	5.298E-08	2.530E-08	1.339E-08	8.484E-09	5.923E-09
NE	5.515E-08	8.002E-08	8.665E-08	7.744E-08	6.662E-08	4.257E-08	2.032E-08	1.076E-08	6.822E-09	4.770E-09
ENE	3.133E-08	4.132E-08	4.518E-08	4.116E-08	3.598E-08	2.370E-08	1.176E-08	6.390E-09	4.109E-09	2.897E-09
E	3.013E-08	4.869E-08	6.018E-08	5.855E-08	5.335E-08	3.748E-08	2.000E-08	1.139E-08	7.511E-09	5.381E-09
ESE	4.534E-08	5.969E-08	6.796E-08	6.429E-08	5.793E-08	4.068E-08	2.220E-08	1.306E-08	8.835E-09	6.458E-09
SE	6.237E-08	5.830E-08	5.637E-08	4.975E-08	4.312E-08	2.871E-08	1.487E-08	8.527E-09	5.716E-09	4.161E-09
SSE	6.756E-08	6.563E-08	5.814E-08	4.775E-08	3.928E-08	2.381E-08	1.086E-08	5.662E-09	3.588E-09	2.515E-09

1USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE: 7/ 8/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
EXIT TB - MIXED MODE RELEASE - NO PURGE RELEASES
2.260 DAY DECAY, UNDEPLETED
0CHI/Q (SEC/METER CUBED) FOR EACH SEGMENT

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
	SEGMENT BOUNDARIES IN MILES FROM THE SITE									
S	5.236E-08	6.140E-08	6.046E-08	5.155E-08	4.292E-08	2.585E-08	1.139E-08	5.699E-09	3.509E-09	2.410E-09
SSW	2.615E-08	3.818E-08	4.164E-08	3.720E-08	3.180E-08	1.977E-08	8.964E-09	4.532E-09	2.796E-09	1.919E-09
SW	1.998E-08	3.072E-08	3.450E-08	3.135E-08	2.708E-08	1.711E-08	7.888E-09	4.028E-09	2.497E-09	1.718E-09
WSW	1.937E-08	2.672E-08	2.932E-08	2.685E-08	2.342E-08	1.505E-08	7.069E-09	3.650E-09	2.273E-09	1.568E-09
W	2.426E-08	3.116E-08	3.351E-08	3.049E-08	2.656E-08	1.716E-08	8.185E-09	4.298E-09	2.710E-09	1.886E-09
WNW	3.049E-08	3.262E-08	3.229E-08	2.857E-08	2.456E-08	1.570E-08	7.482E-09	3.964E-09	2.518E-09	1.764E-09
NW	1.659E-08	2.517E-08	2.981E-08	2.810E-08	2.485E-08	1.634E-08	7.960E-09	4.251E-09	2.708E-09	1.900E-09
NNW	1.289E-08	1.662E-08	2.141E-08	2.148E-08	1.972E-08	1.362E-08	6.932E-09	3.767E-09	2.409E-09	1.690E-09
N	3.317E-08	4.418E-08	5.661E-08	5.666E-08	5.197E-08	3.588E-08	1.825E-08	9.919E-09	6.344E-09	4.448E-09
NNE	6.023E-08	6.752E-08	7.724E-08	7.386E-08	6.630E-08	4.488E-08	2.261E-08	1.231E-08	7.902E-09	5.562E-09
NE	4.070E-08	5.209E-08	6.160E-08	5.930E-08	5.333E-08	3.608E-08	1.814E-08	9.863E-09	6.333E-09	4.461E-09
ENE	2.386E-08	2.657E-08	3.126E-08	3.056E-08	2.789E-08	1.948E-08	1.022E-08	5.719E-09	3.731E-09	2.653E-09
E	2.250E-08	2.858E-08	3.826E-08	4.020E-08	3.843E-08	2.895E-08	1.651E-08	9.756E-09	6.551E-09	4.746E-09
ESE	3.516E-08	3.774E-08	4.512E-08	4.532E-08	4.242E-08	3.134E-08	1.785E-08	1.071E-08	7.318E-09	5.385E-09
SE	5.160E-08	4.257E-08	4.234E-08	3.907E-08	3.480E-08	2.383E-08	1.251E-08	7.170E-09	4.800E-09	3.494E-09
SSE	5.406E-08	5.056E-08	4.739E-08	4.073E-08	3.440E-08	2.146E-08	9.981E-09	5.228E-09	3.313E-09	2.322E-09

Note: Directions are True North.

NAPS COL 2.0-11-A

Table 2.3-211 Long-Term χ/Q (sec/m³) for Routine Releases Along Various Distance Segments, 2.260 Day Decay, Undepleted

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1USNRC COMPUTER CODE - XOQDOQ,  VERSION 2.0          RUN DATE:  7/ 8/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
 EXIT RW - MIXED MODE RELEASE - NO PURGE RELEASES
   2.260 DAY DECAY,  UNDEPLETED
0CHI/Q (SEC/METER CUBED) FOR EACH SEGMENT
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DIRECTION FROM SITE	SEGMENT BOUNDARIES IN MILES FROM THE SITE .5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	5.294E-07	3.126E-07	1.783E-07	1.165E-07	8.345E-08	4.196E-08	1.562E-08	7.245E-09	4.332E-09	2.926E-09
SSW	3.638E-07	2.342E-07	1.385E-07	9.175E-08	6.618E-08	3.353E-08	1.255E-08	5.820E-09	3.470E-09	2.336E-09
SW	3.023E-07	2.023E-07	1.218E-07	8.133E-08	5.893E-08	3.005E-08	1.134E-08	5.280E-09	3.154E-09	2.124E-09
WSW	2.575E-07	1.767E-07	1.089E-07	7.358E-08	5.368E-08	2.762E-08	1.054E-08	4.937E-09	2.957E-09	1.993E-09
W	2.972E-07	2.064E-07	1.290E-07	8.796E-08	6.465E-08	3.373E-08	1.315E-08	6.273E-09	3.798E-09	2.581E-09
WNW	2.980E-07	1.975E-07	1.190E-07	7.980E-08	5.814E-08	3.008E-08	1.167E-08	5.584E-09	3.396E-09	2.317E-09
NW	2.883E-07	2.056E-07	1.258E-07	8.478E-08	6.193E-08	3.214E-08	1.251E-08	5.990E-09	3.642E-09	2.484E-09
NNW	2.161E-07	1.686E-07	1.074E-07	7.336E-08	5.397E-08	2.821E-08	1.103E-08	5.265E-09	3.185E-09	2.162E-09
N	5.768E-07	4.458E-07	2.818E-07	1.917E-07	1.406E-07	7.313E-08	2.839E-08	1.349E-08	8.140E-09	5.516E-09
NNE	7.820E-07	5.707E-07	3.559E-07	2.413E-07	1.768E-07	9.206E-08	3.586E-08	1.712E-08	1.037E-08	7.048E-09
NE	6.255E-07	4.595E-07	2.873E-07	1.953E-07	1.434E-07	7.483E-08	2.927E-08	1.402E-08	8.516E-09	5.802E-09
ENE	3.303E-07	2.566E-07	1.669E-07	1.158E-07	8.617E-08	4.593E-08	1.845E-08	8.987E-09	5.499E-09	3.760E-09
E	4.491E-07	4.107E-07	2.882E-07	2.072E-07	1.577E-07	8.682E-08	3.633E-08	1.817E-08	1.128E-08	7.780E-09
ESE	5.136E-07	4.657E-07	3.416E-07	2.550E-07	1.993E-07	1.148E-07	5.093E-08	2.651E-08	1.682E-08	1.177E-08
SE	4.200E-07	3.272E-07	2.311E-07	1.709E-07	1.331E-07	7.643E-08	3.384E-08	1.763E-08	1.119E-08	7.843E-09
SSE	4.270E-07	2.683E-07	1.626E-07	1.105E-07	8.141E-08	4.296E-08	1.714E-08	8.372E-09	5.147E-09	3.537E-09

Note: Directions are True North.

NAPS COL 2.0-11-A

Table 2.3-212 Long-Term χ/Q (sec/m^3) for Routine Releases at Distances Between 0.25 to 50 Miles, 8.000 Day Decay, Depleted

1USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE: 7/ 8/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
EXIT RB - MIXED MODE RELEASE - NO PURGE RELEASES
8.000 DAY DECAY, DEPLETED

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	0.250	0.500	0.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	1.169E-07	6.545E-08	6.291E-08	7.283E-08	8.268E-08	7.920E-08	7.173E-08	6.394E-08	5.687E-08	5.072E-08	4.545E-08
SSW	5.238E-08	2.982E-08	3.120E-08	4.080E-08	5.294E-08	5.395E-08	5.066E-08	4.627E-08	4.190E-08	3.788E-08	3.432E-08
SW	3.959E-08	2.234E-08	2.331E-08	3.159E-08	4.291E-08	4.468E-08	4.253E-08	3.922E-08	3.578E-08	3.254E-08	2.962E-08
WSW	3.339E-08	2.178E-08	2.287E-08	2.867E-08	3.659E-08	3.771E-08	3.598E-08	3.337E-08	3.064E-08	2.804E-08	2.566E-08
W	4.527E-08	2.876E-08	2.756E-08	3.364E-08	4.231E-08	4.331E-08	4.121E-08	3.820E-08	3.507E-08	3.212E-08	2.944E-08
WNW	4.579E-08	3.709E-08	3.445E-08	3.789E-08	4.373E-08	4.352E-08	4.076E-08	3.734E-08	3.397E-08	3.089E-08	2.815E-08
NW	2.863E-08	1.976E-08	1.866E-08	2.553E-08	3.800E-08	4.165E-08	4.081E-08	3.833E-08	3.542E-08	3.255E-08	2.988E-08
NNW	3.052E-08	1.970E-08	1.349E-08	1.662E-08	2.634E-08	3.058E-08	3.118E-08	3.014E-08	2.846E-08	2.660E-08	2.476E-08
N	8.413E-08	4.846E-08	3.569E-08	4.497E-08	7.066E-08	8.158E-08	8.291E-08	7.999E-08	7.544E-08	7.044E-08	6.552E-08
NNE	1.470E-07	8.704E-08	6.779E-08	7.656E-08	1.019E-07	1.103E-07	1.087E-07	1.030E-07	9.602E-08	8.894E-08	8.225E-08
NE	1.043E-07	5.532E-08	4.706E-08	5.765E-08	8.057E-08	8.823E-08	8.722E-08	8.275E-08	7.718E-08	7.150E-08	6.613E-08
ENE	7.254E-08	3.586E-08	2.692E-08	3.048E-08	4.127E-08	4.549E-08	4.551E-08	4.368E-08	4.116E-08	3.849E-08	3.589E-08
E	8.066E-08	3.577E-08	2.455E-08	2.993E-08	4.796E-08	5.771E-08	6.099E-08	6.087E-08	5.910E-08	5.659E-08	5.382E-08
ESE	1.108E-07	5.409E-08	3.891E-08	4.291E-08	5.893E-08	6.672E-08	6.843E-08	6.712E-08	6.449E-08	6.134E-08	5.808E-08
SE	1.496E-07	8.197E-08	5.625E-08	5.319E-08	5.771E-08	5.823E-08	5.599E-08	5.268E-08	4.912E-08	4.566E-08	4.245E-08
SSE	1.164E-07	7.604E-08	6.198E-08	6.287E-08	6.605E-08	6.277E-08	5.726E-08	5.159E-08	4.639E-08	4.183E-08	3.786E-08

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	4.095E-08	2.620E-08	1.841E-08	1.081E-08	7.278E-09	5.311E-09	4.087E-09	3.265E-09	2.682E-09	2.259E-09	1.926E-09
SSW	3.119E-08	2.052E-08	1.463E-08	8.732E-09	5.932E-09	4.354E-09	3.365E-09	2.698E-09	2.223E-09	1.877E-09	1.603E-09
SW	2.704E-08	1.805E-08	1.299E-08	7.841E-09	5.368E-09	3.963E-09	3.077E-09	2.477E-09	2.047E-09	1.733E-09	1.484E-09
WSW	2.354E-08	1.599E-08	1.163E-08	7.113E-09	4.910E-09	3.646E-09	2.843E-09	2.296E-09	1.904E-09	1.615E-09	1.387E-09
W	2.705E-08	1.853E-08	1.359E-08	8.425E-09	5.883E-09	4.411E-09	3.469E-09	2.822E-09	2.355E-09	2.008E-09	1.733E-09
WNW	2.575E-08	1.744E-08	1.274E-08	7.897E-09	5.533E-09	4.162E-09	3.281E-09	2.676E-09	2.237E-09	1.909E-09	1.650E-09
NW	2.748E-08	1.888E-08	1.390E-08	8.694E-09	6.119E-09	4.619E-09	3.654E-09	2.987E-09	2.503E-09	2.141E-09	1.855E-09
NNW	2.303E-08	1.640E-08	1.232E-08	7.868E-09	5.597E-09	4.253E-09	3.379E-09	2.772E-09	2.328E-09	1.994E-09	1.731E-09
N	6.091E-08	4.330E-08	3.248E-08	2.073E-08	1.473E-08	1.118E-08	8.879E-09	7.278E-09	6.109E-09	5.228E-09	4.535E-09
NNE	7.613E-08	5.356E-08	4.003E-08	2.549E-08	1.812E-08	1.377E-08	1.094E-08	8.976E-09	7.541E-09	6.459E-09	5.607E-09
NE	6.120E-08	4.301E-08	3.212E-08	2.044E-08	1.453E-08	1.104E-08	8.777E-09	7.205E-09	6.055E-09	5.190E-09	4.507E-09
ENE	3.347E-08	2.420E-08	1.843E-08	1.205E-08	8.718E-09	6.715E-09	5.394E-09	4.466E-09	3.781E-09	3.260E-09	2.847E-09
E	5.102E-08	3.905E-08	3.082E-08	2.107E-08	1.570E-08	1.234E-08	1.008E-08	8.455E-09	7.237E-09	6.296E-09	5.546E-09
ESE	5.492E-08	4.201E-08	3.340E-08	2.326E-08	1.764E-08	1.410E-08	1.167E-08	9.917E-09	8.583E-09	7.543E-09	6.705E-09
SE	3.955E-08	2.881E-08	2.225E-08	1.500E-08	1.118E-08	8.833E-09	7.260E-09	6.133E-09	5.288E-09	4.635E-09	4.109E-09
SSE	3.445E-08	2.295E-08	1.663E-08	1.024E-08	7.161E-09	5.388E-09	4.254E-09	3.476E-09	2.912E-09	2.492E-09	2.160E-09

0VENT AND BUILDING PARAMETERS:

RELEASE HEIGHT	(METERS)	52.77	REP. WIND HEIGHT	(METERS)	10.0
DIAMETER	(METERS)	2.40	BUILDING HEIGHT	(METERS)	46.1
EXIT VELOCITY	(METERS)	17.78	BLDG.MIN.CRS.SEC.AREA	(SQ.METERS)	3098.0
			HEAT EMISSION RATE	(CAL/SEC)	0.0

0AT THE RELEASE HEIGHT: / AT THE MEASURED WIND HEIGHT (10.0 METERS):

VENT RELEASE MODE	WIND SPEED (METERS/SEC)	/	VENT RELEASE MODE	WIND SPEED (METERS/SEC) STABLE CONDITIONS	WIND SPEED (METERS/SEC) UNSTABLE/NEUTRAL CONDITIONS
ELEVATED	LESS THAN 3.556	/	ELEVATED	LESS THAN 3.556	LESS THAN 3.556
MIXED	BETWEEN 3.556 AND 17.780	/	MIXED	BETWEEN 3.556 AND 17.780	BETWEEN 3.556 AND 17.780
GROUND LEVEL	ABOVE 17.780	/	GROUND LEVEL	ABOVE 17.780	ABOVE 17.780

Note: Directions are True North.

BASIS: ESBWR COLA

NAPS COL 2.0-11-A

Table 2.3-212 Long-Term χ/Q (sec/m³) for Routine Releases at Distances Between 0.25 to 50 Miles, 8.000 Day Decay, Depleted

0XOQDOQ - North Anna COL (1996-98 Met Data)
EXIT TB - MIXED MODE RELEASE - NO PURGE RELEASES
8.000 DAY DECAY, DEPLETED

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	0.250	0.500	0.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	1.101E-07	5.617E-08	4.555E-08	5.062E-08	6.141E-08	6.281E-08	5.953E-08	5.475E-08	4.978E-08	4.512E-08	4.092E-08
SSW	4.985E-08	2.592E-08	2.194E-08	2.715E-08	3.807E-08	4.179E-08	4.128E-08	3.902E-08	3.619E-08	3.329E-08	3.055E-08
SW	3.718E-08	1.972E-08	1.661E-08	2.101E-08	3.053E-08	3.420E-08	3.426E-08	3.272E-08	3.059E-08	2.832E-08	2.612E-08
WSW	3.114E-08	1.900E-08	1.703E-08	1.990E-08	2.638E-08	2.900E-08	2.905E-08	2.788E-08	2.621E-08	2.440E-08	2.262E-08
W	4.234E-08	2.592E-08	2.124E-08	2.392E-08	3.078E-08	3.333E-08	3.313E-08	3.167E-08	2.972E-08	2.765E-08	2.564E-08
WNW	4.190E-08	3.296E-08	2.843E-08	2.882E-08	3.204E-08	3.284E-08	3.183E-08	2.999E-08	2.788E-08	2.579E-08	2.381E-08
NW	2.576E-08	1.773E-08	1.442E-08	1.677E-08	2.457E-08	2.877E-08	2.981E-08	2.918E-08	2.779E-08	2.614E-08	2.443E-08
NNW	2.752E-08	1.857E-08	1.118E-08	1.072E-08	1.568E-08	1.968E-08	2.151E-08	2.189E-08	2.146E-08	2.063E-08	1.963E-08
N	7.467E-08	4.492E-08	2.905E-08	2.866E-08	4.172E-08	5.214E-08	5.688E-08	5.781E-08	5.665E-08	5.444E-08	5.177E-08
NNE	1.305E-07	7.802E-08	5.413E-08	5.183E-08	6.470E-08	7.406E-08	7.707E-08	7.614E-08	7.325E-08	6.950E-08	6.549E-08
NE	9.437E-08	4.883E-08	3.575E-08	3.698E-08	5.000E-08	5.864E-08	6.155E-08	6.105E-08	5.883E-08	5.588E-08	5.268E-08
ENE	6.483E-08	3.235E-08	2.101E-08	1.989E-08	2.530E-08	2.953E-08	3.122E-08	3.125E-08	3.039E-08	2.912E-08	2.767E-08
E	7.116E-08	3.261E-08	1.936E-08	1.828E-08	2.654E-08	3.415E-08	3.840E-08	4.015E-08	4.037E-08	3.972E-08	3.859E-08
ESE	9.879E-08	4.878E-08	3.109E-08	2.861E-08	3.559E-08	4.190E-08	4.498E-08	4.575E-08	4.519E-08	4.391E-08	4.229E-08
SE	1.322E-07	7.376E-08	4.693E-08	4.029E-08	4.085E-08	4.203E-08	4.170E-08	4.029E-08	3.833E-08	3.618E-08	3.402E-08
SSE	1.058E-07	6.637E-08	4.921E-08	4.719E-08	4.978E-08	4.920E-08	4.648E-08	4.300E-08	3.944E-08	3.608E-08	3.302E-08

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	3.721E-08	2.442E-08	1.734E-08	1.027E-08	6.938E-09	5.070E-09	3.903E-09	3.119E-09	2.563E-09	2.159E-09	1.840E-09
SSW	2.805E-08	1.895E-08	1.368E-08	8.246E-09	5.626E-09	4.139E-09	3.203E-09	2.571E-09	2.119E-09	1.790E-09	1.530E-09
SW	2.409E-08	1.653E-08	1.205E-08	7.354E-09	5.059E-09	3.746E-09	2.913E-09	2.348E-09	1.942E-09	1.645E-09	1.410E-09
WSW	2.095E-08	1.461E-08	1.075E-08	6.638E-09	4.602E-09	3.426E-09	2.675E-09	2.163E-09	1.795E-09	1.524E-09	1.308E-09
W	2.377E-08	1.668E-08	1.235E-08	7.727E-09	5.415E-09	4.068E-09	3.203E-09	2.608E-09	2.177E-09	1.858E-09	1.604E-09
WNW	2.202E-08	1.539E-08	1.142E-08	7.193E-09	5.082E-09	3.841E-09	3.039E-09	2.484E-09	2.081E-09	1.779E-09	1.540E-09
NW	2.279E-08	1.634E-08	1.229E-08	7.856E-09	5.592E-09	4.251E-09	3.378E-09	2.772E-09	2.329E-09	1.997E-09	1.734E-09
NNW	1.858E-08	1.394E-08	1.074E-08	7.053E-09	5.091E-09	3.905E-09	3.123E-09	2.574E-09	2.171E-09	1.865E-09	1.623E-09
N	4.900E-08	3.675E-08	2.833E-08	1.860E-08	1.343E-08	1.030E-08	8.235E-09	6.786E-09	5.721E-09	4.914E-09	4.276E-09
NNE	6.156E-08	4.540E-08	3.477E-08	2.274E-08	1.641E-08	1.259E-08	1.007E-08	8.310E-09	7.013E-09	6.030E-09	5.251E-09
NE	4.952E-08	3.648E-08	2.791E-08	1.822E-08	1.313E-08	1.007E-08	8.059E-09	6.647E-09	5.611E-09	4.826E-09	4.204E-09
ENE	2.621E-08	1.989E-08	1.554E-08	1.045E-08	7.679E-09	5.976E-09	4.837E-09	4.028E-09	3.426E-09	2.966E-09	2.599E-09
E	3.724E-08	3.017E-08	2.457E-08	1.740E-08	1.322E-08	1.054E-08	8.686E-09	7.341E-09	6.323E-09	5.529E-09	4.892E-09
ESE	4.054E-08	3.231E-08	2.621E-08	1.862E-08	1.427E-08	1.148E-08	9.552E-09	8.144E-09	7.072E-09	6.234E-09	5.555E-09
SE	3.198E-08	2.381E-08	1.850E-08	1.248E-08	9.274E-09	7.312E-09	5.997E-09	5.058E-09	4.357E-09	3.817E-09	3.382E-09
SSE	3.030E-08	2.066E-08	1.510E-08	9.344E-09	6.535E-09	4.910E-09	3.871E-09	3.158E-09	2.642E-09	2.259E-09	1.955E-09

0VENT AND BUILDING PARAMETERS:

RELEASE HEIGHT	(METERS)	71.30	REP. WIND HEIGHT	(METERS)	10.0
DIAMETER	(METERS)	1.95	BUILDING HEIGHT	(METERS)	46.1
EXIT VELOCITY	(METERS)	17.78	BLDG.MIN.CRS.SEC.AREA	(SQ.METERS)	3098.0
			HEAT EMISSION RATE	(CAL/SEC)	0.0

0AT THE RELEASE HEIGHT: / AT THE MEASURED WIND HEIGHT (10.0 METERS):

VENT RELEASE MODE	WIND SPEED (METERS/SEC)	/	VENT RELEASE MODE	WIND SPEED (METERS/SEC) STABLE CONDITIONS	WIND SPEED (METERS/SEC) UNSTABLE/NEUTRAL CONDITIONS
ELEVATED	LESS THAN 3.556	/	ELEVATED	LESS THAN 3.556	LESS THAN 3.556
MIXED	BETWEEN 3.556 AND 17.780	/	MIXED	BETWEEN 3.556 AND 17.780	BETWEEN 3.556 AND 17.780
GROUND LEVEL	ABOVE 17.780	/	GROUND LEVEL	ABOVE 17.780	ABOVE 17.780

Note: Directions are True North.

NAPS COL 2.0-11-A

Table 2.3-212 Long-Term χ/Q (sec/m^3) for Routine Releases at Distances Between 0.25 to 50 Miles, 8.000 Day Decay, Depleted

1USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE: 7/ 8/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
EXIT RW - MIXED MODE RELEASE - NO PURGE RELEASES
8.000 DAY DECAY, DEPLETED

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	0.250	0.500	0.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	4.744E-07	6.063E-07	5.473E-07	4.510E-07	3.080E-07	2.229E-07	1.698E-07	1.344E-07	1.097E-07	9.149E-08	7.774E-08
SSW	2.253E-07	3.817E-07	3.809E-07	3.287E-07	2.343E-07	1.732E-07	1.335E-07	1.066E-07	8.744E-08	7.327E-08	6.247E-08
SW	1.665E-07	3.052E-07	3.175E-07	2.799E-07	2.038E-07	1.522E-07	1.181E-07	9.476E-08	7.804E-08	6.559E-08	5.605E-08
WSW	1.570E-07	2.598E-07	2.686E-07	2.398E-07	1.786E-07	1.354E-07	1.061E-07	8.569E-08	7.094E-08	5.987E-08	5.133E-08
W	1.970E-07	3.001E-07	3.093E-07	2.776E-07	2.089E-07	1.596E-07	1.259E-07	1.023E-07	8.513E-08	7.215E-08	6.210E-08
WNW	2.324E-07	3.090E-07	3.113E-07	2.742E-07	1.999E-07	1.496E-07	1.166E-07	9.389E-08	7.767E-08	6.555E-08	5.623E-08
NW	1.322E-07	2.650E-07	3.068E-07	2.821E-07	2.108E-07	1.591E-07	1.245E-07	1.006E-07	8.343E-08	7.054E-08	6.060E-08
NNW	1.161E-07	1.812E-07	2.289E-07	2.227E-07	1.753E-07	1.355E-07	1.075E-07	8.761E-08	7.312E-08	6.210E-08	5.353E-08
N	2.984E-07	4.858E-07	6.118E-07	5.923E-07	4.633E-07	3.566E-07	2.820E-07	2.294E-07	1.911E-07	1.620E-07	1.395E-07
NNE	5.457E-07	7.245E-07	8.205E-07	7.677E-07	5.875E-07	4.489E-07	3.537E-07	2.872E-07	2.389E-07	2.025E-07	1.742E-07
NE	3.661E-07	5.697E-07	6.580E-07	6.171E-07	4.728E-07	3.618E-07	2.855E-07	2.320E-07	1.932E-07	1.639E-07	1.411E-07
ENE	2.320E-07	2.926E-07	3.435E-07	3.328E-07	2.655E-07	2.080E-07	1.668E-07	1.372E-07	1.154E-07	9.862E-08	8.549E-08
E	2.289E-07	3.275E-07	4.644E-07	4.951E-07	4.315E-07	3.533E-07	2.914E-07	2.446E-07	2.089E-07	1.809E-07	1.584E-07
ESE	3.403E-07	4.116E-07	5.256E-07	5.475E-07	4.848E-07	4.080E-07	3.449E-07	2.955E-07	2.569E-07	2.256E-07	2.001E-07
SE	4.950E-07	4.185E-07	4.257E-07	4.029E-07	3.343E-07	2.754E-07	2.305E-07	1.964E-07	1.700E-07	1.490E-07	1.320E-07
SSE	4.814E-07	4.816E-07	4.374E-07	3.720E-07	2.676E-07	2.011E-07	1.577E-07	1.278E-07	1.064E-07	9.032E-08	7.789E-08

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	6.705E-08	3.729E-08	2.424E-08	1.294E-08	8.131E-09	5.633E-09	4.155E-09	3.201E-09	2.546E-09	2.077E-09	1.726E-09
SSW	5.402E-08	3.027E-08	1.974E-08	1.056E-08	6.624E-09	4.582E-09	3.374E-09	2.595E-09	2.061E-09	1.680E-09	1.394E-09
SW	4.857E-08	2.739E-08	1.793E-08	9.631E-09	6.045E-09	4.183E-09	3.081E-09	2.370E-09	1.882E-09	1.534E-09	1.272E-09
WSW	4.460E-08	2.539E-08	1.670E-08	9.026E-09	5.683E-09	3.942E-09	2.908E-09	2.240E-09	1.780E-09	1.452E-09	1.205E-09
W	5.415E-08	3.124E-08	2.074E-08	1.134E-08	7.192E-09	5.013E-09	3.713E-09	2.868E-09	2.286E-09	1.868E-09	1.553E-09
WNW	4.890E-08	2.800E-08	1.851E-08	1.007E-08	6.361E-09	4.422E-09	3.270E-09	2.521E-09	2.006E-09	1.637E-09	1.359E-09
NW	5.276E-08	3.028E-08	2.003E-08	1.089E-08	6.844E-09	4.741E-09	3.495E-09	2.689E-09	2.135E-09	1.738E-09	1.441E-09
NNW	4.672E-08	2.701E-08	1.792E-08	9.740E-09	6.103E-09	4.215E-09	3.099E-09	2.378E-09	1.884E-09	1.530E-09	1.266E-09
N	1.216E-07	6.994E-08	4.625E-08	2.503E-08	1.563E-08	1.077E-08	7.904E-09	6.055E-09	4.790E-09	3.886E-09	3.212E-09
NNE	1.519E-07	8.742E-08	5.788E-08	3.141E-08	1.968E-08	1.359E-08	9.992E-09	7.668E-09	6.076E-09	4.936E-09	4.085E-09
NE	1.231E-07	7.103E-08	4.711E-08	2.563E-08	1.608E-08	1.112E-08	8.183E-09	6.286E-09	4.985E-09	4.054E-09	3.358E-09
ENE	7.499E-08	4.414E-08	2.964E-08	1.636E-08	1.035E-08	7.194E-09	5.316E-09	4.097E-09	3.258E-09	2.654E-09	2.202E-09
E	1.401E-07	8.493E-08	5.805E-08	3.273E-08	2.093E-08	1.467E-08	1.091E-08	8.448E-09	6.744E-09	5.513E-09	4.588E-09
ESE	1.791E-07	1.130E-07	7.926E-08	4.623E-08	3.022E-08	2.153E-08	1.622E-08	1.269E-08	1.022E-08	8.419E-09	7.053E-09
SE	1.179E-07	7.429E-08	5.214E-08	3.050E-08	2.003E-08	1.432E-08	1.082E-08	8.486E-09	6.849E-09	5.651E-09	4.741E-09
SSE	6.807E-08	3.973E-08	2.664E-08	1.479E-08	9.475E-09	6.658E-09	4.964E-09	3.855E-09	3.086E-09	2.530E-09	2.111E-09

0VENT AND BUILDING PARAMETERS:

RELEASE HEIGHT	(METERS)	18.15	REP. WIND HEIGHT	(METERS)	10.0
DIAMETER	(METERS)	1.34	BUILDING HEIGHT	(METERS)	12.1
EXIT VELOCITY	(METERS)	17.78	BLDG.MIN.CRS.SEC.AREA	(SQ.METERS)	3098.0
			HEAT EMISSION RATE	(CAL/SEC)	0.0

0AT THE RELEASE HEIGHT: / AT THE MEASURED WIND HEIGHT (10.0 METERS):

VENT RELEASE MODE	WIND SPEED (METERS/SEC)	/	VENT RELEASE MODE	WIND SPEED (METERS/SEC) STABLE CONDITIONS	WIND SPEED (METERS/SEC) UNSTABLE/NEUTRAL CONDITIONS
ELEVATED	LESS THAN 3.556	/	ELEVATED	LESS THAN 3.556	LESS THAN 3.556
MIXED	BETWEEN 3.556 AND 17.780	/	MIXED	BETWEEN 3.556 AND 17.780	BETWEEN 3.556 AND 17.780
GROUND LEVEL	ABOVE 17.780	/	GROUND LEVEL	ABOVE 17.780	ABOVE 17.780

Note: Directions are True North.

NAPS COL 2.0-11-A

Table 2.3-213 Long-Term χ/Q (sec/m^3) for Routine Releases Along Various Distance Segments, 8.000 Day Decay, Depleted

```
1USNRC COMPUTER CODE - XOQDOQ,  VERSION 2.0          RUN DATE:  7/ 8/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
 EXIT RB - MIXED MODE RELEASE - NO PURGE RELEASES
   8.000 DAY DECAY,    DEPLETED
0CHI/Q (SEC/METER CUBED) FOR EACH SEGMENT
                                            SEGMENT BOUNDARIES IN MILES FROM THE SITE
```

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	6.788E-08	7.894E-08	7.061E-08	5.655E-08	4.535E-08	2.602E-08	1.093E-08	5.346E-09	3.278E-09	2.261E-09
SSW	3.516E-08	5.069E-08	4.978E-08	4.162E-08	3.421E-08	2.027E-08	8.799E-09	4.379E-09	2.708E-09	1.878E-09
SW	2.678E-08	4.118E-08	4.178E-08	3.553E-08	2.953E-08	1.780E-08	7.886E-09	3.983E-09	2.485E-09	1.734E-09
WSW	2.521E-08	3.533E-08	3.540E-08	3.043E-08	2.558E-08	1.573E-08	7.138E-09	3.662E-09	2.303E-09	1.616E-09
W	3.053E-08	4.083E-08	4.056E-08	3.484E-08	2.935E-08	1.823E-08	8.443E-09	4.427E-09	2.829E-09	2.009E-09
WNW	3.656E-08	4.234E-08	4.013E-08	3.376E-08	2.808E-08	1.720E-08	7.922E-09	4.175E-09	2.681E-09	1.910E-09
NW	2.196E-08	3.685E-08	4.004E-08	3.516E-08	2.979E-08	1.858E-08	8.707E-09	4.633E-09	2.993E-09	2.143E-09
NNW	1.626E-08	2.607E-08	3.060E-08	2.823E-08	2.466E-08	1.606E-08	7.847E-09	4.262E-09	2.776E-09	1.995E-09
N	4.265E-08	6.981E-08	8.139E-08	7.484E-08	6.527E-08	4.241E-08	2.067E-08	1.121E-08	7.290E-09	5.232E-09
NNE	7.597E-08	1.000E-07	1.069E-07	9.532E-08	8.197E-08	5.256E-08	2.544E-08	1.380E-08	8.991E-09	6.464E-09
NE	5.360E-08	7.888E-08	8.570E-08	7.661E-08	6.590E-08	4.221E-08	2.041E-08	1.107E-08	7.216E-09	5.193E-09
ENE	3.049E-08	4.075E-08	4.477E-08	4.086E-08	3.576E-08	2.370E-08	1.199E-08	6.721E-09	4.470E-09	3.262E-09
E	2.944E-08	4.829E-08	6.007E-08	5.865E-08	5.360E-08	3.806E-08	2.085E-08	1.233E-08	8.455E-09	6.297E-09
ESE	4.406E-08	5.883E-08	6.745E-08	6.404E-08	5.787E-08	4.105E-08	2.301E-08	1.407E-08	9.911E-09	7.541E-09
SE	6.060E-08	5.694E-08	5.526E-08	4.882E-08	4.233E-08	2.828E-08	1.491E-08	8.828E-09	6.133E-09	4.633E-09
SSE	6.550E-08	6.388E-08	5.646E-08	4.614E-08	3.777E-08	2.270E-08	1.029E-08	5.407E-09	3.483E-09	2.493E-09

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1USNRC COMPUTER CODE - XOQDOQ,  VERSION 2.0          RUN DATE:  7/ 8/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
 EXIT TB - MIXED MODE RELEASE - NO PURGE RELEASES
   8.000 DAY DECAY,    DEPLETED
0CHI/Q (SEC/METER CUBED) FOR EACH SEGMENT
                                            SEGMENT BOUNDARIES IN MILES FROM THE SITE
```

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	5.017E-08	5.964E-08	5.849E-08	4.942E-08	4.079E-08	2.412E-08	1.036E-08	5.101E-09	3.131E-09	2.160E-09
SSW	2.514E-08	3.730E-08	4.052E-08	3.590E-08	3.044E-08	1.863E-08	8.289E-09	4.161E-09	2.579E-09	1.791E-09
SW	1.925E-08	3.005E-08	3.363E-08	3.033E-08	2.602E-08	1.622E-08	7.377E-09	3.763E-09	2.355E-09	1.646E-09
WSW	1.874E-08	2.611E-08	2.857E-08	2.600E-08	2.253E-08	1.431E-08	6.647E-09	3.439E-09	2.169E-09	1.524E-09
W	2.347E-08	3.039E-08	3.260E-08	2.949E-08	2.554E-08	1.633E-08	7.728E-09	4.082E-09	2.614E-09	1.859E-09
WNW	2.961E-08	3.168E-08	3.136E-08	2.769E-08	2.373E-08	1.510E-08	7.194E-09	3.851E-09	2.489E-09	1.780E-09
NW	1.620E-08	2.470E-08	2.928E-08	2.756E-08	2.433E-08	1.597E-08	7.835E-09	4.259E-09	2.777E-09	1.998E-09
NNW	1.262E-08	1.635E-08	2.117E-08	2.127E-08	1.954E-08	1.355E-08	7.001E-09	3.908E-09	2.577E-09	1.866E-09
N	3.240E-08	4.345E-08	5.599E-08	5.614E-08	5.153E-08	3.573E-08	1.846E-08	1.031E-08	6.794E-09	4.917E-09
NNE	5.842E-08	6.600E-08	7.590E-08	7.265E-08	6.522E-08	4.427E-08	2.260E-08	1.260E-08	8.320E-09	6.032E-09
NE	3.920E-08	5.095E-08	6.057E-08	5.834E-08	5.246E-08	3.557E-08	1.811E-08	1.008E-08	6.656E-09	4.828E-09
ENE	2.303E-08	2.598E-08	3.078E-08	3.015E-08	2.756E-08	1.936E-08	1.035E-08	5.975E-09	4.030E-09	2.967E-09
E	2.182E-08	2.809E-08	3.797E-08	4.006E-08	3.843E-08	2.925E-08	1.713E-08	1.051E-08	7.337E-09	5.528E-09
ESE	3.392E-08	3.684E-08	4.447E-08	4.486E-08	4.212E-08	3.143E-08	1.837E-08	1.145E-08	8.138E-09	6.231E-09
SE	4.994E-08	4.125E-08	4.122E-08	3.807E-08	3.390E-08	2.327E-08	1.239E-08	7.309E-09	5.059E-09	3.816E-09
SSE	5.213E-08	4.895E-08	4.581E-08	3.918E-08	3.292E-08	2.033E-08	9.374E-09	4.928E-09	3.165E-09	2.260E-09

Note: Directions are True North.

NAPS COL 2.0-11-A

Table 2.3-213 Long-Term χ/Q (sec/m^3) for Routine Releases Along Various Distance Segments, 8.000 Day Decay, Depleted

```
1USNRC COMPUTER CODE - XOQDOQ,  VERSION 2.0         RUN DATE:  7/ 8/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
 EXIT RW - MIXED MODE RELEASE - NO PURGE RELEASES
   8.000 DAY DECAY,    DEPLETED
0CHI/Q (SEC/METER CUBED) FOR EACH SEGMENT
```

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
	SEGMENT BOUNDARIES IN MILES FROM THE SITE									
S	5.176E-07	3.020E-07	1.698E-07	1.098E-07	7.786E-08	3.810E-08	1.331E-08	5.708E-09	3.224E-09	2.086E-09
SSW	3.579E-07	2.281E-07	1.333E-07	8.751E-08	6.254E-08	3.087E-08	1.085E-08	4.643E-09	2.614E-09	1.687E-09
SW	2.981E-07	1.978E-07	1.179E-07	7.808E-08	5.611E-08	2.789E-08	9.881E-09	4.239E-09	2.388E-09	1.540E-09
WSW	2.539E-07	1.730E-07	1.057E-07	7.094E-08	5.137E-08	2.580E-08	9.246E-09	3.993E-09	2.256E-09	1.458E-09
W	2.931E-07	2.022E-07	1.255E-07	8.510E-08	6.214E-08	3.167E-08	1.159E-08	5.074E-09	2.888E-09	1.875E-09
WNW	2.943E-07	1.941E-07	1.163E-07	7.768E-08	5.627E-08	2.843E-08	1.030E-08	4.478E-09	2.539E-09	1.643E-09
NW	2.865E-07	2.037E-07	1.242E-07	8.343E-08	6.064E-08	3.072E-08	1.112E-08	4.804E-09	2.708E-09	1.746E-09
NNW	2.155E-07	1.681E-07	1.070E-07	7.306E-08	5.355E-08	2.735E-08	9.940E-09	4.272E-09	2.395E-09	1.537E-09
N	5.751E-07	4.445E-07	2.809E-07	1.909E-07	1.395E-07	7.089E-08	2.557E-08	1.092E-08	6.101E-09	3.904E-09
NNE	7.757E-07	5.659E-07	3.525E-07	2.388E-07	1.743E-07	8.861E-08	3.208E-08	1.377E-08	7.725E-09	4.959E-09
NE	6.202E-07	4.555E-07	2.844E-07	1.931E-07	1.412E-07	7.197E-08	2.616E-08	1.127E-08	6.333E-09	4.072E-09
ENE	3.274E-07	2.549E-07	1.659E-07	1.152E-07	8.549E-08	4.455E-08	1.664E-08	7.283E-09	4.126E-09	2.665E-09
E	4.476E-07	4.109E-07	2.892E-07	2.084E-07	1.583E-07	8.525E-08	3.311E-08	1.483E-08	8.502E-09	5.535E-09
ESE	5.100E-07	4.646E-07	3.420E-07	2.560E-07	1.999E-07	1.127E-07	4.646E-08	2.172E-08	1.276E-08	8.447E-09
SE	4.140E-07	3.234E-07	2.288E-07	1.696E-07	1.318E-07	7.414E-08	3.066E-08	1.444E-08	8.528E-09	5.669E-09
SSE	4.182E-07	2.612E-07	1.573E-07	1.064E-07	7.794E-08	4.021E-08	1.506E-08	6.731E-09	3.879E-09	2.540E-09

Note: Directions are True North.

NAPS COL 2.0-11-A **Table 2.3-214 Long-Term D/Q ($1/m^2$) for Routine Releases at Distances Between 0.25 to 50 Miles**

1USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE: 7/ 8/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
EXIT RB - MIXED MODE RELEASE - NO PURGE RELEASES
******************** RELATIVE DEPOSITION PER UNIT AREA (M**-2) AT FIXED POINTS BY DOWNWIND SECTORS ********************

DIRECTION	DISTANCES IN MILES										
FROM SITE	0.25	0.50	0.75	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
S	3.039E-09	1.897E-09	1.544E-09	1.381E-09	9.561E-10	7.176E-10	5.564E-10	4.416E-10	3.568E-10	2.926E-10	2.429E-10
SSW	1.184E-09	8.178E-10	7.730E-10	7.624E-10	5.636E-10	4.356E-10	3.431E-10	2.746E-10	2.229E-10	1.832E-10	1.522E-10
SW	9.372E-10	6.500E-10	6.118E-10	6.036E-10	4.461E-10	3.453E-10	2.723E-10	2.182E-10	1.772E-10	1.457E-10	1.211E-10
WSW	9.115E-10	6.612E-10	5.927E-10	5.590E-10	3.989E-10	3.047E-10	2.386E-10	1.905E-10	1.545E-10	1.269E-10	1.055E-10
W	1.177E-09	8.409E-10	7.241E-10	6.617E-10	4.609E-10	3.485E-10	2.715E-10	2.161E-10	1.749E-10	1.436E-10	1.194E-10
WNW	1.599E-09	1.131E-09	8.545E-10	6.923E-10	4.326E-10	3.125E-10	2.376E-10	1.867E-10	1.501E-10	1.229E-10	1.022E-10
NW	8.198E-10	6.218E-10	5.076E-10	4.401E-10	2.918E-10	2.171E-10	1.677E-10	1.330E-10	1.075E-10	8.820E-11	7.334E-11
NNW	6.798E-10	5.102E-10	3.870E-10	3.116E-10	1.924E-10	1.386E-10	1.052E-10	8.265E-11	6.647E-11	5.445E-11	4.527E-11
N	1.856E-09	1.373E-09	1.030E-09	8.202E-10	5.015E-10	3.593E-10	2.720E-10	2.132E-10	1.713E-10	1.403E-10	1.166E-10
NNE	3.560E-09	2.438E-09	1.794E-09	1.422E-09	8.718E-10	6.231E-10	4.708E-10	3.686E-10	2.959E-10	2.420E-10	2.011E-10
NE	2.590E-09	1.685E-09	1.262E-09	1.031E-09	6.560E-10	4.753E-10	3.617E-10	2.843E-10	2.285E-10	1.870E-10	1.553E-10
ENE	1.563E-09	1.011E-09	7.263E-10	5.695E-10	3.472E-10	2.473E-10	1.865E-10	1.459E-10	1.170E-10	9.566E-11	7.944E-11
E	1.739E-09	1.149E-09	7.962E-10	5.938E-10	3.412E-10	2.359E-10	1.748E-10	1.354E-10	1.080E-10	8.816E-11	7.321E-11
ESE	2.690E-09	1.708E-09	1.179E-09	8.812E-10	5.117E-10	3.535E-10	2.616E-10	2.023E-10	1.612E-10	1.314E-10	1.090E-10
SE	4.132E-09	2.588E-09	1.758E-09	1.306E-09	7.562E-10	5.218E-10	3.859E-10	2.984E-10	2.378E-10	1.938E-10	1.608E-10
SSE	3.761E-09	2.348E-09	1.690E-09	1.343E-09	8.385E-10	5.999E-10	4.530E-10	3.544E-10	2.841E-10	2.322E-10	1.926E-10

0DIRECTION	DISTANCES IN MILES										
FROM SITE	5.00	7.50	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00
S	2.039E-10	1.064E-10	6.729E-11	3.511E-11	2.201E-11	1.548E-11	1.157E-11	9.015E-12	7.245E-12	5.959E-12	4.994E-12
SSW	1.278E-10	6.671E-11	4.218E-11	2.193E-11	1.370E-11	9.571E-12	7.116E-12	5.523E-12	4.426E-12	3.634E-12	3.043E-12
SW	1.016E-10	5.310E-11	3.361E-11	1.750E-11	1.094E-11	7.653E-12	5.695E-12	4.423E-12	3.545E-12	2.911E-12	2.438E-12
WSW	8.857E-11	4.636E-11	2.938E-11	1.535E-11	9.618E-12	6.771E-12	5.058E-12	3.937E-12	3.159E-12	2.594E-12	2.171E-12
W	1.003E-10	5.251E-11	3.329E-11	1.742E-11	1.094E-11	7.730E-12	5.793E-12	4.522E-12	3.637E-12	2.993E-12	2.509E-12
WNW	8.597E-11	4.526E-11	2.887E-11	1.531E-11	9.709E-12	7.023E-12	5.352E-12	4.228E-12	3.432E-12	2.843E-12	2.396E-12
NW	6.167E-11	3.245E-11	2.066E-11	1.090E-11	6.881E-12	4.927E-12	3.728E-12	2.930E-12	2.369E-12	1.957E-12	1.646E-12
NNW	3.812E-11	2.013E-11	1.286E-11	6.844E-12	4.350E-12	3.164E-12	2.421E-12	1.918E-12	1.560E-12	1.295E-12	1.093E-12
N	9.823E-11	5.187E-11	3.316E-11	1.766E-11	1.124E-11	8.190E-12	6.273E-12	4.977E-12	4.052E-12	3.365E-12	2.842E-12
NNE	1.692E-10	8.908E-11	5.684E-11	3.019E-11	1.918E-11	1.392E-11	1.064E-11	8.438E-12	6.872E-12	5.710E-12	4.829E-12
NE	1.305E-10	6.840E-11	4.348E-11	2.293E-11	1.450E-11	1.042E-11	7.920E-12	6.264E-12	5.102E-12	4.245E-12	3.601E-12
ENE	6.685E-11	3.515E-11	2.244E-11	1.192E-11	7.574E-12	5.497E-12	4.206E-12	3.338E-12	2.722E-12	2.266E-12	1.919E-12
E	6.169E-11	3.256E-11	2.086E-11	1.118E-11	7.159E-12	5.289E-12	4.105E-12	3.301E-12	2.724E-12	2.290E-12	1.961E-12
ESE	9.178E-11	4.820E-11	3.076E-11	1.639E-11	1.046E-11	7.674E-12	5.925E-12	4.742E-12	3.899E-12	3.268E-12	2.790E-12
SE	1.353E-10	7.108E-11	4.539E-11	2.423E-11	1.547E-11	1.132E-11	8.704E-12	6.921E-12	5.648E-12	4.696E-12	3.968E-12
SSE	1.619E-10	8.467E-11	5.379E-11	2.837E-11	1.795E-11	1.288E-11	9.768E-12	7.686E-12	6.221E-12	5.141E-12	4.321E-12

Note: Directions are True North.

BASIS: ESBWR COLA

NAPS COL 2.0-11-A **Table 2.3-214 Long-Term D/Q (1/m^2) for Routine Releases at Distances Between 0.25 to 50 Miles**

```
1USNRC COMPUTER CODE - XOQDOQ,  VERSION 2.0          RUN DATE:  7/ 8/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
 EXIT TB - MIXED MODE RELEASE - NO PURGE RELEASES
 ********************     RELATIVE DEPOSITION PER UNIT AREA (M**-2) AT FIXED POINTS BY DOWNWIND SECTORS     ********************
```

DIRECTION FROM SITE	DISTANCES IN MILES 0.25	0.50	0.75	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
S	2.773E-09	1.735E-09	1.452E-09	1.325E-09	9.255E-10	7.018E-10	5.477E-10	4.364E-10	3.534E-10	2.901E-10	2.411E-10
SSW	1.144E-09	7.743E-10	7.406E-10	7.410E-10	5.524E-10	4.299E-10	3.400E-10	2.728E-10	2.218E-10	1.824E-10	1.516E-10
SW	9.066E-10	6.276E-10	5.977E-10	5.947E-10	4.413E-10	3.429E-10	2.710E-10	2.174E-10	1.767E-10	1.453E-10	1.208E-10
WSW	8.970E-10	6.425E-10	5.782E-10	5.494E-10	3.938E-10	3.022E-10	2.373E-10	1.897E-10	1.539E-10	1.265E-10	1.052E-10
W	1.159E-09	8.155E-10	7.041E-10	6.484E-10	4.539E-10	3.450E-10	2.696E-10	2.150E-10	1.742E-10	1.431E-10	1.190E-10
WNW	1.572E-09	1.114E-09	8.449E-10	6.864E-10	4.294E-10	3.108E-10	2.367E-10	1.861E-10	1.498E-10	1.227E-10	1.020E-10
NW	8.198E-10	6.218E-10	5.076E-10	4.401E-10	2.918E-10	2.171E-10	1.677E-10	1.330E-10	1.075E-10	8.820E-11	7.334E-11
NNW	6.798E-10	5.102E-10	3.870E-10	3.116E-10	1.924E-10	1.386E-10	1.052E-10	8.265E-11	6.647E-11	5.445E-11	4.527E-11
N	1.855E-09	1.372E-09	1.029E-09	8.195E-10	5.011E-10	3.591E-10	2.719E-10	2.132E-10	1.713E-10	1.403E-10	1.166E-10
NNE	3.456E-09	2.381E-09	1.765E-09	1.405E-09	8.619E-10	6.180E-10	4.679E-10	3.669E-10	2.947E-10	2.412E-10	2.005E-10
NE	2.440E-09	1.597E-09	1.214E-09	1.002E-09	6.398E-10	4.670E-10	3.571E-10	2.815E-10	2.267E-10	1.857E-10	1.543E-10
ENE	1.486E-09	9.816E-10	7.164E-10	5.649E-10	3.441E-10	2.457E-10	1.855E-10	1.453E-10	1.166E-10	9.536E-11	7.923E-11
E	1.675E-09	1.123E-09	7.869E-10	5.892E-10	3.383E-10	2.344E-10	1.739E-10	1.348E-10	1.077E-10	8.789E-11	7.301E-11
ESE	2.520E-09	1.613E-09	1.129E-09	8.516E-10	4.951E-10	3.449E-10	2.568E-10	1.994E-10	1.593E-10	1.301E-10	1.080E-10
SE	3.739E-09	2.416E-09	1.688E-09	1.269E-09	7.340E-10	5.100E-10	3.792E-10	2.942E-10	2.350E-10	1.918E-10	1.593E-10
SSE	3.371E-09	2.148E-09	1.593E-09	1.288E-09	8.067E-10	5.833E-10	4.437E-10	3.487E-10	2.804E-10	2.295E-10	1.906E-10

0DIRECTION FROM SITE	DISTANCES IN MILES 5.00	7.50	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00
S	2.024E-10	1.060E-10	6.722E-11	3.516E-11	2.204E-11	1.553E-11	1.161E-11	9.033E-12	7.244E-12	5.946E-12	4.971E-12
SSW	1.272E-10	6.655E-11	4.214E-11	2.195E-11	1.371E-11	9.580E-12	7.115E-12	5.513E-12	4.408E-12	3.611E-12	3.014E-12
SW	1.014E-10	5.304E-11	3.360E-11	1.751E-11	1.094E-11	7.656E-12	5.691E-12	4.413E-12	3.530E-12	2.892E-12	2.415E-12
WSW	8.834E-11	4.629E-11	2.936E-11	1.536E-11	9.625E-12	6.777E-12	5.061E-12	3.938E-12	3.158E-12	2.592E-12	2.167E-12
W	9.994E-11	5.240E-11	3.327E-11	1.743E-11	1.094E-11	7.735E-12	5.792E-12	4.515E-12	3.625E-12	2.978E-12	2.492E-12
WNW	8.581E-11	4.522E-11	2.886E-11	1.532E-11	9.710E-12	7.022E-12	5.343E-12	4.212E-12	3.409E-12	2.816E-12	2.365E-12
NW	6.167E-11	3.245E-11	2.066E-11	1.090E-11	6.879E-12	4.923E-12	3.719E-12	2.917E-12	2.353E-12	1.939E-12	1.626E-12
NNW	3.812E-11	2.013E-11	1.286E-11	6.844E-12	4.349E-12	3.160E-12	2.412E-12	1.906E-12	1.545E-12	1.278E-12	1.074E-12
N	9.821E-11	5.186E-11	3.316E-11	1.766E-11	1.123E-11	8.178E-12	6.251E-12	4.944E-12	4.010E-12	3.318E-12	2.789E-12
NNE	1.687E-10	8.896E-11	5.682E-11	3.021E-11	1.918E-11	1.391E-11	1.061E-11	8.378E-12	6.788E-12	5.611E-12	4.714E-12
NE	1.297E-10	6.819E-11	4.345E-11	2.296E-11	1.450E-11	1.041E-11	7.882E-12	6.191E-12	4.998E-12	4.121E-12	3.456E-12
ENE	6.668E-11	3.513E-11	2.244E-11	1.193E-11	7.570E-12	5.493E-12	4.189E-12	3.307E-12	2.679E-12	2.214E-12	1.860E-12
E	6.153E-11	3.253E-11	2.086E-11	1.119E-11	7.149E-12	5.267E-12	4.058E-12	3.226E-12	2.627E-12	2.178E-12	1.834E-12
ESE	9.096E-11	4.799E-11	3.073E-11	1.642E-11	1.047E-11	7.671E-12	5.889E-12	4.670E-12	3.795E-12	3.143E-12	2.644E-12
SE	1.342E-10	7.084E-11	4.538E-11	2.428E-11	1.549E-11	1.137E-11	8.738E-12	6.935E-12	5.639E-12	4.673E-12	3.932E-12
SSE	1.603E-10	8.429E-11	5.374E-11	2.844E-11	1.799E-11	1.295E-11	9.824E-12	7.727E-12	6.244E-12	5.151E-12	4.322E-12

Note: Directions are True North.

BASIS: ESBWR COLA

NAPS COL 2.0-11-A

Table 2.3-214 Long-Term D/Q (1/m^2) for Routine Releases at Distances Between 0.25 to 50 Miles

1USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE: 7/ 8/2013

0XOQDOQ - North Anna COL (1996-98 Met Data)

EXIT RW - MIXED MODE RELEASE - NO PURGE RELEASES

******************** RELATIVE DEPOSITION PER UNIT AREA (M**-2) AT FIXED POINTS BY DOWNWIND SECTORS ********************

DIRECTION FROM SITE	DISTANCES IN MILES 0.25	0.50	0.75	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
S	1.172E-08	6.975E-09	4.377E-09	2.934E-09	1.648E-09	1.054E-09	7.354E-10	5.460E-10	4.241E-10	3.410E-10	2.822E-10
SSW	5.184E-09	3.567E-09	2.408E-09	1.695E-09	9.932E-10	6.468E-10	4.568E-10	3.426E-10	2.685E-10	2.177E-10	1.816E-10
SW	3.859E-09	2.678E-09	1.836E-09	1.310E-09	7.749E-10	5.077E-10	3.603E-10	2.715E-10	2.138E-10	1.743E-10	1.462E-10
WSW	3.474E-09	2.340E-09	1.573E-09	1.117E-09	6.597E-10	4.337E-10	3.089E-10	2.333E-10	1.841E-10	1.503E-10	1.262E-10
W	3.941E-09	2.710E-09	1.811E-09	1.279E-09	7.489E-10	4.913E-10	3.498E-10	2.645E-10	2.093E-10	1.716E-10	1.447E-10
WNW	4.141E-09	2.574E-09	1.635E-09	1.130E-09	6.451E-10	4.196E-10	2.981E-10	2.261E-10	1.801E-10	1.492E-10	1.275E-10
NW	2.064E-09	1.495E-09	1.033E-09	7.547E-10	4.519E-10	2.994E-10	2.161E-10	1.669E-10	1.361E-10	1.159E-10	1.020E-10
NNW	1.357E-09	9.088E-10	6.017E-10	4.378E-10	2.611E-10	1.755E-10	1.288E-10	1.016E-10	8.484E-11	7.410E-11	6.698E-11
N	3.994E-09	2.485E-09	1.596E-09	1.144E-09	6.770E-10	4.536E-10	3.329E-10	2.628E-10	2.200E-10	1.927E-10	1.748E-10
NNE	9.991E-09	5.402E-09	3.288E-09	2.232E-09	1.265E-09	8.237E-10	5.897E-10	4.537E-10	3.695E-10	3.148E-10	2.779E-10
NE	8.000E-09	4.121E-09	2.533E-09	1.723E-09	9.798E-10	6.387E-10	4.578E-10	3.529E-10	2.883E-10	2.468E-10	2.189E-10
ENE	4.814E-09	2.449E-09	1.431E-09	9.371E-10	5.162E-10	3.326E-10	2.371E-10	1.826E-10	1.494E-10	1.285E-10	1.147E-10
E	5.117E-09	2.249E-09	1.268E-09	8.266E-10	4.525E-10	2.956E-10	2.167E-10	1.743E-10	1.511E-10	1.385E-10	1.319E-10
ESE	7.845E-09	3.529E-09	1.999E-09	1.291E-09	6.985E-10	4.504E-10	3.254E-10	2.572E-10	2.188E-10	1.968E-10	1.841E-10
SE	1.135E-08	5.121E-09	2.911E-09	1.886E-09	1.020E-09	6.534E-10	4.626E-10	3.524E-10	2.840E-10	2.395E-10	2.092E-10
SSE	1.148E-08	5.829E-09	3.488E-09	2.300E-09	1.266E-09	8.080E-10	5.654E-10	4.222E-10	3.306E-10	2.687E-10	2.251E-10

0DIRECTION FROM SITE	DISTANCES IN MILES 5.00	7.50	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00
S	2.396E-10	1.284E-10	8.300E-11	4.427E-11	2.775E-11	1.894E-11	1.379E-11	1.051E-11	8.292E-12	6.726E-12	5.568E-12
SSW	1.553E-10	8.560E-11	5.614E-11	3.031E-11	1.898E-11	1.286E-11	9.295E-12	7.030E-12	5.512E-12	4.446E-12	3.663E-12
SW	1.257E-10	7.071E-11	4.701E-11	2.572E-11	1.616E-11	1.095E-11	7.899E-12	5.963E-12	4.667E-12	3.758E-12	3.092E-12
WSW	1.085E-10	6.124E-11	4.084E-11	2.247E-11	1.417E-11	9.630E-12	6.975E-12	5.281E-12	4.146E-12	3.345E-12	2.757E-12
W	1.252E-10	7.237E-11	4.902E-11	2.739E-11	1.733E-11	1.178E-11	8.527E-12	6.446E-12	5.054E-12	4.072E-12	3.350E-12
WNW	1.118E-10	6.785E-11	4.745E-11	2.742E-11	1.757E-11	1.202E-11	8.732E-12	6.616E-12	5.200E-12	4.195E-12	3.452E-12
NW	9.216E-11	6.177E-11	4.540E-11	2.726E-11	1.751E-11	1.180E-11	8.435E-12	6.291E-12	4.876E-12	3.886E-12	3.165E-12
NNW	6.207E-11	4.498E-11	3.436E-11	2.128E-11	1.377E-11	9.279E-12	6.624E-12	4.927E-12	3.810E-12	3.029E-12	2.461E-12
N	1.626E-10	1.191E-10	9.150E-11	5.691E-11	3.686E-11	2.481E-11	1.770E-11	1.316E-11	1.017E-11	8.077E-12	6.559E-12
NNE	2.522E-10	1.717E-10	1.277E-10	7.758E-11	5.010E-11	3.385E-11	2.427E-11	1.814E-11	1.408E-11	1.124E-11	9.171E-12
NE	1.998E-10	1.385E-10	1.038E-10	6.326E-11	4.078E-11	2.743E-11	1.956E-11	1.455E-11	1.124E-11	8.937E-12	7.266E-12
ENE	1.054E-10	7.468E-11	5.666E-11	3.493E-11	2.259E-11	1.521E-11	1.086E-11	8.081E-12	6.245E-12	4.969E-12	4.040E-12
E	1.285E-10	1.063E-10	8.588E-11	5.533E-11	3.603E-11	2.409E-11	1.704E-11	1.256E-11	9.615E-12	7.584E-12	6.119E-12
ESE	1.768E-10	1.412E-10	1.126E-10	7.191E-11	4.675E-11	3.130E-11	2.217E-11	1.637E-11	1.255E-11	9.911E-12	8.008E-12
SE	1.880E-10	1.244E-10	9.149E-11	5.523E-11	3.579E-11	2.438E-11	1.761E-11	1.327E-11	1.036E-11	8.317E-12	6.817E-12
SSE	1.936E-10	1.094E-10	7.349E-11	4.094E-11	2.611E-11	1.796E-11	1.314E-11	1.005E-11	7.934E-12	6.443E-12	5.334E-12

Note: Directions are True North.

NAPS COL 2.0-11-A

Table 2.3-215 Long-Term D/Q ($1/m^2$) for Routine Releases Along Various Distance Segments

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1USNRC COMPUTER CODE - XOQDOQ,  VERSION 2.0          RUN DATE:  7/ 8/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
 EXIT RB - MIXED MODE RELEASE - NO PURGE RELEASES
0************************     RELATIVE DEPOSITION PER UNIT AREA (M**-2) BY DOWNWIND SECTORS     ************************
                                            SEGMENT BOUNDARIES IN MILES
```

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	1.550E-09	9.444E-10	5.535E-10	3.566E-10	2.432E-10	1.107E-10	3.644E-11	1.566E-11	9.071E-12	5.982E-12
SSW	7.782E-10	5.509E-10	3.404E-10	2.226E-10	1.524E-10	6.937E-11	2.277E-11	9.689E-12	5.560E-12	3.650E-12
SW	6.166E-10	4.363E-10	2.701E-10	1.769E-10	1.211E-10	5.522E-11	1.816E-11	7.746E-12	4.452E-12	2.924E-12
WSW	5.929E-10	3.926E-10	2.370E-10	1.543E-10	1.056E-10	4.819E-11	1.592E-11	6.845E-12	3.961E-12	2.605E-12
W	7.223E-10	4.556E-10	2.699E-10	1.748E-10	1.195E-10	5.458E-11	1.807E-11	7.810E-12	4.548E-12	3.005E-12
WNW	8.439E-10	4.369E-10	2.372E-10	1.502E-10	1.023E-10	4.702E-11	1.583E-11	7.071E-12	4.246E-12	2.852E-12
NW	5.030E-10	2.915E-10	1.670E-10	1.074E-10	7.342E-11	3.370E-11	1.128E-11	4.968E-12	2.944E-12	1.964E-12
NNW	3.808E-10	1.950E-10	1.051E-10	6.651E-11	4.534E-11	2.090E-11	7.073E-12	3.183E-12	1.925E-12	1.299E-12
N	1.013E-09	5.091E-10	2.718E-10	1.715E-10	1.168E-10	5.386E-11	1.825E-11	8.236E-12	4.995E-12	3.375E-12
NNE	1.772E-09	8.836E-10	4.705E-10	2.961E-10	2.014E-10	9.256E-11	3.122E-11	1.401E-11	8.472E-12	5.728E-12
NE	1.254E-09	6.591E-10	3.610E-10	2.286E-10	1.555E-10	7.114E-11	2.375E-11	1.051E-11	6.294E-12	4.260E-12
ENE	7.199E-10	3.522E-10	1.865E-10	1.171E-10	7.958E-11	3.654E-11	1.233E-11	5.535E-12	3.351E-12	2.273E-12
E	7.846E-10	3.505E-10	1.754E-10	1.083E-10	7.337E-11	3.383E-11	1.154E-11	5.314E-12	3.311E-12	2.297E-12
ESE	1.164E-09	5.235E-10	2.624E-10	1.616E-10	1.093E-10	5.014E-11	1.695E-11	7.718E-12	4.759E-12	3.278E-12
SE	1.741E-09	7.741E-10	3.872E-10	2.383E-10	1.611E-10	7.394E-11	2.504E-11	1.138E-11	6.945E-12	4.708E-12
SSE	1.682E-09	8.446E-10	4.527E-10	2.844E-10	1.930E-10	8.811E-11	2.939E-11	1.299E-11	7.722E-12	5.157E-12

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0VENT AND BUILDING PARAMETERS:
     RELEASE HEIGHT  (METERS)   52.77                  REP. WIND HEIGHT       (METERS)       10.0
     DIAMETER        (METERS)    2.40                  BUILDING HEIGHT        (METERS)       46.1
     EXIT VELOCITY   (METERS)   17.78                  BLDG.MIN.CRS.SEC.AREA  (SQ.METERS)  3098.0
                                                       HEAT EMISSION RATE     (CAL/SEC)       0.0
0AT THE RELEASE HEIGHT:                          /  AT THE MEASURED WIND HEIGHT ( 10.0 METERS):
 VENT RELEASE MODE   WIND SPEED (METERS/SEC)     /  VENT RELEASE MODE   WIND SPEED (METERS/SEC)       WIND SPEED (METERS/SEC)
                                                 /                      STABLE CONDITIONS             UNSTABLE/NEUTRAL CONDITIONS
     ELEVATED        LESS THAN  3.556            /      ELEVATED        LESS THAN  3.556              LESS THAN  3.556
     MIXED           BETWEEN    3.556 AND 17.780 /      MIXED           BETWEEN    3.556 AND 17.780   BETWEEN    3.556 AND 17.780
     GROUND LEVEL    ABOVE     17.780            /      GROUND LEVEL    ABOVE     17.780              ABOVE     17.780
```

Note: Directions are True North.

NAPS COL 2.0-11-A

Table 2.3-215 Long-Term D/Q (1/m^2) for Routine Releases Along Various Distance Segments

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1USNRC COMPUTER CODE - XOQDOQ,  VERSION 2.0          RUN DATE:  7/ 8/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
 EXIT TB - MIXED MODE RELEASE - NO PURGE RELEASES
0************************     RELATIVE DEPOSITION PER UNIT AREA (M**-2) BY DOWNWIND SECTORS     ************************
                                              SEGMENT BOUNDARIES IN MILES
```

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	1.458E-09	9.148E-10	5.442E-10	3.530E-10	2.413E-10	1.102E-10	3.646E-11	1.570E-11	9.087E-12	5.969E-12
SSW	7.483E-10	5.399E-10	3.371E-10	2.214E-10	1.517E-10	6.919E-11	2.278E-11	9.696E-12	5.550E-12	3.626E-12
SW	6.030E-10	4.316E-10	2.687E-10	1.763E-10	1.209E-10	5.514E-11	1.817E-11	7.747E-12	4.442E-12	2.904E-12
WSW	5.796E-10	3.876E-10	2.355E-10	1.537E-10	1.053E-10	4.811E-11	1.592E-11	6.850E-12	3.961E-12	2.602E-12
W	7.041E-10	4.487E-10	2.679E-10	1.740E-10	1.191E-10	5.447E-11	1.807E-11	7.814E-12	4.541E-12	2.990E-12
WNW	8.343E-10	4.338E-10	2.362E-10	1.498E-10	1.021E-10	4.697E-11	1.583E-11	7.067E-12	4.229E-12	2.825E-12
NW	5.030E-10	2.915E-10	1.670E-10	1.074E-10	7.342E-11	3.370E-11	1.128E-11	4.963E-12	2.931E-12	1.945E-12
NNW	3.808E-10	1.950E-10	1.051E-10	6.651E-11	4.534E-11	2.090E-11	7.072E-12	3.178E-12	1.913E-12	1.282E-12
N	1.012E-09	5.088E-10	2.717E-10	1.715E-10	1.168E-10	5.385E-11	1.825E-11	8.222E-12	4.962E-12	3.327E-12
NNE	1.742E-09	8.741E-10	4.675E-10	2.950E-10	2.008E-10	9.241E-11	3.122E-11	1.400E-11	8.410E-12	5.627E-12
NE	1.205E-09	6.435E-10	3.562E-10	2.267E-10	1.545E-10	7.087E-11	2.375E-11	1.049E-11	6.219E-12	4.134E-12
ENE	7.080E-10	3.494E-10	1.855E-10	1.167E-10	7.936E-11	3.650E-11	1.233E-11	5.525E-12	3.320E-12	2.221E-12
E	7.737E-10	3.479E-10	1.744E-10	1.079E-10	7.317E-11	3.379E-11	1.154E-11	5.285E-12	3.236E-12	2.184E-12
ESE	1.113E-09	5.075E-10	2.573E-10	1.596E-10	1.082E-10	4.987E-11	1.696E-11	7.704E-12	4.685E-12	3.152E-12
SE	1.664E-09	7.533E-10	3.801E-10	2.355E-10	1.596E-10	7.360E-11	2.506E-11	1.142E-11	6.957E-12	4.685E-12
SSE	1.581E-09	8.143E-10	4.429E-10	2.805E-10	1.909E-10	8.761E-11	2.942E-11	1.304E-11	7.761E-12	5.168E-12

```
0VENT AND BUILDING PARAMETERS:
     RELEASE HEIGHT  (METERS)   71.30                  REP. WIND HEIGHT       (METERS)       10.0
     DIAMETER        (METERS)    1.95                  BUILDING HEIGHT        (METERS)       46.1
     EXIT VELOCITY   (METERS)   17.78                  BLDG.MIN.CRS.SEC.AREA  (SQ.METERS)  3098.0
                                                       HEAT EMISSION RATE     (CAL/SEC)       0.0
0AT THE RELEASE HEIGHT:                          /  AT THE MEASURED WIND HEIGHT ( 10.0 METERS):
 VENT RELEASE MODE   WIND SPEED  (METERS/SEC)    /  VENT RELEASE MODE   WIND SPEED (METERS/SEC)       WIND SPEED  (METERS/SEC)
                                                 /                      STABLE CONDITIONS             UNSTABLE/NEUTRAL CONDITIONS
     ELEVATED        LESS THAN  3.556            /      ELEVATED        LESS THAN  3.556              LESS THAN  3.556
     MIXED           BETWEEN    3.556 AND 17.780 /      MIXED           BETWEEN    3.556 AND 17.780   BETWEEN    3.556 AND 17.780
     GROUND LEVEL    ABOVE     17.780            /      GROUND LEVEL    ABOVE     17.780              ABOVE     17.780
```

Note: Directions are True North.

NAPS COL 2.0-11-A

Table 2.3-215 Long-Term D/Q (1/m^2) for Routine Releases Along Various Distance Segments

1USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE: 7/ 8/2013

0XOQDOQ - North Anna COL (1996-98 Met Data)

EXIT RW - MIXED MODE RELEASE - NO PURGE RELEASES

0*********************** RELATIVE DEPOSITION PER UNIT AREA (M**-2) BY DOWNWIND SECTORS ***********************

SEGMENT BOUNDARIES IN MILES

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	4.313E-09	1.670E-09	7.446E-10	4.273E-10	2.839E-10	1.330E-10	4.553E-11	1.923E-11	1.060E-11	6.761E-12
SSW	2.348E-09	9.952E-10	4.618E-10	2.703E-10	1.826E-10	8.801E-11	3.102E-11	1.307E-11	7.099E-12	4.472E-12
SW	1.789E-09	7.750E-10	3.641E-10	2.152E-10	1.469E-10	7.239E-11	2.620E-11	1.112E-11	6.022E-12	3.781E-12
WSW	1.541E-09	6.610E-10	3.120E-10	1.853E-10	1.268E-10	6.268E-11	2.286E-11	9.778E-12	5.333E-12	3.365E-12
W	1.774E-09	7.521E-10	3.534E-10	2.107E-10	1.455E-10	7.374E-11	2.773E-11	1.196E-11	6.511E-12	4.096E-12
WNW	1.619E-09	6.525E-10	3.017E-10	1.815E-10	1.281E-10	6.855E-11	2.750E-11	1.219E-11	6.681E-12	4.217E-12
NW	1.012E-09	4.514E-10	2.186E-10	1.372E-10	1.025E-10	6.125E-11	2.696E-11	1.198E-11	6.365E-12	3.912E-12
NNW	5.971E-10	2.623E-10	1.304E-10	8.554E-11	6.727E-11	4.406E-11	2.085E-11	9.415E-12	4.986E-12	3.050E-12
N	1.593E-09	6.816E-10	3.371E-10	2.218E-10	1.756E-10	1.165E-10	5.569E-11	2.518E-11	1.332E-11	8.134E-12
NNE	3.289E-09	1.284E-09	5.977E-10	3.727E-10	2.793E-10	1.701E-10	7.651E-11	3.435E-11	1.835E-11	1.132E-11
NE	2.526E-09	9.934E-10	4.641E-10	2.909E-10	2.201E-10	1.367E-10	6.227E-11	2.784E-11	1.472E-11	9.000E-12
ENE	1.438E-09	5.281E-10	2.407E-10	1.509E-10	1.153E-10	7.349E-11	3.427E-11	1.544E-11	8.174E-12	5.003E-12
E	1.290E-09	4.659E-10	2.208E-10	1.529E-10	1.326E-10	1.022E-10	5.354E-11	2.445E-11	1.272E-11	7.643E-12
ESE	2.024E-09	7.198E-10	3.315E-10	2.214E-10	1.851E-10	1.364E-10	6.977E-11	3.177E-11	1.657E-11	9.987E-12
SE	2.947E-09	1.049E-09	4.694E-10	2.866E-10	2.103E-10	1.239E-10	5.465E-11	2.472E-11	1.340E-11	8.366E-12
SSE	3.480E-09	1.292E-09	5.728E-10	3.332E-10	2.264E-10	1.122E-10	4.158E-11	1.821E-11	1.013E-11	6.474E-12

0VENT AND BUILDING PARAMETERS:

RELEASE HEIGHT	(METERS)	18.15	REP. WIND HEIGHT	(METERS)	10.0
DIAMETER	(METERS)	1.34	BUILDING HEIGHT	(METERS)	12.1
EXIT VELOCITY	(METERS)	17.78	BLDG.MIN.CRS.SEC.AREA	(SQ.METERS)	3098.0
			HEAT EMISSION RATE	(CAL/SEC)	0.0

0AT THE RELEASE HEIGHT: / AT THE MEASURED WIND HEIGHT (10.0 METERS):

VENT RELEASE MODE	WIND SPEED (METERS/SEC)	/	VENT RELEASE MODE	WIND SPEED (METERS/SEC) STABLE CONDITIONS	WIND SPEED (METERS/SEC) UNSTABLE/NEUTRAL CONDITIONS
ELEVATED	LESS THAN 3.556	/	ELEVATED	LESS THAN 3.556	LESS THAN 3.556
MIXED	BETWEEN 3.556 AND 17.780	/	MIXED	BETWEEN 3.556 AND 17.780	BETWEEN 3.556 AND 17.780
GROUND LEVEL	ABOVE 17.780	/	GROUND LEVEL	ABOVE 17.780	ABOVE 17.780

Note: Directions are True North.

BASIS: ESBWR COLA

NAPS COL 2.0-11-A

Table 2.3-216 Cooling Tower Release - No Decay Undepleted χ/Qs at Various Distances

1USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE: 7/16/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
EXIT TWR - GROUND LEVEL RELEASE - NO PURGE RELEASES
NO DECAY, UNDEPLETED

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	0.250	0.500	0.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	1.356E-05	3.928E-06	1.928E-06	1.186E-06	6.109E-07	3.861E-07	2.719E-07	2.048E-07	1.615E-07	1.316E-07	1.100E-07
SSW	1.072E-05	3.119E-06	1.534E-06	9.444E-07	4.874E-07	3.084E-07	2.175E-07	1.640E-07	1.294E-07	1.056E-07	8.827E-08
SW	9.638E-06	2.807E-06	1.381E-06	8.500E-07	4.390E-07	2.781E-07	1.963E-07	1.481E-07	1.170E-07	9.552E-08	7.994E-08
WSW	9.049E-06	2.632E-06	1.293E-06	7.957E-07	4.111E-07	2.606E-07	1.841E-07	1.391E-07	1.099E-07	8.978E-08	7.518E-08
W	1.131E-05	3.284E-06	1.608E-06	9.898E-07	5.127E-07	3.260E-07	2.310E-07	1.749E-07	1.386E-07	1.134E-07	9.519E-08
WNW	9.801E-06	2.841E-06	1.391E-06	8.537E-07	4.413E-07	2.803E-07	1.984E-07	1.502E-07	1.190E-07	9.738E-08	8.172E-08
NW	1.001E-05	2.927E-06	1.439E-06	8.852E-07	4.593E-07	2.927E-07	2.078E-07	1.576E-07	1.251E-07	1.026E-07	8.620E-08
NNW	8.566E-06	2.510E-06	1.236E-06	7.606E-07	3.954E-07	2.524E-07	1.794E-07	1.363E-07	1.083E-07	8.887E-08	7.474E-08
N	2.178E-05	6.394E-06	3.154E-06	1.940E-06	1.007E-06	6.422E-07	4.561E-07	3.462E-07	2.749E-07	2.254E-07	1.895E-07
NNE	2.770E-05	8.114E-06	3.995E-06	2.457E-06	1.276E-06	8.135E-07	5.778E-07	4.386E-07	3.483E-07	2.857E-07	2.401E-07
NE	2.271E-05	6.664E-06	3.282E-06	2.020E-06	1.050E-06	6.701E-07	4.763E-07	3.618E-07	2.874E-07	2.358E-07	1.983E-07
ENE	1.437E-05	4.211E-06	2.067E-06	1.274E-06	6.647E-07	4.261E-07	3.040E-07	2.317E-07	1.846E-07	1.519E-07	1.281E-07
E	2.851E-05	8.354E-06	4.085E-06	2.521E-06	1.323E-06	8.528E-07	6.116E-07	4.683E-07	3.746E-07	3.094E-07	2.617E-07
ESE	4.394E-05	1.279E-05	6.200E-06	3.832E-06	2.022E-06	1.310E-06	9.443E-07	7.261E-07	5.831E-07	4.832E-07	4.100E-07
SE	3.069E-05	8.874E-06	4.292E-06	2.651E-06	1.396E-06	9.027E-07	6.494E-07	4.986E-07	3.999E-07	3.311E-07	2.807E-07
SSE	1.522E-05	4.392E-06	2.139E-06	1.316E-06	6.834E-07	4.359E-07	3.097E-07	2.352E-07	1.868E-07	1.533E-07	1.289E-07

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	9.375E-08	5.103E-08	3.332E-08	1.841E-08	1.216E-08	8.834E-09	6.815E-09	5.478E-09	4.538E-09	3.845E-09	3.318E-09
SSW	7.529E-08	4.107E-08	2.685E-08	1.486E-08	9.810E-09	7.126E-09	5.497E-09	4.417E-09	3.658E-09	3.099E-09	2.673E-09
SW	6.823E-08	3.733E-08	2.446E-08	1.358E-08	8.993E-09	6.547E-09	5.058E-09	4.071E-09	3.376E-09	2.863E-09	2.472E-09
WSW	6.421E-08	3.523E-08	2.314E-08	1.289E-08	8.560E-09	6.247E-09	4.836E-09	3.900E-09	3.239E-09	2.751E-09	2.378E-09
W	8.145E-08	4.505E-08	2.977E-08	1.675E-08	1.120E-08	8.224E-09	6.399E-09	5.181E-09	4.319E-09	3.681E-09	3.192E-09
WNW	6.993E-08	3.872E-08	2.561E-08	1.444E-08	9.687E-09	7.127E-09	5.556E-09	4.506E-09	3.761E-09	3.209E-09	2.785E-09
NW	7.385E-08	4.103E-08	2.720E-08	1.537E-08	1.031E-08	7.585E-09	5.911E-09	4.792E-09	3.999E-09	3.410E-09	2.959E-09
NNW	6.408E-08	3.570E-08	2.372E-08	1.343E-08	9.014E-09	6.632E-09	5.169E-09	4.191E-09	3.497E-09	2.982E-09	2.587E-09
N	1.624E-07	9.026E-08	5.985E-08	3.379E-08	2.264E-08	1.663E-08	1.295E-08	1.048E-08	8.738E-09	7.445E-09	6.453E-09
NNE	2.058E-07	1.145E-07	7.596E-08	4.294E-08	2.880E-08	2.117E-08	1.649E-08	1.337E-08	1.115E-08	9.502E-09	8.241E-09
NE	1.700E-07	9.468E-08	6.287E-08	3.558E-08	2.388E-08	1.757E-08	1.369E-08	1.110E-08	9.260E-09	7.897E-09	6.851E-09
ENE	1.101E-07	6.187E-08	4.138E-08	2.365E-08	1.599E-08	1.183E-08	9.261E-09	7.538E-09	6.311E-09	5.398E-09	4.696E-09
E	2.255E-07	1.283E-07	8.651E-08	5.006E-08	3.414E-08	2.543E-08	2.002E-08	1.638E-08	1.377E-08	1.182E-08	1.032E-08
ESE	3.544E-07	2.039E-07	1.388E-07	8.136E-08	5.602E-08	4.206E-08	3.333E-08	2.741E-08	2.316E-08	1.997E-08	1.749E-08
SE	2.424E-07	1.391E-07	9.455E-08	5.536E-08	3.810E-08	2.859E-08	2.266E-08	1.863E-08	1.574E-08	1.357E-08	1.190E-08
SSE	1.106E-07	6.173E-08	4.110E-08	2.339E-08	1.580E-08	1.168E-08	9.150E-09	7.450E-09	6.241E-09	5.341E-09	4.650E-09

0VENT AND BUILDING PARAMETERS:

RELEASE HEIGHT (METERS) 0.00 REP. WIND HEIGHT (METERS) 10.0
DIAMETER (METERS) 0.00 BUILDING HEIGHT (METERS) 0.0
EXIT VELOCITY (METERS) 0.00 BLDG.MIN.CRS.SEC.AREA (SQ.METERS) 0.0
HEAT EMISSION RATE (CAL/SEC) 0.0

0ALL GROUND LEVEL RELEASES.

Note: Directions are True North.

NAPS COL 2.0-11-A

Table 2.3-217 Cooling Tower Release - No Decay Undepleted χ/Qs along Various Segments

```
1USNRC COMPUTER CODE - XOQDOQ,  VERSION 2.0          RUN DATE:  7/16/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
 EXIT TWR - GROUND LEVEL RELEASE - NO PURGE RELEASES
 NO DECAY,  UNDEPLETED
0CHI/Q (SEC/METER CUBED) FOR EACH SEGMENT
                                             SEGMENT BOUNDARIES IN MILES FROM THE SITE
```

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	2.043E-06	6.387E-07	2.755E-07	1.625E-07	1.104E-07	5.265E-08	1.895E-08	8.913E-09	5.502E-09	3.855E-09
SSW	1.624E-06	5.094E-07	2.203E-07	1.302E-07	8.859E-08	4.235E-08	1.528E-08	7.190E-09	4.436E-09	3.107E-09
SW	1.462E-06	4.588E-07	1.988E-07	1.177E-07	8.022E-08	3.848E-08	1.396E-08	6.604E-09	4.088E-09	2.870E-09
WSW	1.370E-06	4.297E-07	1.865E-07	1.106E-07	7.544E-08	3.629E-08	1.324E-08	6.300E-09	3.915E-09	2.757E-09
W	1.706E-06	5.358E-07	2.339E-07	1.394E-07	9.550E-08	4.635E-08	1.718E-08	8.288E-09	5.201E-09	3.689E-09
WNW	1.474E-06	4.614E-07	2.010E-07	1.197E-07	8.199E-08	3.983E-08	1.481E-08	7.181E-09	4.522E-09	3.215E-09
NW	1.523E-06	4.799E-07	2.104E-07	1.258E-07	8.648E-08	4.218E-08	1.575E-08	7.643E-09	4.810E-09	3.417E-09
NNW	1.308E-06	4.130E-07	1.816E-07	1.089E-07	7.498E-08	3.668E-08	1.375E-08	6.682E-09	4.206E-09	2.988E-09
N	3.334E-06	1.052E-06	4.618E-07	2.764E-07	1.901E-07	9.277E-08	3.463E-08	1.676E-08	1.052E-08	7.461E-09
NNE	4.227E-06	1.333E-06	5.850E-07	3.502E-07	2.409E-07	1.177E-07	4.399E-08	2.133E-08	1.341E-08	9.522E-09
NE	3.473E-06	1.097E-06	4.822E-07	2.890E-07	1.990E-07	9.728E-08	3.644E-08	1.770E-08	1.114E-08	7.914E-09
ENE	2.191E-06	6.940E-07	3.076E-07	1.856E-07	1.285E-07	6.347E-08	2.418E-08	1.191E-08	7.563E-09	5.409E-09
E	4.338E-06	1.380E-06	6.186E-07	3.765E-07	2.624E-07	1.313E-07	5.108E-08	2.559E-08	1.642E-08	1.184E-08
ESE	6.611E-06	2.108E-06	9.547E-07	5.859E-07	4.111E-07	2.084E-07	8.285E-08	4.229E-08	2.748E-08	2.000E-08
SE	4.581E-06	1.456E-06	6.566E-07	4.019E-07	2.814E-07	1.423E-07	5.639E-08	2.875E-08	1.868E-08	1.360E-08
SSE	2.274E-06	7.140E-07	3.135E-07	1.879E-07	1.294E-07	6.342E-08	2.395E-08	1.177E-08	7.475E-09	5.352E-09

Note: Directions are True North.

NAPS COL 2.0-11-A

Table 2.3-218 Cooling Tower Release - 2.26 Day Decay Undepleted χ/Qs at Various Distances

1USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE: 7/16/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
EXIT TWR - GROUND LEVEL RELEASE - NO PURGE RELEASES
2.260 DAY DECAY, UNDEPLETED

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	0.250	0.500	0.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	1.354E-05	3.920E-06	1.922E-06	1.181E-06	6.070E-07	3.828E-07	2.690E-07	2.022E-07	1.591E-07	1.293E-07	1.079E-07
SSW	1.071E-05	3.111E-06	1.529E-06	9.401E-07	4.840E-07	3.056E-07	2.150E-07	1.617E-07	1.273E-07	1.036E-07	8.644E-08
SW	9.627E-06	2.800E-06	1.376E-06	8.459E-07	4.358E-07	2.754E-07	1.939E-07	1.460E-07	1.150E-07	9.365E-08	7.819E-08
WSW	9.038E-06	2.625E-06	1.288E-06	7.916E-07	4.079E-07	2.580E-07	1.817E-07	1.369E-07	1.079E-07	8.792E-08	7.343E-08
W	1.130E-05	3.275E-06	1.602E-06	9.845E-07	5.087E-07	3.226E-07	2.279E-07	1.721E-07	1.360E-07	1.110E-07	9.290E-08
WNW	9.788E-06	2.834E-06	1.385E-06	8.494E-07	4.379E-07	2.774E-07	1.959E-07	1.479E-07	1.168E-07	9.538E-08	7.982E-08
NW	9.995E-06	2.919E-06	1.433E-06	8.807E-07	4.558E-07	2.897E-07	2.051E-07	1.552E-07	1.229E-07	1.005E-07	8.422E-08
NNW	8.554E-06	2.503E-06	1.231E-06	7.563E-07	3.920E-07	2.495E-07	1.769E-07	1.340E-07	1.061E-07	8.686E-08	7.284E-08
N	2.175E-05	6.376E-06	3.141E-06	1.929E-06	9.987E-07	6.351E-07	4.498E-07	3.405E-07	2.695E-07	2.204E-07	1.848E-07
NNE	2.766E-05	8.092E-06	3.979E-06	2.444E-06	1.265E-06	8.048E-07	5.701E-07	4.316E-07	3.418E-07	2.796E-07	2.344E-07
NE	2.268E-05	6.646E-06	3.269E-06	2.009E-06	1.042E-06	6.630E-07	4.700E-07	3.561E-07	2.821E-07	2.309E-07	1.936E-07
ENE	1.435E-05	4.199E-06	2.058E-06	1.266E-06	6.589E-07	4.211E-07	2.996E-07	2.277E-07	1.809E-07	1.484E-07	1.247E-07
E	2.847E-05	8.328E-06	4.066E-06	2.505E-06	1.311E-06	8.421E-07	6.021E-07	4.595E-07	3.665E-07	3.017E-07	2.544E-07
ESE	4.386E-05	1.274E-05	6.169E-06	3.807E-06	2.002E-06	1.293E-06	9.289E-07	7.118E-07	5.698E-07	4.706E-07	3.980E-07
SE	3.064E-05	8.845E-06	4.271E-06	2.633E-06	1.382E-06	8.910E-07	6.389E-07	4.889E-07	3.908E-07	3.225E-07	2.725E-07
SSE	1.520E-05	4.380E-06	2.131E-06	1.309E-06	6.779E-07	4.312E-07	3.055E-07	2.313E-07	1.833E-07	1.500E-07	1.258E-07

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	9.173E-08	4.938E-08	3.188E-08	1.722E-08	1.112E-08	7.895E-09	5.954E-09	4.679E-09	3.790E-09	3.140E-09	2.649E-09
SSW	7.355E-08	3.964E-08	2.561E-08	1.383E-08	8.917E-09	6.323E-09	4.761E-09	3.736E-09	3.020E-09	2.499E-09	2.105E-09
SW	6.657E-08	3.596E-08	2.327E-08	1.259E-08	8.130E-09	5.770E-09	4.346E-09	3.411E-09	2.758E-09	2.281E-09	1.921E-09
WSW	6.254E-08	3.385E-08	2.194E-08	1.190E-08	7.690E-09	5.463E-09	4.117E-09	3.232E-09	2.614E-09	2.162E-09	1.820E-09
W	7.927E-08	4.324E-08	2.818E-08	1.542E-08	1.003E-08	7.162E-09	5.420E-09	4.270E-09	3.463E-09	2.871E-09	2.423E-09
WNW	6.813E-08	3.722E-08	2.429E-08	1.334E-08	8.713E-09	6.243E-09	4.739E-09	3.744E-09	3.044E-09	2.531E-09	2.141E-09
NW	7.197E-08	3.946E-08	2.583E-08	1.421E-08	9.290E-09	6.658E-09	5.055E-09	3.994E-09	3.248E-09	2.700E-09	2.284E-09
NNW	6.227E-08	3.420E-08	2.239E-08	1.232E-08	8.038E-09	5.749E-09	4.356E-09	3.434E-09	2.786E-09	2.311E-09	1.950E-09
N	1.579E-07	8.654E-08	5.658E-08	3.106E-08	2.024E-08	1.446E-08	1.095E-08	8.628E-09	6.998E-09	5.803E-09	4.896E-09
NNE	2.003E-07	1.099E-07	7.195E-08	3.958E-08	2.584E-08	1.849E-08	1.402E-08	1.107E-08	8.989E-09	7.464E-09	6.306E-09
NE	1.655E-07	9.096E-08	5.959E-08	3.283E-08	2.146E-08	1.537E-08	1.167E-08	9.215E-09	7.491E-09	6.225E-09	5.263E-09
ENE	1.069E-07	5.919E-08	3.900E-08	2.164E-08	1.420E-08	1.020E-08	7.760E-09	6.135E-09	4.990E-09	4.148E-09	3.507E-09
E	2.185E-07	1.223E-07	8.122E-08	4.555E-08	3.011E-08	2.175E-08	1.660E-08	1.317E-08	1.074E-08	8.946E-09	7.577E-09
ESE	3.428E-07	1.940E-07	1.299E-07	7.367E-08	4.910E-08	3.568E-08	2.738E-08	2.181E-08	1.785E-08	1.491E-08	1.266E-08
SE	2.345E-07	1.324E-07	8.849E-08	5.012E-08	3.338E-08	2.425E-08	1.860E-08	1.481E-08	1.212E-08	1.012E-08	8.597E-09
SSE	1.076E-07	5.919E-08	3.885E-08	2.148E-08	1.410E-08	1.013E-08	7.711E-09	6.103E-09	4.970E-09	4.136E-09	3.501E-09

0VENT AND BUILDING PARAMETERS:

RELEASE HEIGHT	(METERS)	0.00	REP. WIND HEIGHT	(METERS)	10.0
DIAMETER	(METERS)	0.00	BUILDING HEIGHT	(METERS)	0.0
EXIT VELOCITY	(METERS)	0.00	BLDG.MIN.CRS.SEC.AREA	(SQ.METERS)	0.0
			HEAT EMISSION RATE	(CAL/SEC)	0.0

0ALL GROUND LEVEL RELEASES.

Note: Directions are True North.

NAPS COL 2.0-11-A

Table 2.3-219 Cooling Tower Release - 2.26 Day Decay Undepleted χ/Qs along Various Segments

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1USNRC COMPUTER CODE - XOQDOQ,  VERSION 2.0          RUN DATE:  7/16/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
 EXIT TWR - GROUND LEVEL RELEASE - NO PURGE RELEASES
   2.260 DAY DECAY,  UNDEPLETED
0CHI/Q (SEC/METER CUBED) FOR EACH SEGMENT
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DIRECTION FROM SITE	SEGMENT BOUNDARIES IN MILES FROM THE SITE .5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	2.037E-06	6.349E-07	2.726E-07	1.601E-07	1.083E-07	5.101E-08	1.776E-08	7.978E-09	4.705E-09	3.151E-09
SSW	1.619E-06	5.061E-07	2.179E-07	1.281E-07	8.675E-08	4.094E-08	1.427E-08	6.390E-09	3.756E-09	2.507E-09
SW	1.457E-06	4.556E-07	1.965E-07	1.157E-07	7.847E-08	3.712E-08	1.298E-08	5.830E-09	3.430E-09	2.289E-09
WSW	1.365E-06	4.265E-07	1.841E-07	1.086E-07	7.369E-08	3.493E-08	1.226E-08	5.519E-09	3.249E-09	2.169E-09
W	1.699E-06	5.317E-07	2.308E-07	1.368E-07	9.322E-08	4.455E-08	1.586E-08	7.230E-09	4.291E-09	2.881E-09
WNW	1.469E-06	4.580E-07	1.984E-07	1.175E-07	8.010E-08	3.834E-08	1.372E-08	6.300E-09	3.762E-09	2.538E-09
NW	1.518E-06	4.764E-07	2.077E-07	1.236E-07	8.450E-08	4.063E-08	1.461E-08	6.719E-09	4.013E-09	2.708E-09
NNW	1.303E-06	4.096E-07	1.791E-07	1.067E-07	7.308E-08	3.519E-08	1.266E-08	5.802E-09	3.450E-09	2.318E-09
N	3.321E-06	1.044E-06	4.555E-07	2.711E-07	1.854E-07	8.907E-08	3.192E-08	1.460E-08	8.671E-09	5.821E-09
NNE	4.211E-06	1.323E-06	5.773E-07	3.437E-07	2.351E-07	1.131E-07	4.066E-08	1.866E-08	1.112E-08	7.487E-09
NE	3.460E-06	1.088E-06	4.759E-07	2.837E-07	1.943E-07	9.359E-08	3.372E-08	1.551E-08	9.259E-09	6.243E-09
ENE	2.182E-06	6.882E-07	3.032E-07	1.819E-07	1.251E-07	6.081E-08	2.219E-08	1.029E-08	6.163E-09	4.160E-09
E	4.319E-06	1.368E-06	6.091E-07	3.684E-07	2.551E-07	1.254E-07	4.661E-08	2.192E-08	1.323E-08	8.971E-09
ESE	6.580E-06	2.088E-06	9.392E-07	5.726E-07	3.991E-07	1.986E-07	7.524E-08	3.594E-08	2.189E-08	1.495E-08
SE	4.560E-06	1.442E-06	6.461E-07	3.928E-07	2.732E-07	1.356E-07	5.120E-08	2.442E-08	1.487E-08	1.015E-08
SSE	2.265E-06	7.085E-07	3.094E-07	1.843E-07	1.262E-07	6.090E-08	2.206E-08	1.022E-08	6.131E-09	4.148E-09

Note: Directions are True North.

BASIS: ESBWR COLA

NAPS COL 2.0-11-A

Table 2.3-220 Cooling Tower Release - 8 Day Decay Depleted χ/Qs at Various Distances

1USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE: 7/16/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
EXIT TWR - GROUND LEVEL RELEASE - NO PURGE RELEASES
8.000 DAY DECAY, DEPLETED

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	0.250	0.500	0.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	1.283E-05	3.585E-06	1.717E-06	1.037E-06	5.179E-07	3.189E-07	2.196E-07	1.621E-07	1.255E-07	1.005E-07	8.270E-08
SSW	1.014E-05	2.846E-06	1.366E-06	8.256E-07	4.131E-07	2.547E-07	1.756E-07	1.297E-07	1.005E-07	8.060E-08	6.635E-08
SW	9.119E-06	2.562E-06	1.229E-06	7.430E-07	3.720E-07	2.296E-07	1.585E-07	1.172E-07	9.086E-08	7.292E-08	6.006E-08
WSW	8.561E-06	2.402E-06	1.151E-06	6.955E-07	3.484E-07	2.152E-07	1.486E-07	1.100E-07	8.532E-08	6.851E-08	5.647E-08
W	1.070E-05	2.996E-06	1.432E-06	8.651E-07	4.345E-07	2.692E-07	1.864E-07	1.383E-07	1.075E-07	8.654E-08	7.147E-08
WNW	9.272E-06	2.593E-06	1.238E-06	7.462E-07	3.739E-07	2.314E-07	1.601E-07	1.188E-07	9.236E-08	7.432E-08	6.137E-08
NW	9.468E-06	2.671E-06	1.281E-06	7.737E-07	3.892E-07	2.417E-07	1.677E-07	1.247E-07	9.713E-08	7.829E-08	6.475E-08
NNW	8.104E-06	2.291E-06	1.100E-06	6.647E-07	3.350E-07	2.083E-07	1.447E-07	1.077E-07	8.402E-08	6.778E-08	5.610E-08
N	2.060E-05	5.834E-06	2.807E-06	1.695E-06	8.533E-07	5.301E-07	3.680E-07	2.737E-07	2.133E-07	1.720E-07	1.422E-07
NNE	2.621E-05	7.404E-06	3.556E-06	2.147E-06	1.081E-06	6.716E-07	4.663E-07	3.468E-07	2.703E-07	2.179E-07	1.803E-07
NE	2.148E-05	6.081E-06	2.921E-06	1.766E-06	8.896E-07	5.532E-07	3.844E-07	2.861E-07	2.231E-07	1.800E-07	1.489E-07
ENE	1.360E-05	3.842E-06	1.840E-06	1.113E-06	5.631E-07	3.516E-07	2.452E-07	1.831E-07	1.432E-07	1.159E-07	9.612E-08
E	2.697E-05	7.622E-06	3.635E-06	2.203E-06	1.121E-06	7.037E-07	4.932E-07	3.700E-07	2.905E-07	2.358E-07	1.963E-07
ESE	4.156E-05	1.166E-05	5.517E-06	3.348E-06	1.713E-06	1.081E-06	7.614E-07	5.735E-07	4.520E-07	3.682E-07	3.074E-07
SE	2.904E-05	8.096E-06	3.820E-06	2.316E-06	1.182E-06	7.447E-07	5.236E-07	3.938E-07	3.100E-07	2.523E-07	2.104E-07
SSE	1.440E-05	4.007E-06	1.904E-06	1.150E-06	5.791E-07	3.598E-07	2.499E-07	1.859E-07	1.450E-07	1.170E-07	9.681E-08

0ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE INMILES FROM THE SITE

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	6.945E-08	3.564E-08	2.211E-08	1.123E-08	6.921E-09	4.733E-09	3.457E-09	2.643E-09	2.088E-09	1.693E-09	1.400E-09
SSW	5.575E-08	2.866E-08	1.780E-08	9.052E-09	5.575E-09	3.810E-09	2.781E-09	2.125E-09	1.678E-09	1.359E-09	1.123E-09
SW	5.051E-08	2.604E-08	1.620E-08	8.266E-09	5.102E-09	3.494E-09	2.554E-09	1.953E-09	1.544E-09	1.252E-09	1.035E-09
WSW	4.751E-08	2.456E-08	1.531E-08	7.834E-09	4.848E-09	3.326E-09	2.435E-09	1.865E-09	1.476E-09	1.198E-09	9.915E-10
W	6.025E-08	3.139E-08	1.969E-08	1.017E-08	6.339E-09	4.373E-09	3.217E-09	2.474E-09	1.965E-09	1.599E-09	1.327E-09
WNW	5.174E-08	2.699E-08	1.695E-08	8.777E-09	5.488E-09	3.797E-09	2.799E-09	2.156E-09	1.715E-09	1.399E-09	1.162E-09
NW	5.465E-08	2.861E-08	1.801E-08	9.346E-09	5.845E-09	4.043E-09	2.980E-09	2.296E-09	1.826E-09	1.488E-09	1.237E-09
NNW	4.738E-08	2.487E-08	1.568E-08	8.147E-09	5.095E-09	3.523E-09	2.596E-09	1.998E-09	1.588E-09	1.294E-09	1.074E-09
N	1.201E-07	6.288E-08	3.957E-08	2.052E-08	1.281E-08	8.843E-09	6.508E-09	5.005E-09	3.975E-09	3.235E-09	2.685E-09
NNE	1.522E-07	7.978E-08	5.025E-08	2.609E-08	1.630E-08	1.127E-08	8.303E-09	6.391E-09	5.080E-09	4.138E-09	3.436E-09
NE	1.258E-07	6.599E-08	4.160E-08	2.162E-08	1.352E-08	9.356E-09	6.896E-09	5.311E-09	4.223E-09	3.442E-09	2.860E-09
ENE	8.136E-08	4.307E-08	2.733E-08	1.434E-08	9.026E-09	6.274E-09	4.642E-09	3.586E-09	2.860E-09	2.336E-09	1.944E-09
E	1.666E-07	8.921E-08	5.708E-08	3.030E-08	1.923E-08	1.345E-08	1.001E-08	7.764E-09	6.213E-09	5.091E-09	4.250E-09
ESE	2.617E-07	1.417E-07	9.148E-08	4.918E-08	3.150E-08	2.220E-08	1.661E-08	1.295E-08	1.041E-08	8.564E-09	7.173E-09
SE	1.790E-07	9.672E-08	6.233E-08	3.346E-08	2.142E-08	1.509E-08	1.129E-08	8.802E-09	7.075E-09	5.820E-09	4.875E-09
SSE	8.178E-08	4.300E-08	2.717E-08	1.420E-08	8.929E-09	6.206E-09	4.593E-09	3.550E-09	2.832E-09	2.315E-09	1.928E-09

0VENT AND BUILDING PARAMETERS:

RELEASE HEIGHT	(METERS)	0.00	REP. WIND HEIGHT	(METERS)	10.0
DIAMETER	(METERS)	0.00	BUILDING HEIGHT	(METERS)	0.0
EXIT VELOCITY	(METERS)	0.00	BLDG.MIN.CRS.SEC.AREA	(SQ.METERS)	0.0
			HEAT EMISSION RATE	(CAL/SEC)	0.0

0ALL GROUND LEVEL RELEASES.

Note: Directions are True North.

NAPS COL 2.0-11-A

Table 2.3-221 Cooling Tower Release - 8 Day Decay Depleted χ/Qs along Various Segments

```
1USNRC COMPUTER CODE - XOQDOQ,  VERSION 2.0          RUN DATE:  7/16/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
 EXIT TWR - GROUND LEVEL RELEASE - NO PURGE RELEASES
   8.000 DAY DECAY,    DEPLETED
0CHI/Q (SEC/METER CUBED) FOR EACH SEGMENT
```

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
	SEGMENT BOUNDARIES IN MILES FROM THE SITE									
S	1.830E-06	5.448E-07	2.231E-07	1.264E-07	8.308E-08	3.714E-08	1.173E-08	4.806E-09	2.664E-09	1.701E-09
SSW	1.455E-06	4.344E-07	1.784E-07	1.013E-07	6.665E-08	2.985E-08	9.450E-09	3.869E-09	2.142E-09	1.366E-09
SW	1.309E-06	3.912E-07	1.609E-07	9.155E-08	6.033E-08	2.710E-08	8.624E-09	3.547E-09	1.969E-09	1.258E-09
WSW	1.227E-06	3.663E-07	1.509E-07	8.596E-08	5.672E-08	2.555E-08	8.169E-09	3.376E-09	1.880E-09	1.204E-09
W	1.528E-06	4.567E-07	1.892E-07	1.083E-07	7.178E-08	3.260E-08	1.058E-08	4.435E-09	2.492E-09	1.607E-09
WNW	1.320E-06	3.933E-07	1.626E-07	9.303E-08	6.164E-08	2.803E-08	9.131E-09	3.849E-09	2.172E-09	1.405E-09
NW	1.364E-06	4.091E-07	1.702E-07	9.782E-08	6.502E-08	2.968E-08	9.715E-09	4.098E-09	2.312E-09	1.495E-09
NNW	1.171E-06	3.520E-07	1.469E-07	8.461E-08	5.633E-08	2.578E-08	8.464E-09	3.571E-09	2.013E-09	1.300E-09
N	2.986E-06	8.967E-07	3.735E-07	2.148E-07	1.428E-07	6.523E-08	2.132E-08	8.966E-09	5.042E-09	3.250E-09
NNE	3.785E-06	1.136E-06	4.732E-07	2.722E-07	1.811E-07	8.276E-08	2.711E-08	1.143E-08	6.438E-09	4.157E-09
NE	3.110E-06	9.348E-07	3.901E-07	2.246E-07	1.495E-07	6.844E-08	2.246E-08	9.484E-09	5.350E-09	3.458E-09
ENE	1.962E-06	5.913E-07	2.488E-07	1.442E-07	9.650E-08	4.459E-08	1.487E-08	6.355E-09	3.611E-09	2.346E-09
E	3.884E-06	1.176E-06	5.000E-07	2.924E-07	1.970E-07	9.213E-08	3.133E-08	1.362E-08	7.814E-09	5.112E-09
ESE	5.919E-06	1.795E-06	7.715E-07	4.548E-07	3.085E-07	1.461E-07	5.072E-08	2.244E-08	1.303E-08	8.596E-09
SE	4.102E-06	1.240E-06	5.307E-07	3.120E-07	2.112E-07	9.972E-08	3.452E-08	1.526E-08	8.855E-09	5.842E-09
SSE	2.037E-06	6.086E-07	2.536E-07	1.460E-07	9.721E-08	4.459E-08	1.474E-08	6.287E-09	3.575E-09	2.325E-09

Note: Directions are True North.

BASIS: ESBWR COLA

NAPS COL 2.0-11-A **Table 2.3-222 Cooling Tower Release - D/Qs at Various Distances**

1USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE: 7/16/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
EXIT TWR - GROUND LEVEL RELEASE - NO PURGE RELEASES
******************** RELATIVE DEPOSITION PER UNIT AREA (M**-2) AT FIXED POINTS BY DOWNWIND SECTORS ********************

DIRECTION FROM SITE	DISTANCES IN MILES 0.25	0.50	0.75	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
S	4.819E-08	1.630E-08	8.367E-09	5.138E-09	2.561E-09	1.553E-09	1.050E-09	7.611E-10	5.787E-10	4.559E-10	3.691E-10
SSW	3.194E-08	1.080E-08	5.546E-09	3.405E-09	1.698E-09	1.030E-09	6.961E-10	5.045E-10	3.836E-10	3.022E-10	2.446E-10
SW	2.633E-08	8.902E-09	4.571E-09	2.807E-09	1.399E-09	8.486E-10	5.738E-10	4.158E-10	3.161E-10	2.491E-10	2.016E-10
WSW	2.286E-08	7.732E-09	3.970E-09	2.438E-09	1.215E-09	7.371E-10	4.983E-10	3.611E-10	2.746E-10	2.163E-10	1.751E-10
W	2.691E-08	9.101E-09	4.673E-09	2.869E-09	1.430E-09	8.676E-10	5.866E-10	4.251E-10	3.232E-10	2.546E-10	2.061E-10
WNW	2.495E-08	8.438E-09	4.333E-09	2.660E-09	1.326E-09	8.044E-10	5.439E-10	3.941E-10	2.997E-10	2.361E-10	1.911E-10
NW	2.242E-08	7.583E-09	3.893E-09	2.391E-09	1.192E-09	7.229E-10	4.887E-10	3.542E-10	2.693E-10	2.122E-10	1.718E-10
NNW	1.628E-08	5.504E-09	2.826E-09	1.735E-09	8.652E-10	5.247E-10	3.548E-10	2.571E-10	1.955E-10	1.540E-10	1.247E-10
N	4.309E-08	1.457E-08	7.481E-09	4.594E-09	2.290E-09	1.389E-09	9.391E-10	6.805E-10	5.175E-10	4.077E-10	3.300E-10
NNE	6.257E-08	2.116E-08	1.086E-08	6.671E-09	3.326E-09	2.017E-09	1.364E-09	9.882E-10	7.514E-10	5.920E-10	4.793E-10
NE	5.046E-08	1.706E-08	8.761E-09	5.379E-09	2.682E-09	1.627E-09	1.100E-09	7.969E-10	6.059E-10	4.774E-10	3.865E-10
ENE	2.720E-08	9.199E-09	4.723E-09	2.900E-09	1.446E-09	8.769E-10	5.929E-10	4.296E-10	3.267E-10	2.574E-10	2.084E-10
E	3.824E-08	1.293E-08	6.640E-09	4.077E-09	2.033E-09	1.233E-09	8.335E-10	6.040E-10	4.593E-10	3.618E-10	2.929E-10
ESE	5.097E-08	1.724E-08	8.849E-09	5.434E-09	2.709E-09	1.643E-09	1.111E-09	8.050E-10	6.121E-10	4.822E-10	3.904E-10
SE	4.574E-08	1.547E-08	7.942E-09	4.877E-09	2.431E-09	1.475E-09	9.970E-10	7.225E-10	5.493E-10	4.328E-10	3.504E-10
SSE	4.085E-08	1.381E-08	7.092E-09	4.355E-09	2.171E-09	1.317E-09	8.902E-10	6.451E-10	4.905E-10	3.865E-10	3.129E-10

0DIRECTION FROM SITE	DISTANCES IN MILES 5.00	7.50	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00
S	3.053E-10	1.496E-10	9.388E-11	4.745E-11	2.872E-11	1.926E-11	1.380E-11	1.036E-11	8.056E-12	6.435E-12	5.252E-12
SSW	2.024E-10	9.917E-11	6.222E-11	3.145E-11	1.904E-11	1.276E-11	9.145E-12	6.867E-12	5.339E-12	4.265E-12	3.481E-12
SW	1.668E-10	8.174E-11	5.129E-11	2.592E-11	1.569E-11	1.052E-11	7.538E-12	5.660E-12	4.401E-12	3.515E-12	2.869E-12
WSW	1.449E-10	7.099E-11	4.454E-11	2.251E-11	1.363E-11	9.136E-12	6.547E-12	4.916E-12	3.822E-12	3.053E-12	2.492E-12
W	1.705E-10	8.356E-11	5.243E-11	2.650E-11	1.604E-11	1.075E-11	7.706E-12	5.786E-12	4.499E-12	3.594E-12	2.933E-12
WNW	1.581E-10	7.748E-11	4.861E-11	2.457E-11	1.487E-11	9.971E-12	7.145E-12	5.365E-12	4.171E-12	3.332E-12	2.720E-12
NW	1.421E-10	6.962E-11	4.369E-11	2.208E-11	1.336E-11	8.961E-12	6.421E-12	4.821E-12	3.749E-12	2.994E-12	2.444E-12
NNW	1.031E-10	5.054E-11	3.171E-11	1.603E-11	9.701E-12	6.504E-12	4.661E-12	3.500E-12	2.721E-12	2.174E-12	1.774E-12
N	2.730E-10	1.338E-10	8.394E-11	4.243E-11	2.568E-11	1.722E-11	1.234E-11	9.264E-12	7.203E-12	5.754E-12	4.697E-12
NNE	3.964E-10	1.943E-10	1.219E-10	6.161E-11	3.729E-11	2.500E-11	1.792E-11	1.345E-11	1.046E-11	8.355E-12	6.820E-12
NE	3.197E-10	1.567E-10	9.830E-11	4.968E-11	3.007E-11	2.016E-11	1.445E-11	1.085E-11	8.435E-12	6.738E-12	5.500E-12
ENE	1.724E-10	8.446E-11	5.300E-11	2.679E-11	1.621E-11	1.087E-11	7.789E-12	5.849E-12	4.548E-12	3.633E-12	2.965E-12
E	2.423E-10	1.187E-10	7.451E-11	3.766E-11	2.279E-11	1.528E-11	1.095E-11	8.223E-12	6.393E-12	5.107E-12	4.168E-12
ESE	3.229E-10	1.583E-10	9.929E-11	5.019E-11	3.038E-11	2.037E-11	1.459E-11	1.096E-11	8.520E-12	6.806E-12	5.555E-12
SE	2.898E-10	1.420E-10	8.912E-11	4.504E-11	2.726E-11	1.828E-11	1.310E-11	9.835E-12	7.647E-12	6.108E-12	4.986E-12
SSE	2.588E-10	1.268E-10	7.957E-11	4.022E-11	2.434E-11	1.632E-11	1.170E-11	8.782E-12	6.828E-12	5.454E-12	4.452E-12

Note: Directions are True North.

NAPS COL 2.0-11-A

Table 2.3-223 Cooling Tower Release - D/Qs Along Various Segments

```
1USNRC COMPUTER CODE - XOQDOQ,  VERSION 2.0          RUN DATE:  7/16/2013
0XOQDOQ - North Anna COL (1996-98 Met Data)
 EXIT TWR - GROUND LEVEL RELEASE - NO PURGE RELEASES
0*************************     RELATIVE DEPOSITION PER UNIT AREA (M**-2) BY DOWNWIND SECTORS     ************************
                                            SEGMENT BOUNDARIES IN MILES
```

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	8.694E-09	2.686E-09	1.069E-09	5.841E-10	3.712E-10	1.594E-10	4.944E-11	1.960E-11	1.046E-11	6.477E-12
SSW	5.762E-09	1.780E-09	7.084E-10	3.871E-10	2.460E-10	1.057E-10	3.277E-11	1.299E-11	6.936E-12	4.293E-12
SW	4.749E-09	1.467E-09	5.839E-10	3.191E-10	2.028E-10	8.710E-11	2.701E-11	1.071E-11	5.717E-12	3.538E-12
WSW	4.125E-09	1.274E-09	5.071E-10	2.771E-10	1.761E-10	7.565E-11	2.346E-11	9.298E-12	4.965E-12	3.073E-12
W	4.855E-09	1.500E-09	5.969E-10	3.262E-10	2.073E-10	8.905E-11	2.761E-11	1.094E-11	5.844E-12	3.617E-12
WNW	4.502E-09	1.391E-09	5.534E-10	3.024E-10	1.922E-10	8.256E-11	2.560E-11	1.015E-11	5.419E-12	3.354E-12
NW	4.045E-09	1.250E-09	4.973E-10	2.718E-10	1.727E-10	7.420E-11	2.301E-11	9.119E-12	4.870E-12	3.014E-12
NNW	2.937E-09	9.072E-10	3.610E-10	1.973E-10	1.254E-10	5.386E-11	1.670E-11	6.619E-12	3.535E-12	2.188E-12
N	7.773E-09	2.402E-09	9.557E-10	5.222E-10	3.319E-10	1.426E-10	4.421E-11	1.752E-11	9.357E-12	5.792E-12
NNE	1.129E-08	3.487E-09	1.388E-09	7.583E-10	4.820E-10	2.070E-10	6.420E-11	2.544E-11	1.359E-11	8.410E-12
NE	9.103E-09	2.812E-09	1.119E-09	6.115E-10	3.887E-10	1.669E-10	5.177E-11	2.052E-11	1.096E-11	6.782E-12
ENE	4.908E-09	1.516E-09	6.033E-10	3.297E-10	2.095E-10	9.001E-11	2.791E-11	1.106E-11	5.907E-12	3.656E-12
E	6.899E-09	2.132E-09	8.482E-10	4.635E-10	2.946E-10	1.265E-10	3.924E-11	1.555E-11	8.305E-12	5.140E-12
ESE	9.195E-09	2.841E-09	1.130E-09	6.177E-10	3.926E-10	1.686E-10	5.230E-11	2.073E-11	1.107E-11	6.851E-12
SE	8.252E-09	2.550E-09	1.015E-09	5.544E-10	3.524E-10	1.514E-10	4.693E-11	1.860E-11	9.934E-12	6.149E-12
SSE	7.369E-09	2.277E-09	9.059E-10	4.950E-10	3.146E-10	1.351E-10	4.191E-11	1.661E-11	8.870E-12	5.490E-12

```
0VENT AND BUILDING PARAMETERS:
     RELEASE HEIGHT  (METERS)    0.00                   REP. WIND HEIGHT       (METERS)       10.0
     DIAMETER        (METERS)    0.00                   BUILDING HEIGHT        (METERS)        0.0
     EXIT VELOCITY   (METERS)    0.00                   BLDG.MIN.CRS.SEC.AREA  (SQ.METERS)     0.0
                                                        HEAT EMISSION RATE     (CAL/SEC)       0.0
0ALL GROUND LEVEL RELEASES.
```

Note: Directions are True North.

NAPS COL 2.0-7-A

Table 2.3-224 Climatological Extremes at Selected NWS and Cooperative Observing Stations in the Unit 3 Site Area (Date of Occurrence)

Parameter	Partlow 3WNW	Louisa	Piedmont Research Station	Gordonsville 3S	Fredericksburg Nat'l Park	Charlottesville 2W	Richmond
Maximum Snowfall Event	24 in.[a] (1/30/1966)	19 in.[a] (1/08/1996)	25.5 in.[a] (1/08/1996)	20.5 in.[a] (1/08/1996)	25.5 in.[a] (1/28/1922)	22.5 in.[a] (3/07/1962)	21.6 in.[b] (1/1940)
Maximum Snowpack	4 in.[a] (12/23/1967, 2/29/1969)	24 in.[a] (1/26/1987)	22 in.[a] (1/08/1996)	22 in.[a] (1/26/1987)	17 in.[a] (1/25/1940)	20 in.[a] (1/31/1966)	Insufficient Data[a]
100-Year Return Snowfall	21.8 in.[a]	21.1 in.[a]	26.5 in.[a]	24.6 in.[a]	22.0 in.[a]	22.7 in.[a]	17.5 in.[a]

a. Reference 2.3-208

b. SSAR Reference 1

NAPS COL 2.0-7-A

Table 2.3-225 Unit 3 Site Tornado Characteristics

Criteria	Unit of Measure	Site Tornado (10^{-7} per year occurrence)
Max. Wind Speed	mph	200
Max. Rotational Velocity	mph	160
Max. Translation Velocity	mph	40
Radius of Max. Rotational Velocity	ft	150
Pressure Drop	psi	0.9
Rate of Pressure Drop	psi/sec	0.4

NAPS COL 2.0-11-A

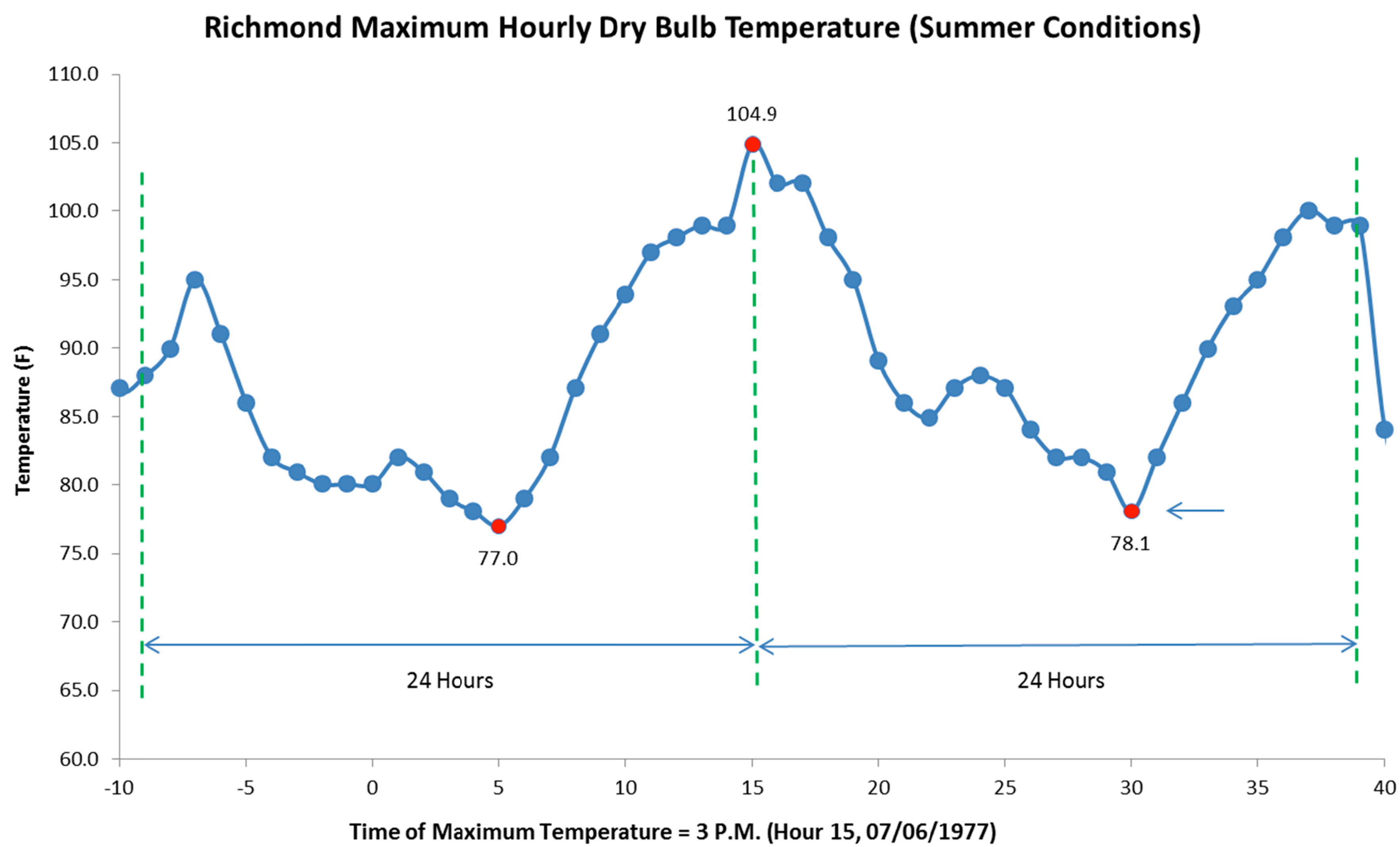
Table 2.3-226 Source to Receptor Distances for CIRC Cooling Tower Releases

Receptor Type	Direction from Unit 3 (True North)	Distance from CIRC Cooling Tower (miles/km)
EAB	S	0.43/0.69
EAB	SSW	0.37/0.59
EAB	SW	0.34/0.55
EAB	WSW	0.34/0.55
EAB	W	0.34/0.55
EAB	WNW	0.37/0.59
EAB	NW	0.42/0.68
EAB	NNW	0.53/0.86
EAB	N	0.71/1.14
EAB	NNE	0.95/1.53
EAB	NE	1.20/1.94
EAB	ENE	1.39/2.24
EAB	E	1.21/1.95
EAB	ESE	0.98/1.58
EAB	SE	0.74/1.18
EAB	SSE	0.55/0.88

Figure 2.3-201 [Deleted]

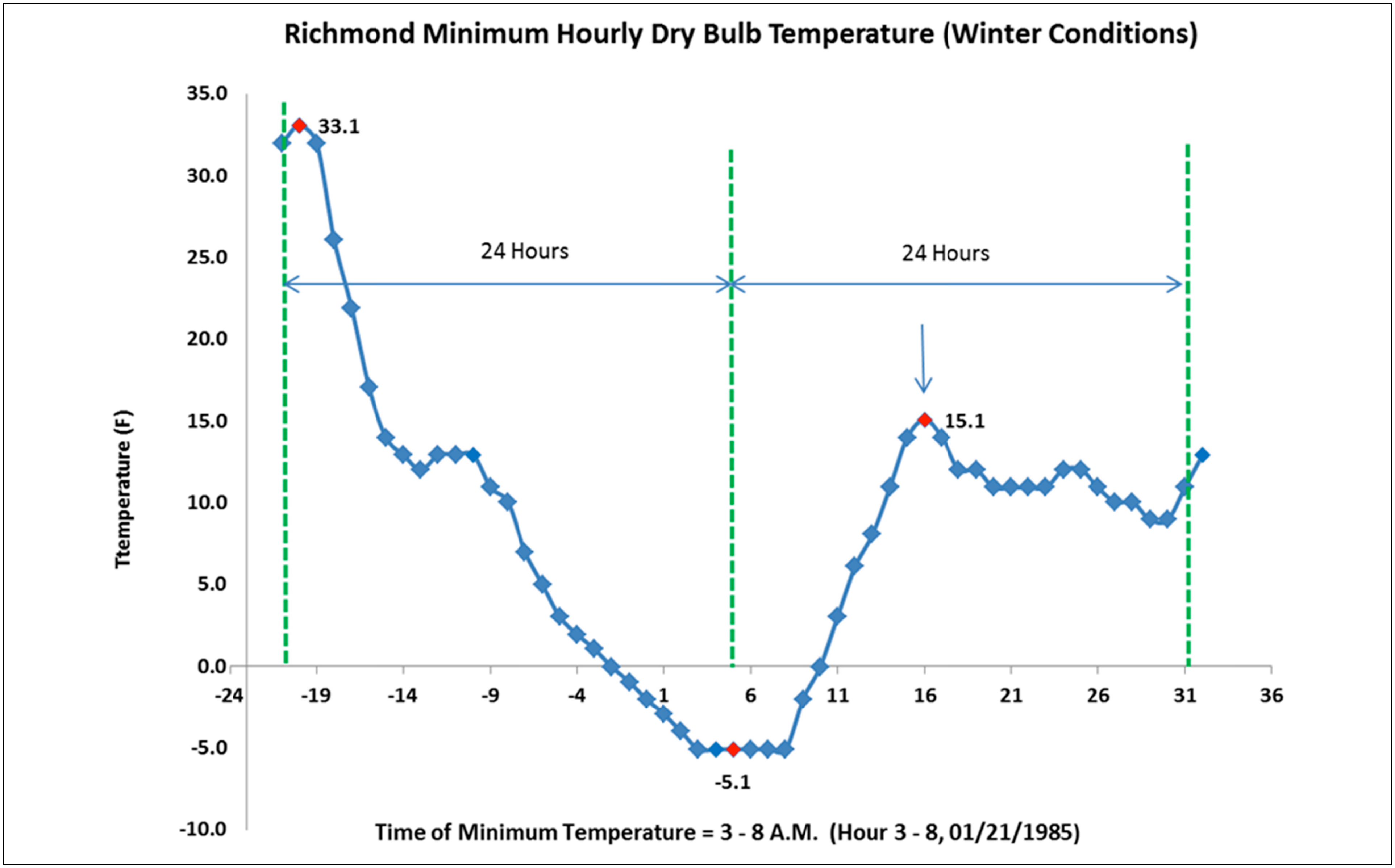
BASIS: NEW

NAPS COL 2.3-7-A Figure 2.3-202 Hourly Dry Bulb Temperature for Richmond on July 06, 1977



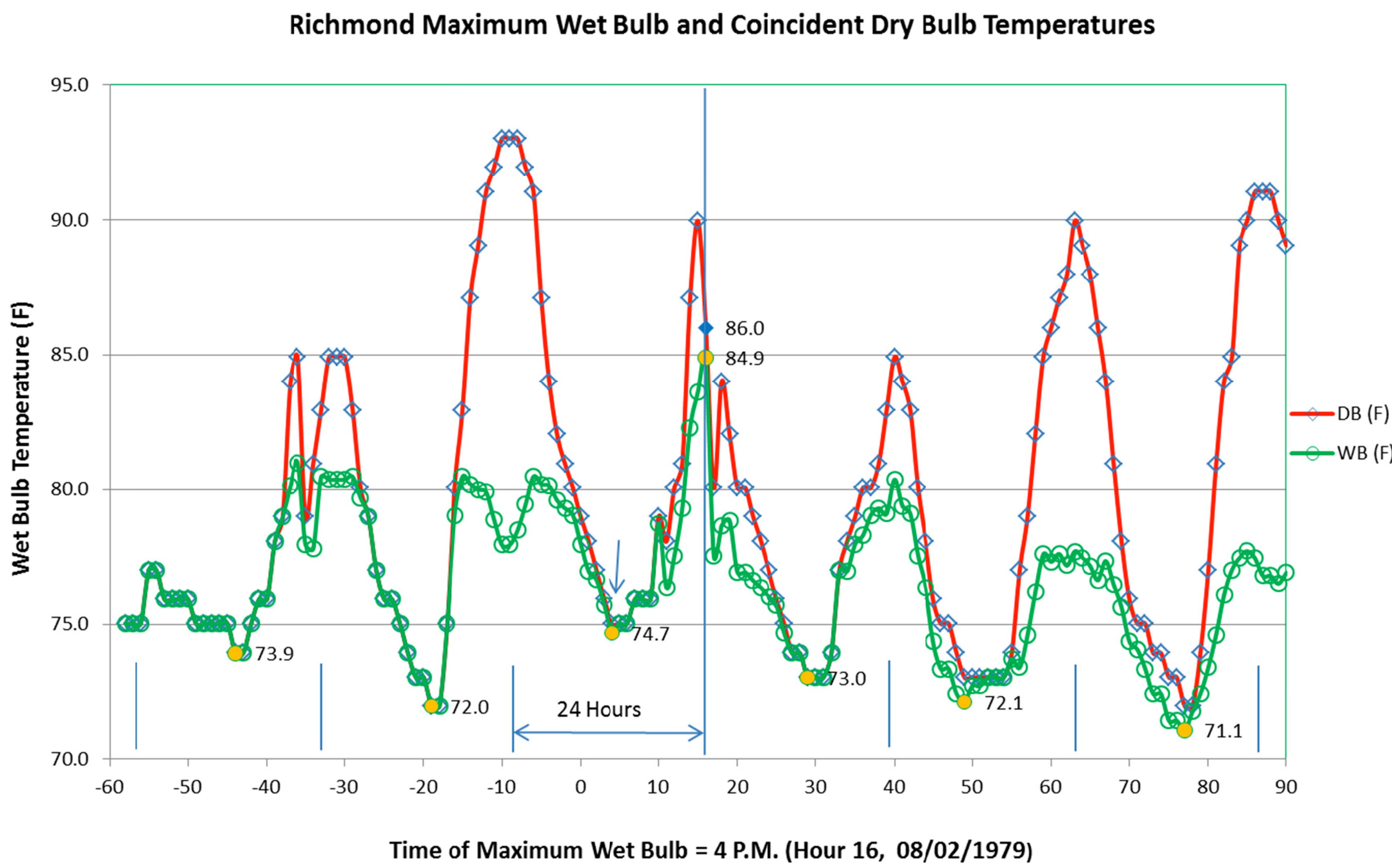
BASIS: NEW

NAPS COL 2.3-7-A **Figure 2.3-203 Hourly Dry Bulb Temperature from Richmond on January 21, 1985**



BASIS: NEW

NAPS COL 2.3-7-A Figure 2.3-204 Hourly Dry Bulb and Wet Bulb Temperature from Richmond on August 02, 1979



2.4 Hydrology

2.4.1 Hydrologic Description

NAPS COL 2.0-12-A

The information needed to address DCD COL Item 2.0-12-A is included in SSAR Section 2.4.1, which is incorporated by reference with the following variance and supplements.

2.4.1.1 Site and Facilities

The second paragraph of this SSAR section is supplemented as follows with information on the site grade elevation for Unit 3 and the effects on site drainage.

NAPS COL 2.0-12-A

The design plant grade elevation for Unit 3 safety-related structures is 290.0 ft NAVD88 (290.86 ft NGVD29). Figure 2.1-201 shows the layout of the external structures and components of Unit 3. The layout of Unit 3 will affect a few small wetlands and the upstream portions of two intermittent streams that flow north into an unnamed arm of Lake Anna just northwest of the power-block area. These areas will be partially filled in for the construction of the Unit 3 cooling towers in the CIRC. The drainage in these areas will be redirected to drainage swales and the stormwater management system before rejoining the two intermittent streams. There are no other natural drainage features requiring changes to accommodate Unit 3. Evaluations of the flood levels from various flooding sources as they relate to protection of safety-related facilities for Unit 3 are discussed in Sections 2.4.2 and 2.4.10.

2.4.1.3 Existing and Proposed Water Control Structures

The second sentence of the seventh paragraph of this SSAR section is supplemented as follows with information on the Lake Anna normal pool level.

NAPS ESP VAR 2.4-4

The normal pool level is maintained at an elevation of 249.39 ft NAVD88 (250.25 ft NGVD29), which is 3 inches higher than the normal pool level of 249.14 ft NAVD88 (250 ft NGVD29) before the addition of Unit 3. The increased normal pool level improves water availability downstream of Lake Anna during drought conditions.

The sixth sentence of the seventh paragraph of this SSAR section is supplemented as follows with information on the flood surcharge.

The flood surcharge capacity is 14.75 ft above the normal pool level.

SSAR Table 2.4-1 is supplemented with information on the Lake Anna storage allocation as shown in Table 2.4-1R.

2.4.2 Floods

NAPS COL 2.0-13-A

The information needed to address DCD COL Item 2.0-13-A is included in SSAR Section 2.4.2, which is incorporated by reference with the following supplements.

2.4.2.2 Flood Design Considerations

This SSAR section is supplemented as follows with information on the design basis flooding level and the design plant grade elevation for Unit 3.

NAPS COL 2.0-13-A

The Unit 3 design basis flood was determined by considering a number of different flooding possibilities. The applicable possibilities considered include the local probable maximum precipitation (PMP) over the site, the probable maximum flood (PMF) on streams and rivers, potential dam failures, probable maximum tsunami, probable maximum surge and seiche flooding, and ice effects flooding. Details of the individual scenarios are presented in Section 2.4.2.3 and Sections 2.4.3 through 2.4.7.

The highest water level from among the flooding possibilities was selected as the design basis flooding level (DBFL). The Unit 3 DBFL was derived from the local PMP, with an elevation of 288.4 ft NAVD88 (289.3 ft NGVD29). Details of the flood level determination are presented in Section 2.4.2.3.

The design plant grade for Unit 3 safety-related components and structures is at Elevation 290.0 ft NAVD88 (290.86 ft NGVD29) providing 1.6 ft of freeboard above the DBFL.

2.4.2.3 Effects of Local Intense Precipitation

This SSAR section is supplemented as follows to show that local intense precipitation is discharged to Lake Anna and that safety-related

structures are located at elevations above the maximum water surface elevation produced by local intense precipitation.

NAPS COL 2.0-13-A

The site layout, drainage facilities, and drainage areas are shown on Figure 2.4-201. Plant north for Unit 3 is oriented 23.54 degrees east of true north. All directions presented in this section are referenced to plant north. The safety-related buildings with entrances at design plant grade consist of the Reactor, Control, and Fuel Buildings and related structures. These safety-related buildings are located in the power block and all grading slopes away from the safety-related buildings. The design plant grade (floor and entrance elevation) for all safety-related buildings is at Elevation 290.0 ft NAVD88 (290.86 ft NGVD29). The ground elevation just outside the safety-related buildings is 6 inches lower at Elevation 289.5 ft NAVD88 (290.36 ft NGVD29). Beyond the safety-related buildings, the site grading falls at varying slopes to drainage ditches located along the southern, eastern and western edges of the power block. The south drainage ditch conveys runoff to the west drainage ditch. The east and west drainage ditches convey the collected runoff from the power block and surrounding areas as shown on Figure 2.4-201 to the plant stormwater management pond located along the northern boundary of the site. The stormwater management pond discharges to Lake Anna through a bio-retention under-drain and a riser and pipe outlet. An emergency spillway over the plant access road is also provided to discharge large storm events, such as the PMP peak discharge, to Lake Anna. In performing the runoff analysis for the PMP storm, the under-drain and riser pipe outlet were conservatively assumed to be clogged. The sub-basin drainage areas shown on Figure 2.4-201 are summarized in Tables 2.4-201 and 2.4-202.

NAPS ESP COL 2.4-4

For typical design storm events, such as the 10-year storm, runoff from the plant area is conveyed to the south, east and west drainage ditches through catch basins and storm drains. The south and west drainage ditches also pass through culverts at road crossings. For the PMP runoff analysis, however, all underground storm drains and culverts were conservatively assumed to be completely clogged. Therefore, all flows were assumed to be overland or in open ditches.

The PMP runoff analysis was performed on the south, east and west drainage ditches to determine the peak water levels during the PMP

event and compare them to the design plant grade elevations for the safety-related buildings.

The rational method was used to determine the peak discharges at the point of interest (POI) for each of the sub-basin drainage areas shown on Figure 2.4-201. Two runoff coefficients were selected to represent ground cover conditions in the sub-basins. Conservative runoff coefficient values were selected to represent saturated ground conditions and also to reflect the intense rainfall that would occur during a PMP event. For vegetated areas, a runoff coefficient of 0.9 was used. For all other areas, a runoff coefficient of 1.0 was used to reflect an impervious surface. Composite runoff coefficients were determined based on the percentage of vegetated and impervious land cover for each sub-basin. Time of concentration values were estimated for each sub-basin using Natural Resources Conservation Service methodologies (Reference 2.4-201). According to guidance from the U.S. Army Corps of Engineers (Reference 2.4-202) the time of concentration values should be reduced to account for the nonlinear response for large storms such as the PMP. Thus, a 25 percent reduction in the estimated time of concentration values was adopted. PMP rainfall intensities were developed from the values listed in SSAR Table 2.4-3 and are shown in Figure 2.4-202. Using a duration equal to the reduced time of concentration for each sub-basin, the PMP rainfall intensity for each sub-basin was determined from Figure 2.4-202. The PMP peak discharge for each sub-basin POI was determined using the sub-basin POI drainage area, runoff coefficient, and PMP rainfall intensity. The estimated values for each sub-basin are shown in Table 2.4-203.

The steady-state standard step backwater method in the computer program HEC-RAS (Reference 2.4-203) was used to estimate the peak PMP water levels in the south, east and west drainage ditches. HEC-RAS was first used to model the PMP flows over the stormwater pond emergency spillway and determine the peak PMP water level in the pond, which then became the starting water level at the downstream-most cross sections for the east and west drainage ditches. Cross-section data for the stormwater pond spillway (outfall) and the north, east and west drainage ditches are shown on Figure 2.4-203 and Table 2.4-204.

Plant access roads or security fences cross the south and west drainage ditches at four locations. At each of these locations, the culverts under

the roads were assumed to be blocked for the PMP runoff analysis. Inline weirs were used in HEC-RAS to model the road crossings and the flow over the top of the roads.

Manning's roughness coefficients (n values) for the channel and overbank areas were assigned based on guidance provided by Chow (Reference 2.4-204). Ditch linings consist mainly of rip rap, which is represented in the model by a Manning's n value of 0.035. Land cover in the ditch overbank areas consists of mostly gravel with limited areas of grass vegetation and pavement. Therefore, a uniform Manning's n value of 0.035, representing the gravel surface, was used for all overbank areas. This is a conservative approach as Manning's n values for gravel cover are higher than those for paved or grass areas and produce higher water levels.

The peak discharges listed in Table 2.4-203 were entered into the HEC-RAS model conservatively at the upstream end of each subbasin. The results of the HEC-RAS analysis are summarized in Table 2.4-204.

NAPS ESP COL 2.4-5 The design plant grade elevation for safety-related structures is Elevation 290.0 ft NAVD88 (290.86 ft NGVD29) as shown in Figure 2.4-201. As summarized in Table 2.4-204, all cross-sections in the power block area have maximum water surface elevations below Elevation 290.0 ft NAVD88 (290.86 ft NGVD29). The maximum PMP water level in the power block area, located near the Hot Machine Shop and Maintenance Building, is Elevation 288.4 ft NAVD88 (289.3 ft NGVD29), which is 1.6 ft below the design plant grade elevation for safety-related structures.

NAPS COL 2.0-13-A At the northern boundary of the Unit 3 site, the drainage divide between the Unit 3 site and the Units 1 and 2 site is at Elevation 272.0 ft NAVD88 (272.86 ft NGVD29). The maximum PMP water level in this area, represented by the stormwater management pond, is predicted to be at Elevation 271.8 ft NAVD88 (272.7 ft NGVD29), which is 0.2 ft below the drainage divide elevation. Thus, all Unit 3 PMP flows are confined to the Unit 3 site and runoff generated from Unit 3 does not impact the Units 1 and 2 site.

Drainage ditches, overflow areas, and embankments are required to be protected to withstand the predicted flood flow velocities resulting from the local PMP event. The HEC-RAS model analysis indicates that the locations of supercritical flow regimes and potential hydraulic jumps,

illustrated in Figure 2.4-221, are the east drainage ditch upstream of the inlet to the stormwater management pond, the west drainage ditch along the access road near the stormwater management pond and upstream of the culvert and the confluence with the south drainage ditch, and the outfall channel embankment. These locations are provided with linings or hardened surface protection designed to withstand the erosive forces associated with the expected flow regimes during the local PMP event.

Grading in the vicinity of the safety-related structures slopes away from the individual structures such that PMP ground and roof runoff will sheet flow away from each of these buildings and towards the collection ditches preventing flood flows from entering the buildings. Some ponding may occur near storm drain inlets and other depressed areas. The ponding will be temporary, however, and localized. No storm drain inlets or depressed areas are located near safety-related buildings.

The Unit 3 site drainage facilities and grading in the power block area provide evacuation of the runoff from the PMP storm event. The design plant grade elevations for safety-related buildings are located above the estimated PMP water levels and grading is such that sheet flows and roof drainage flow away from safety-related buildings. Additionally, the Unit 3 PMP flows do not impact the Units 1 and 2 site. No flood protection measures are necessary for the Unit 3 site. The following controls ensure that the drainage properties of the Unit 3 plant are not adversely impacted.

During the Unit 3 construction phase, drawings issued for construction and the as-built drawings for site grading and drainage details are checked against the site topography, surface conditions, and channel lining properties represented in the local PMP flood analysis, including the HEC-RAS computer model. Construction procedures specify that drainage facilities remain free of obstructions. Throughout the construction phase, the stormwater drainage facilities are inspected at least once every two weeks. These inspections confirm the continuing integrity of the as-constructed Unit 3 stormwater drainage facilities, including the channels and the overbank areas.

After the start of Unit 3 operations, the Unit 3 stormwater drainage facilities are monitored and maintained to ensure the channel and overbank topography, surface cover, and lining properties remain as represented in the local PMP flood analysis, including the HEC-RAS computer model. Quarterly site walk-downs are performed to inspect

areas with erosion potential. These areas include ditches, outfall channels, and side slopes. In addition, stormwater effluent is monitored quarterly for indications of upstream channel erosion or degradation such as clarity, floating solids, settled solids, and suspended solids. If erosion or any other type of pollution has occurred that could lead to impeding stormwater flow, corrective action is initiated to determine the source and mitigate the problem.

2.4.3 Probable Maximum Flood on Streams and Rivers

NAPS COL 2.0-14-A

The information needed to address DCD COL Item 2.0-14-A is included in SSAR Section 2.4.3 which is incorporated by reference with the following variances and supplements.

The third paragraph of this SSAR section is supplemented as follows with information on the revised Lake Anna PMF analysis incorporating the raised normal pool level and using the peaked unit hydrograph methodology.

NAPS ESP VAR 2.4-4

The Lake Anna PMF analysis presented in the SSAR utilized a normal pool elevation of 249.14 ft NAVD88 (250.00 ft NGVD29) as described in Section 2.4.1.3. For the addition of the Unit 3 power reactor, the normal pool elevation was raised by 3 inches to an elevation of 249.39 ft NAVD88 (250.25 ft NGVD29). The increased normal pool elevation results in increased water availability during drought conditions downstream of the Lake Anna Dam.

Because the normal pool elevation has been increased, another Lake Anna PMF analysis has been performed to reflect the new normal pool elevation. Also for the revised analysis, the combined unit hydrograph for the North Anna Reservoir and WHTF watersheds was peaked to account for the non-linear response of large storms as suggested by the U.S. Army Corps of Engineers (Reference 2.4-202).The modeling approach, calibration, and nearly all input data from the Lake Anna PMF model presented in the SSAR remain the same for the current analysis. The input data for the starting water level and the stage-discharge relationship have been revised to reflect the new normal pool elevation. Additionally, the U.S. Army Corps of Engineers (USACE) computer program HEC-HMS (Reference 2.4-220) is used to compute inflow and outflow hydrographs as well as Lake Anna water levels instead of the USACE Computer Program HEC-1 (SSAR Reference 14), which was used in the

SSAR PMF analysis. HEC-HMS performs the same function as HEC-1 and is an upgraded program that makes use of modem computer operating systems. All of the methodologies utilized in the SSAR HEC-1 analysis with the same input data are utilized in the current HEC-HMS analysis. For the HEC-HMS model, adjustments to two variables (the Coefficient Ratio and the Recession Ratio) were necessary due to revisions to input parameters for HEC-HMS. Those instances where alterations were required are described in the following sections. Otherwise, the input parameters described in the SSAR are still valid for the current HEC-HMS analysis.

Initially, the SSAR HEC-1 input parameters, without modification to the normal pool elevation, were input into the HEC-HMS model. As mentioned previously, minor adjustments were made to two input variables due to revisions to the input parameters. With these adjustments, the HEC-HMS analysis produced results essentially identical to the results produced in the SSAR HEC-1 analysis.

NAPS ESP VAR 2.4-5

Then, the normal pool elevation (starting water level) and the stage-discharge relationship were revised to reflect the raised normal pool for Lake Anna in the HEC-HMS analysis. Additionally, the unit hydrograph was peaked as described in Section 2.4.3.3. The results of the current HEC-HMS analysis indicate that with a 3 inch increase in the starting water level and a peaked unit hydrograph, the maximum Lake Anna PMF still water level at Lake Anna Dam increases by 0.03 ft to Elevation 263.24 ft NAVD88 (264.10 ft NGVD29). Because the still water increase at the dam is so small, the backwater and wind wave activity analyses were revised, as the small increase would not impact the backwater or wind wave analysis results.

The PMF on streams and rivers at the Unit 3 site is at Elevation 266.56 ft NAVD88 (267.42 ft NGVD29). This elevation is 23.44 ft below the Unit 3 design plant grade elevation of 290.0 ft NAVD88 (290.86 ft NGVD29) for safety-related facilities, including the reactor building, which contains the safety-related UHS SSCs. Also, the Fire Water Service Complex (FWSC), which provides an on-site source of water supply to the UHS is at the same grade elevation as the reactor building. The FWSC components are above the design plant grade elevation and are therefore above the PMF elevation. Because the site grade and access to the connection on Unit 3 for supply of make-up water to the UHS are

above the PMF elevation, the water supply to the UHS is capable of withstanding the PMF on streams and rivers without loss of the UHS safety functions.

2.4.3.2 Precipitation losses

NAPS COL 2.0-14-A

The second paragraph of this SSAR section is supplemented as follows with information on precipitation losses used in the Lake Anna PMF model.

The HEC-1 precipitation loss coefficients listed in SSAR Table 2.4-11, DKLTR, ERAIN, RTIOL, and STRKR, are defined as Initial Range, Exponent, Coefficient Ratio, and Initial Coefficient, respectively, in HEC-HMS. The Initial Range, Initial Coefficient and Exponent HEC-HMS precipitation loss coefficients are defined exactly the same as their counterpart HEC-1 coefficients. The same values for these HEC-1 loss coefficients, used in the SSAR PMF analysis, were input into the HEC-HMS model for the current analysis. The Coefficient Ratio in HEC-HMS has a slightly different definition than RTIOL in HEC-1. An appropriate value for the Coefficient Ratio in HEC-HMS was determined by trial and error until the runoff from the Lake Anna watershed in the HEC-HMS results essentially matched the runoff in the HEC-1 results and thus confirmed that the selected HEC-HMS Coefficient Ratio is valid for the calibrations performed in the SSAR PMF analysis. The value selected for the HEC-HMS Coefficient Ratio and used in the current PMF analysis is 11.055.

2.4.3.3 Runoff Model

The third, fourth and fifth paragraphs of this SSAR section are supplemented as follows with information on the peaked unit hydrograph, stage-storage, stage-discharge and base flow data used in the Lake Anna PMF analysis.

NAPS ESP VAR 2.4-4

The U.S. Army Corps of Engineers indicates that for PMF modeling, unit hydrographs should be peaked to account for the non-linear response of a watershed to large storm events (Reference 2.4-202). Thus, the 1976 unit hydrograph is modified to include a peaking effect. For this analysis the unit hydrograph peak is increased by 20 percent and the time to peak is reduced by 50 percent. Figure 2.4-222 shows the modified peaked unit hydrograph compared with the original 1976 unit hydrograph.

The same stage-storage data for Lake Anna presented in the SSAR is input into the HEC-HMS model for the current analysis.

The HEC-1 base flow variable defined as the Recession Ratio (RR) as used in the SSAR PMF analysis is replaced by the Recession Constant (RC) in HEC-HMS and has a different definition. HEC-HMS provides a formula to convert the RR to an RC as shown below (Reference 2.4-220):

$$RC = \frac{1}{RR^{24}}$$

The RR value used in the SSAR HEC-1 model is 1.0135; thus the RC value used in the HEC-HMS model is 0.72482.

The SSAR HEC-1 model stage-discharge relationship data based on the Lake Anna Dam adopted spillway rule curve was revised and input into the HEC-HMS model. Because outflow from the dam is controlled by the positions of the skimmer gates and three radial gates, only the portion of the discharge rating data near the normal pool elevation is revised. During flooding events with higher water levels, the same operating procedures and gate openings are used. The physical geometry of the dam has not changed as a result of the raised normal pool elevation.

2.4.3.4 Probable Maximum Flood Flow

The first paragraph of this SSAR Section is supplemented as follows with information on the inflow hydrograph and peak discharges.

NAPS ESP VAR 2.4-5

The computed PMF inflow hydrograph to the combined WHTF and North Anna Reservoir is shown in Figure 2.4-11R. The peak PMF inflow discharge is about 339,900 cfs, and the peak discharge over the dam is about 141,400 cfs.

2.4.3.5 Water Level Determination

The first two sentences of the first paragraph of this SSAR section are supplemented as follows with information on the HEC-HMS computed water levels.

NAPS ESP VAR 2.4-5

The PMF inflow hydrograph was routed through the combined reservoir using HEC-HMS to determine the maximum still water level associated with the PMF. This routing resulted in a peak outflow of 141,400 cfs with a maximum water level at the dam of 263.24 ft NAVD88 (264.10 ft NGVD29).

The last sentence of the second paragraph of this SSAR section is supplemented as follows with information on the HEC-HMS computed water levels.

By adding the backwater effect of 0.2 ft to the PMF still water elevation of 263.24 ft NAVD88 (264.10 ft NGVD29) at the dam, the PMF still water elevation at Unit 3 is 263.44 ft NAVD88 (264.30 ft NGVD29).

2.4.3.6 Coincident Wind Wave Activity

The last sentence of the second paragraph of this SSAR section is supplemented as follows with information on HEC-HMS computed water levels.

NAPS ESP VAR 2.4-5

Adding the wind setup value of 0.09 ft and the wave run-up value of 3.03 ft to the PMF still water elevation at Unit 3 resulted in a maximum PMF elevation of 266.56 ft NAVD88 (267.42 ft NGVD29).

2.4.4 Potential Dam Failures

NAPS COL 2.0.15-A

The information needed to address DCD COL Item 2.0-15-A is included in SSAR Section 2.4.4, which is incorporated by reference with the following supplements.

The second paragraph in this SSAR section is supplemented as follows to address the ESBWR UHS design.

NAPS ESP COL 2.4-6
NAPS ESP COL 2.4-7

DCD Section 9.2.5 describes the UHS and addresses NRC requirements to provide sufficient emergency cooling capability. The UHS for the passive ESBWR design is in the reactor building and does not use safety-related engineered underground reservoirs or storage basins. The service water system is not safety-related for the ESBWR. Even if Lake Anna were to be drained due to a dam failure, no safety-related structures or systems for Unit 3 would be adversely affected.

2.4.5 Probable Maximum Surge and Seiche Flooding

NAPS COL 2.0-16-A

The information needed to address DCD COL Item 2.0-16-A is included in SSAR Section 2.4.5, which is incorporated by reference.

2.4.6 Probable Maximum Tsunami Flooding

NAPS COL 2.0.17-A

The information needed to address DCD COL Item 2.0-17-A is included in SSAR Section 2.4.6, which is incorporated by reference.

2.4.7 Ice Effects

NAPS COL 2.0-18-A

The information needed to address DCD COL Item 2.0-18-A is included in SSAR Section 2.4.7, which is incorporated by reference with the following supplements.

2.4.7.2 Description of the Cooling Water System

The second paragraph of this SSAR section is supplemented as follows with information on the emergency cooling system for Unit 3.

NAPS COL 2.0-18-A

The emergency cooling water for Unit 3 is provided from the UHS as described in DCD Section 9.2.5.

The last paragraph of this SSAR section is supplemented as follows with information on normal and emergency cooling system functions for Unit 3 specific systems.

The normal cooling systems for Unit 3 are not safety-related. The emergency cooling system for Unit 3 is provided by the UHS, described in DCD Section 9.2.5, which is not affected by ice conditions. There is no safety-related system interconnection or inter-system reliance between normal and emergency cooling.

2.4.7.4 Frazil Ice

The fifth paragraph of this SSAR section is supplemented as follows with information on site-specific design for Unit 3.

NAPS COL 2.0-18-A

The design of the Unit 3 station water intake building is such that approach velocities are less than 0.5 fps. An approach velocity this low would not produce sufficient turbulence to generate frazil ice. Nonetheless, based on criteria stated in SSAR Reference 27 and others, there are other extreme climate factors that could combine and could cause formation of such ice. However, the Plant Service Water System (PSWS), which uses pumps in the Unit 3 station water intake building for water make-up, is not safety-related. Information on the UHS is found in DCD Section 9.2.5.

The last paragraph of this SSAR section is supplemented as follows with information on preventing possible effects of anchor ice on the Unit 3 intake.

The most likely location for anchor ice to form is at the intake trash racks or intake screens. In the event of shutdown of Units 1 and 2 during cold weather, continuous rotation of traveling water screens and use of the trash removal rake on the intake trash rack will be effective in preventing any anchor ice formation.

2.4.7.5 Surface Ice

The second paragraph of this SSAR section is supplemented as follows with information on preventing possible effects of surface ice on the Unit 3 intake structure.

NAPS COL 2.0-18-A

Additionally, the skimmer wall at the front of the Unit 3 station water intake building extends below the design low water level to further preclude the entry of ice sheets.

The fourth paragraph of this SSAR section is supplemented as follows with information showing emergency cooling for Unit 3 is not affected by surface ice formation.

The intake and associated pumps for Unit 3 do not perform safety-related functions. The PSWS is supplied by pumps in the intake building, but this system is not safety-related. Emergency cooling needed during a DBA is supplied by a separate UHS as discussed in DCD Section 9.2.5. Therefore, no safety-related Unit 3 facilities are affected by ice layer formation on the lake.

The last paragraph of this SSAR section is supplemented as follows with information showing emergency cooling for Unit 3 is not affected by the break-up of surface ice.

The presence of the skimmer wall, trash racks and traveling screens at the Unit 3 station water intake building prevent ice floes from reaching the pumps. The accumulation of ice at the trash racks and traveling screens could clog them and reduce the flow capacity of the intake. However, because the PSWS is not safety-related and emergency cooling is

provided by the UHS, no safety-related facilities are affected by ice floe accumulation on the lake.

2.4.7.6 Ice and Snow Roof Loads on Safety Related Structures

The second paragraph of this SSAR section is supplemented as follows with information relating to snow loads on roofs of Unit 3 safety-related structures.

NAPS COL 2.0-18-A

Details of the snow depths and 48-hour winter PMP for the design snow loads on the roofs of safety-related structures are provided in Section 2.3.1.3.4.

The last paragraph of this SSAR section is supplemented as follows with information to show ice and snow loads for Unit 3 safety-related structures are accounted for in the design.

NAPS COL 2.0-18-A

Design loadings for roofs of safety-related structures are described in DCD Appendix 3G, e.g., for the Reactor Building, see DCD Section 3G.1.5.2.

2.4.8 Cooling Water Canals and Reservoirs

NAPS COL 2.0-19-A

The information needed to address DCD COL Item 2.0-19-A is included in SSAR Section 2.4.8, which is incorporated by reference with the following supplements.

The third paragraph in this SSAR section is supplemented with information as follows to address whether Lake Anna is used for safety-related water withdrawals.

NAPS ESP COL 2.4-8

The UHS for Unit 3 is described in DCD Section 9.2.5. The IC/PCCS pools have their own water in place during Unit 3 operation for safety-related cooling in the event that use of the UHS is required. The North Anna Reservoir and Waste Heat Treatment Facility (WHTF), which comprise Lake Anna, are not used for safety-related water withdrawal for Unit 3.

The eighth paragraph of this SSAR section is supplemented as follows to reflect the increase in the normal pool level.

NAPS ESP VAR 2.4-4

For the addition of Unit 3, the normal pool elevation has been raised by 3 inches to an elevation of 249.39 ft NAVD88 (250.25 ft NGVD29). With

Unit 3 operating, the normal water level in the WHTF is 250.89 ft NAVD88 (251.75 ft NGVD29) as shown in Figure 2.4-14R.

2.4.9 Channel Diversions

NAPS COL 2.0-20-A

The information needed to address DCD COL Item 2.0-20-A is included in SSAR Section 2.4.9, which is incorporated by reference.

2.4.10 Flooding Protection Requirements

NAPS COL 2.0-21-A

The information needed to address DCD COL Item 2.0-21-A is included in SSAR Section 2.4.10, which is incorporated by reference with the following supplements.

The first paragraph of this SSAR section is supplemented as follows with information on the site grade elevation for Unit 3.

NAPS ESP VAR 2.4-5

The design plant grade is at Elevation 290.0 ft NAVD88 (290.86 ft NGVD29) (a greater height above the maximum Lake Anna flood level of 266.56 ft NAVD88 (267.42 ft NGVD29) than was assumed in the SSAR).

The first paragraph of this SSAR section is further supplemented as follows with information to address slope embankment protection features for the Unit 3 intake structure.

NAPS ESP COL 2.4-9

The Unit 3 station water intake building is located in a separate intake channel west of the cove that houses the intake for Units 1 and 2 as shown on Figure 2.4-204. The Unit 3 intake channel area is separated from Lake Anna by an outer berm constructed in the early 1980s. The top of the outer berm is Elevation 254.14 ft NAVD88 (255.0 ft NGVD29) and protects the Unit 3 intake channel area from flood events up to the 100-year flood on Lake Anna, which has an estimated flood level at Elevation 254.14 ft NAVD88 (255.0 ft NGVD29) (SSAR Reference 23). Flow from Lake Anna passes though a multi-barrel culvert in the outer berm as shown on Figure 2.4-204. The Unit 3 station water intake building and the intake channel area are protected from wind wave activity on Lake Anna by the outer berm, which has no visible indications of erosion or damage from wave activity. Rip-rap protection of the slope embankment at the station water intake building location is provided to prevent local runoff from eroding the embankment near this on-shore intake building. Although protection is provided, the Unit 3 station water intake is not a safety-related structure.

The second paragraph of this SSAR section is supplemented as follows with information to show that flood protection measures are not required for the Unit 3 site.

NAPS COL 2.0-21-A

A local PMP drainage analysis was performed assuming, conservatively, that all underground storm drains and culverts are clogged. Details of the local PMP analysis and the resulting flood levels are presented in Section 2.4.2.3. The maximum PMP water level in the power block area is predicted to be at Elevation 288.4 ft (289.3 ft NGVD29), which is 1.6 ft below Elevation 290.0 ft NAVD88 (290.86 ft NGVD29), the design plant grade elevation for safety-related facilities. Thus, no Unit 3 safety-related structure is subject to static or dynamic loading due to flooding as a result of design basis flood events, including local PMP events. No flood protection measures are required for the Unit 3 site. Additionally, no technical specifications or emergency procedures are required to implement flood protection activities.

2.4.11 Low Water Considerations

NAPS COL 2.0-22-A

The information needed to address DCD COL Item 2.0-22-A is included in SSAR Section 2.4.11, which is incorporated by reference with the following supplements.

2.4.11.1 Low Flow in Streams

The third sentence of the third paragraph of this SSAR section is supplemented as follows with information on the Lake Anna operating water level.

NAPS ESP VAR 2.4-4

With the addition of Unit 3, the lake normal pool water level is Elevation 249.39 ft NAVD88 (250.25 ft NGVD29).

2.4.11.4 Future Controls

This SSAR section is supplemented as follows with information on the water budget analysis and calculated minimum water levels.

NAPS ESP VAR 2.4-4

As indicated in Section 2.4.1, other than the required releases from the Lake Anna Dam, the only other consumptive water use on Lake Anna is from the existing units. To determine the impact of Unit 3 on Lake Anna water levels, a water budget analysis of the lake was performed. The

period analyzed extends from October 1979 to October 2007 with two different water use scenarios investigated, which are described below.

Two Unit Scenario	Units 1 and 2 operating at a plant capacity factor of 93 percent, which is in excess of their historical operating experience.
Three Unit Scenario	Units 1 and 2 operating as described above and Unit 3 operating with an assumed 96 percent capacity factor using a closed-cycle, dry and wet cooling tower system, withdrawing makeup water from the North Anna Reservoir and discharging blowdown to the WHTF.

The conceptual model used to represent the Lake Anna water budget considers surface inflow, groundwater inflow, and precipitation as additions to the lake storage; and evaporation and dam releases as subtractions from the lake storage. The continuity equation for this control volume may be expressed as (SSAR Reference 17):

$$\frac{dS}{dt} = I - O, \; S(0) = S_0 \qquad (2.4.11\text{-}1)$$

where:

S	is the storage
t	is time
I	is the inflow rate
O	is the outflow rate
S_0	is the initial storage

In this analysis, S includes the combined storage of the North Anna Reservoir and the WHTF. The inflow rate to Lake Anna, I, is defined as:

$$I = I_{SW} + I_{GW} + I_P \qquad (2.4.11\text{-}2)$$

where:

I_{SW}	is the surface water inflow to the lake from contributing tributaries
I_{GW}	is the groundwater inflow to the lake
I_P	is the inflow from precipitation falling directly on the lake

Because data are not available to characterize I_{SW} and I_{GW} adequately, the total inflow rate to Lake Anna, I, is unknown. The basis for estimating this time series is described below.

The outflow rate from Lake Anna, O, is defined as

$$O = O_{Preop-Evap} + O_{Unit3-Evap} + O_R \quad (2.4.11\text{-}3)$$

where

$O_{Preop\text{-}Evap}$	is the pre-operational outflow due to evaporation
$O_{Unit3\text{-}Evap}$	is the evaporative loss associated with Unit 3's wet cooling towers
O_R	is the outflow from dam releases

$O_{Preop\text{-}Evap}$ includes the natural evaporation from the lake plus the forced evaporation from operating the once-through cooling systems of Units 1 and 2.

The initial value problem defined by Equation 2.4.11-1 is solved by the finite-difference method. Using subscript *n* and *n+1* to represent the beginning and end of any given time period, Equation 2.4.11-1 can be written as:

$$\frac{S_{n+1} - S_n}{\Delta t} = I_n + O_n \quad (2.4.11\text{-}4)$$

and rearranged to yield:

$$S_{n+1} = (I_n - O_n)\Delta t + S_n \quad (2.4.11\text{-}5)$$

S_{n+1} is a function of reservoir elevation, h, which can be obtained from the reservoir's elevation-storage relationship. Equation 2.4.11-5 is solved first for S_1 given the initial conditions at $t = 0$. The computation is then repeated for succeeding time steps.

Required model input includes the relationship between water surface elevation and lake storage, the relationship between water surface elevation and lake outflow, the inflow time history to Lake Anna, and the time histories of evaporative losses from the lake and the wet cooling towers. The bases for assigning these input data are described below.

The relationship between water surface elevation and storage is derived from the elevation-volume curves for the North Anna Reservoir and the WHTF. These curves were added to yield a single elevation-storage curve for the entire Lake Anna for the purpose of this water budget study.

Table 2.4-213 summarizes the storage volumes at Elevations 239.14, 249.14, and 259.14 ft NAVD88 (240, 250 and 260 ft NGVD29). These storage volumes do not reflect the storage volumes used in the Lake Anna PMF analysis and shown on SSAR Figure 2.4-10. As discussed in SSAR Section 2.4.3.3, portions of the WHTF storage volume were not included in the Lake Anna PMF Analysis. A quadratic equation was fitted to the values for interpolating between elevations. The estimated storage volume of 305,100 acre-ft at 249.14 ft NAVD88 (250 ft NGVD29) lake level used in the water budget model is slightly higher (by 0.03 percent) than the 305,000 acre-ft volume reported in the Units 1 and 2 UFSAR Section 2.4.1.2 (SSAR Reference 1). This small difference is not expected to have any impact on any of the hydrologic and water use evaluations.

The operating rule curve implemented in the model, which relates water surface elevation to dam releases, was developed as follows. For lake levels less than or equal to 249.39 ft NAVD88 (250.25 ft NGVD29), a minimum instantaneous release from the Lake Anna impoundment of 40 cfs is maintained. When the lake level drops to 247.14 ft NAVD88 (248 ft NGVD29) or below releases can be incrementally reduced to a 20 cfs minimum (SSAR Reference 7). For lake levels greater than or equal to 249.39 ft NAVD88 (250.25 ft NGVD29), it is assumed that any inflow in excess of the evaporative losses is released, provided the minimum release requirements are met. The inflow time history to Lake Anna was calculated by a reverse routing procedure using observed Lake Anna releases and water levels and estimated pre-operational evaporation. This procedure was adopted because only a small fraction of the Lake Anna watershed is gauged as described in SSAR Section 2.4.1. The inflow to Lake Anna is calculated by solving Equation 2.4.11-4 for I_n,

or:

$$I_n = \frac{S_{n+1} - S_n}{\Delta t} + O_n \qquad (2.4.11\text{-}6)$$

This calculation requires the time histories for storage, S, and outflow, O. The storage time history was determined using the available period of record for lake level observation, which extends from October 1, 1978, through October 31, 2007. Lake levels, h, were related to S through quadratic interpolation of the values summarized in Table 2.4-213. According to Equation 2.4.11-3, O includes the historical releases from the Lake Anna Dam, and the historical rate of Lake Anna evaporation

associated with operation of the existing units. Historical releases from the dam from October 1, 1978, through October 9, 1995, have been derived from the Partlow stream gauging station, which is approximately one-half mile downstream of the dam. Stream gauging at this station was discontinued on October 10, 1995. Releases from October 10, 1995, through October 31, 2007 were, therefore, estimated from the historical gate openings and associated rating curves for the Lake Anna Dam. The determination of historical lake evaporation is described below.

Historical evaporation from Lake Anna was estimated using the Lake Anna Cooling Pond Model developed by the Massachusetts Institute of Technology (References 2.4-221 and 2.4-222). This model calculates, as part of the heat balance, the heat lost to the atmosphere due to evaporation and the associated evaporation rate on a daily basis for the control volumes used to represent the main ponds in the WHTF and the North Anna Reservoir. The model assumes a constant lake level at 249.14 ft NAVD88 (250.0 ft NGVD29). The thermal model also includes a number of side arms for which the model does not provide the evaporation rates directly.

To determine these evaporation rates, an exponentially decreasing function is used to represent the temperature distribution in the surface layer of each side arm based on the entrance and return flow temperatures predicted by the thermal model. Using the mean value of this function to assign a characteristic temperature for the entire side arm, side arm evaporation is calculated using the Ryan-Harleman function (Reference 2.4-223). The pre-operational evaporative loss, $O_{Preop-Evap}$, is then determined as the sum of the values calculated directly by the thermal model for the ponds and those calculated for the side arms. Note that this time series was estimated using the historical waste heat load from Units 1 and 2.

For predictive purposes, the evaporative losses associated with Units 1 and 2, which use once-through cooling systems, have been determined on a daily basis using the thermal model following the methodology described above. The calculated evaporation rates have been corrected to reflect 93 percent plant capacity factor for the existing units and averaged to obtain weekly values for use in the water budget model. The corresponding waste heats loads are 1.26×10^{10} Btu per hour for Units 1 and 2 combined.

Evaporative losses from Unit 3 were determined as follows:

Evaporation rates from Unit 3's wet cooling towers were calculated on a daily basis as a function of air temperature and relative humidity, using performance data supplied by a cooling tower vendor, and a waste heat load of 1.03×10^{10} Btu/hour from the circulating and plant service water systems.

Evaporation rates were determined for plant operation in the Energy Conservation (EC) and Maximum Water Conservation (MWC) modes. In the EC mode, which applies when lake levels are at or above Elevation 249.14 ft NAVD88 (250 ft NGVD29), Unit 3's CIRC wet cooling towers are used to dissipate 100 percent of the waste heat from the main condenser. When lake levels fall below Elevation 249.14 NAVD88 (250 ft NGVD29) for seven successive days in the model prediction, the plant is assumed to be operated in the MWC mode, wherein the dry towers would be used to dissipate a minimum of about one-third of the waste heat and the wet towers would be used to dissipate the remaining waste heat. For any given time step, the determination of whether Unit 3 would be in an EC or MWC mode of operation was made based on the lake elevation from the previous time step. The CIRC cooling tower evaporation rates were combined with those from the PSWS, corrected to reflect a 96 percent plant capacity factor for Unit 3, and averaged to obtain weekly values for use in the water budget model.

The minimum calculated Lake Anna water levels for the Two Unit and Three Unit scenarios are 244.2 and 243.5 ft NAVD88 (245.1 and 244.4 ft NGVD29), respectively. The durations of low lake water levels from the analysis are shown in Table 2.4-6R. The minimum operating level for existing Units 1 and 2 and for Unit 3 (Elevation 241.14 ft NAVD88 (242.0 ft NGVD29)) is below the minimum lake level predicted under the Three Unit scenario. Therefore, there are no impacts of low-flow conditions on the operation of either the existing Units 1 and 2 or Unit 3.

2.4.11.5 Plant Requirements

The last sentence of the first paragraph in this SSAR Section is supplemented as follows with information on water withdrawals for emergency cooling.

Lake Anna is not relied on as a safety-related water supply for emergency cooling and does not serve as the UHS.

This SSAR section is supplemented as follows with information on the operational modes for the circulating water cooling system (CIRC) with respect to low water conditions.

NAPS ESP COL 2.4-10

The Unit 3 CIRC operates in either of two operating modes:

- Energy Conservation (EC)—The dry cooling array is bypassed and cooling water is circulated directly to the hybrid tower with a provision for cold weather bypass.
- Maximum Water Conservation (MWC)—The dry cooling tower and hybrid cooling tower operate in series with a provision for cold weather bypass.

Generally, when the North Anna Reservoir water level is at or above Elevation 249.14 ft NAVD88 (250 ft NGVD29) at the dam, and adequate reservoir discharge is being maintained, the EC mode is used. However, if the reservoir water level falls below Elevation 249.14 ft NAVD88 (250.0 ft NGVD29) and is not restored within a reasonable period of time, the MWC mode is used. While in the MWC mode, the dry tower fans may be turned off to provide additional electrical output during hours of peak demand. Normal operation water demands for the CIRC are described in Section 10.4.5.2.1.

As discussed in Section 2.4.14, Unit 3 will be required to shut down when the water level in Lake Anna decreases below Elevation 241.14 ft NAVD88 (242.0 ft NGVD29).

2.4.11.6 Heat Sink Dependability Requirements

This SSAR section is supplemented as follows with information on the effect of low water conditions on the UHS.

NAPS COL 2.0-22-A

The Unit 3 UHS is described in DCD Section 9.2.5. Lake Anna is not relied on as a safety-related source of water withdrawals for emergency cooling.

2.4.12 Groundwater

NAPS COL 2.0-23-A

The information needed to address DCD COL Item 2.0-23-A is included in SSAR Section 2.4.12, which is incorporated by reference with the following supplements and variances.

2.4.12.1.2 Local Hydrogeology

The third paragraph of this SSAR section is supplemented as follows based on additional borings.

NAPS COL 2.0-23-A

Borings drilled as part of the ESP subsurface investigation program (SSAR Appendix 2.5.4B) and the Unit 3 subsurface investigation programs (Appendices 2.5.4AA, 2.5.4BB, and 2.5.4CC) penetrated saprolite with a maximum thickness of 114 ft and a median thickness of 37 ft. The saprolite penetrated by these borings is generally described as a clayey silt, silty sand and sand, with occasional (less than 10 percent) rock fragments grading to silty fine to course sand with some (between 10 and 50 percent) rock fragments and traces of clay.

The fifth paragraph of this SSAR section is supplemented as follows with information on additional groundwater level measurements data.

Groundwater at the Unit 3 site occurs in unconfined conditions in both the saprolite and underlying bedrock. The results of previous investigations at the site indicate that a hydrologic connection exists between the saprolite and the bedrock. (SSAR Reference 45) This condition has been confirmed as part of the ESP and Unit 3 subsurface investigation programs (SSAR Appendix 2.5.4B and Appendices 2.5.4AA, 2.5.4BB, and 2.5.4CC) by the presence of nearly equal water level elevations recorded in the following observation well pairs: OW-845 and OW-846; OW-841 and OW-951; OW-848 and OW-950; and OW-842 and OW-949. (Figure 2.4-205). The wells are installed adjacent to each other, one sealed in the bedrock and the other in the saprolite. Water level elevations are provided in Table 2.4-15R. At the Unit 3 site, the water table is considered to be a subdued reflection of the ground surface and, therefore, the direction of groundwater movement is toward areas of lower elevations (SSAR Reference 45). Measurements made between December 2002 and November 2007 in observation wells at the site exhibit water level elevations ranging from about Elevation 237 ft NAVD88 (237.86 ft NGVD29) to Elevation 314 ft NAVD88 (314.86 ft NGVD29), with corresponding ground surface elevations of about Elevation 283 ft NAVD88 (283.86 ft NGVD29) and Elevation 335 ft NAVD88 (335.86 ft NGVD29), respectively (Table 2.4-15R). The measurements shown in Table 2.4-15R characterize short-term seasonal variability in the site water levels. Figure 2.4-205 presents hydrographs

based on the water levels provided in this table for the 16 observation wells (OW-841 through OW-849, OW-901, OW-945 through OW-947, and OW-949 through OW-951) installed during the ESP and Unit 3 subsurface investigation programs and three monitoring wells (P-10, P-14, and P-18) previously installed for Units 1 and 2. The other wells being monitored (P- and WP-) were installed previously for Units 1 and 2 groundwater monitoring purposes around the SWR and the ISFSI, respectively. Figure 2.4-206 shows the locations of the observation wells.

Piezometric head contour maps (Figure 2.4-207 through Figure 2.4-214b), prepared using water levels measured from December 2002 through November 2007 (Table 2.4-15R), indicate that groundwater flow is generally to the north and east, toward Lake Anna. Freshwater Creek and Elk Creek, both of which flow to Lake Anna, form hydrologic boundaries to the west and south of the site, respectively (SSAR Reference 46). Because the water levels in the observation wells are generally above the top of the well screen, the water level elevation represents the piezometric head. An evaluation of the piezometric head contours shown on Figure 2.4-207 through Figure 2.4-214b, and using the maximum groundwater level observed in OW-901 (Elevation 289 ft NAVD88 (289.86 ft NGVD29)) and the minimum level observed in OW-950 (Elevation 237 ft NAVD88 (237.86 ft NGVD29)), with a distance

NAPS ESP VAR 2.0-3

between the two wells of 1,131 ft, results in a calculated hydraulic gradient toward Lake Anna of about 5 ft per 100 ft.

The eighth paragraph of this SSAR section is supplemented as follows with information on hydraulic conductivity values.

Thirteen groundwater observation wells installed at the site as part of the ESP and Unit 3 subsurface investigation programs were tested using the slug test method to determine hydraulic conductivity values for the saprolite and underlying shallow bedrock (SSAR Appendix 2.5.4B and Appendices 2.5.4AA, 2.5.4BB, and 2.5.4CC). In addition, borehole packer tests were conducted in the bedrock at selected Unit 3 observation well locations as an alternate method for determining hydraulic conductivity in the bedrock. Tests in only one well boring (OW-949) produced flow results at all pressures. Hydraulic conductivities

NAPS ESP VAR 2.0-2

calculated for the saprolite, based on tests in eleven wells, range from 0.076 to 3.017 m/day (0.25 to 9.9 ft/day), with a geometric mean of 0.53 m/day (1.74 ft/day). The hydraulic conductivity of the shallow

bedrock, as determined from tests in two wells, is estimated to range from 0.152 to 1.920 m/day (0.5 to 6.3 ft/day) with a geometric mean of 0.625 m/day (2.05 ft/day). Table 2.4-16R summarizes the hydraulic conductivity data.

The ninth paragraph in this SSAR section is supplemented as follows with information on additional geotechnical data and calculations of void ratio and total porosity.

NAPS ESP VAR 2.4-1

Bulk densities for the bedrock range from 23.56 kN/m^3 (150 pounds per cubic foot (pcf)) for highly weathered rock to 25.76 kN/m^3 (164 pcf) for slightly weathered to fresh rock (Table 2.5.4-208). Laboratory tests to determine the moisture content of saprolite samples indicate a median moisture content of about 17 percent (Table 2.5.4-208). Laboratory tests to determine the specific gravity of saprolite samples indicate a median specific gravity of 2.65 (Appendix 2.5.4AA). Using the median moisture content of 17 percent and a value of 2.65 for the specific gravity of the saprolite, the void ratio of the saprolite is estimated to be about 0.45. The void ratio is defined as the ratio of the volume of the voids to the volume of the solids and for a fully saturated soil is calculated as follows (Reference 2.4-205):

Void Ratio = moisture content × specific gravity

Using a void ratio of 0.45 for the saprolite, the total porosity is estimated to be about 31 percent. The porosity is defined as the ratio of the volume of the voids to the total volume of the soil. The void ratio and porosity are inter-related as follows (Reference 2.4-205):

Total Porosity = void ratio / (1 + void ratio)

Using a total porosity of 0.31, an effective porosity of about 25 percent is estimated based on 80 percent of the total porosity (Reference 2.4-224).

The tenth paragraph of this SSAR section is supplemented as follows with information on calculations of seepage velocity and travel time.

Based on the estimated hydraulic gradient, hydraulic conductivity, and effective porosity indicated above, groundwater beneath the Unit 3 site is expected to flow toward Lake Anna at a rate of about 0.35 ft/day. This

groundwater seepage velocity is calculated as follows (Reference 2.4-206):

Seepage Velocity = (hydraulic conductivity × hydraulic gradient) / effective porosity

Travel time is defined as the time it takes the groundwater to move a set distance and is calculated as follows:

Travel Time = distance / velocity

Using a distance of approximately 304.8 m (1000 ft) between the Unit 3 radwaste building and the closest point along the shoreline of Lake Anna (Unit 3 intake), the groundwater travel time is estimated to be about 7.8 years. From the condensate storage tank, using a distance of approximately 770 ft between the tank and the closest point along the shoreline of Lake Anna (Unit 3 intake), the groundwater travel time is approximately 6 years.

2.4.12.1.3 Plant Groundwater Use

The first paragraph of this SSAR section is supplemented as follows with information on the number and allocation of water supply wells at the site.

NAPS COL 2.0-23-A

Groundwater withdrawal for use by Units 1 and 2 is accomplished from three water supply wells permitted for public use by the Virginia Department of Health (VDH). These three wells (Nos. 4 (new), 6, and 7) comprise a single water supply system at the site. A separately permitted North Anna Nuclear Information Center (NANIC) well provides the water supply for the NANIC, while a fifth well provides water to the security training building. A sixth well is used to supply water to the Metrology/Environmental laboratory. Two other site wells (Number 2 and old Number 4) are not normally used, but are available, if needed. Well Number 3A is scheduled to be abandoned in accordance with Virginia regulations. The locations of these wells are shown on Figure 2.4-215 and the wells are described in Table 2.4-17R.

The second paragraph of this SSAR section is supplemented as follows with information on the individual and total capacities of the primary

groundwater supply system wells for Units 1 and 2 (Nos. 4 (new), 6, and 7).

The three wells comprising the primary groundwater supply system for Units 1 and 2 have individual capacities ranging from 0.166 to 0.235 m^3/min (44 to 62 gpm) and a total capacity of 0.609 m^3/min (161 gpm). These three wells are permitted by the VDH for a total design capacity of 487.56 m^3/min (128,800 gpd), or about 0.337 m^3/min (89 gpm), based on a determination of the wells' capacity to supply an equivalent population of 3680 employees. Well Number 2 has a reported capacity of 0.034 m^3/min (9 gpm) and old Number 4 has a reported capacity of 0.204 m^3/min (54 gpm). (Reference 2.4-207)

The third paragraph of this SSAR section is supplemented as follows with information on the monthly groundwater withdrawal quantities of the primary groundwater supply system wells for Units 1 and 2 (Nos. 4 (new), 6, and 7).

Table 2.4-205 shows the monthly withdrawal quantities that were reported for the year ending December 31, 2006. It can be determined from this table that the primary wells withdrew a combined average of almost 0.027 m^3/min (7.25 gpm) for the year. The highest total monthly withdrawal in 2006 for the combined wells averaged almost 0.053 m^3/min (14 gpm) in March. (Reference 2.4-208)

The fourth paragraph of this SSAR section is supplemented as follows with information to explicitly state that groundwater is not used for safety-related purposes.

Any groundwater supply required by Unit 3 will not be used for safety-related purposes and will come from the existing wells or from drilling additional wells.

2.4.12.3 Monitoring of Safeguard Requirements

The fifth and sixth paragraphs of this SSAR section are supplemented as follows with information on the groundwater monitoring program required during and following construction of the plant.

NAPS COL 2.0-23-A

Because the Units 1 and 2 groundwater monitoring wells were not considered to be of sufficient areal extent to determine groundwater

levels beneath the Unit 3 site, nine additional observation wells were installed as part of the ESP subsurface investigation program and seven additional observation wells were installed as part of the Unit 3 subsurface investigation program. Water levels in these 16 wells and 10 of the Units 1 and 2 monitoring wells (Table 2.4-15R) were measured between December 2002 and November 2007 to provide data on groundwater flow direction, gradient, and seasonal groundwater level fluctuations at the site.

Prior to site earthwork activities, some observation wells will need to be abandoned. As discussed in Section 2.5.4.5.1, the design plant grade elevation for Unit 3 is 290 ft NAVD88 (290.86 ft NGVD29). To achieve this elevation, excavation will be required in the southern portion of the power block area while lower areas to the north will need to be filled. As a result, existing observation wells in these and other areas of the site will be abandoned prior to the start of earthwork activities. An evaluation of the existing observation well locations will be performed to determine which wells will be abandoned and if any new wells will be required to establish an adequate monitoring network for the evaluation of impacts on site groundwater levels during plant construction. Abandoned wells will be grouted in compliance with Virginia regulations.

Evaluation of the groundwater monitoring program will include a review of the frequency with which groundwater level measurements are made in the observation wells. Groundwater levels in all or selected wells will be measured on a monthly basis for the duration of any temporary dewatering activities, and on a quarterly basis thereafter for two years following the completion of construction. Groundwater levels will then be measured on a semi-annual or annual basis during plant operation.

2.4.12.4 Design Bases for Subsurface Hydrostatic Loading

The first paragraph of this SSAR section is supplemented as follows with information on the design plant grade elevation for Unit 3.

NAPS COL 2.0-23-A

This maximum groundwater level means that a permanent dewatering system is not needed for safe operation of Unit 3, based on the groundwater design bases for safety-related SSCs as described in DCD Section 3.4.1 and the comparison with the DCD site parameter value for maximum groundwater level as shown in Table 2.0-201.

The third paragraph of this SSAR section is supplemented as follows with information on the maximum groundwater level for hydrostatic loading purposes.

Construction of Unit 3 at a design plant grade elevation of 290 ft NAVD88 (290.86 ft NGVD29), 5.8 m (19 ft) higher than that of Units 1 and 2, will result in the maximum groundwater level in this area being higher than that previously estimated in the SSAR. The pre-construction ground surface in the Unit 3 power block area ranges in elevation from about 318 ft NAVD88 (318.86 ft NGVD29) (B-919) to 272 ft NAVD88 (272.86 ft NGVD29) (B-928) and the piezometric head contour maps (Figure 2.4-207 through Figure 2.4-214b) indicate that groundwater level elevations in this area range from about 300 to 265 ft NAVD88 (300.86 to 265.86 ft NGVD29).

As discussed in Section 2.5.4.5.1, the Unit 3 design plant grade elevation will be achieved by excavation in the southern portion of the power block area and filling in lower areas to the north. A 3-horizontal to 1-vertical (3H:1V) slope will be cut into the existing natural ground surrounding the southern and eastern sides of the plant area.

Because earthwork and construction associated with Unit 3 will alter the existing groundwater levels within the power block area, a numerical groundwater flow model was constructed to evaluate these effects and determine maximum post-construction groundwater levels beneath the power block area. The groundwater model was developed using site-specific hydrogeologic and hydrologic data and the computer code Groundwater Vistas version 6.07 (Reference 2.4-209). The post-construction piezometric head contour map (Figure 2.4-216) indicates that maximum groundwater level elevations in the power block area range from about 270 to 284 ft NAVD88 (270.86 to 284.86 ft NGVD29). The maximum groundwater level elevation in the power block area around Seismic Category I structures is approximately 282.6 ft NAVD88 (283.46 ft NGVD29) or 7.4 ft below the design plant grade elevation of 290 ft NAVD88 (290.86 ft NGVD29), and occurs at the southern edge of the Fuel Building. This maximum groundwater level means that a permanent dewatering system is not needed for safe operation of Unit 3, based on the groundwater design bases for safety-related SSCs as described in DCD Section 3.4.1 and the

comparison with the DCD site parameter value for maximum groundwater level as shown in Table 2.0-201.

2.4.13 Accidental Releases of Liquid Effluents to Ground and Surface Waters

NAPS COL 2.0-24-A

The information needed to address DCD COL Item 2.0-24-A is included in SSAR Section 2.4.13, which is incorporated by reference with the following supplements.

The purpose of this section is to provide a conservative analysis of a postulated, accidental release of radioactive liquid effluents to the environment at the Unit 3 site. The accident scenario is described. The model used to evaluate radionuclide transport is presented, along with potential pathways of contamination to water users. The radionuclide transport analysis is described, and the results are summarized. The radionuclide concentrations and associated doses to which a water user might be exposed are compared against the regulatory limits.

2.4.13.1 Accident Source

An evaluation of tanks outside of containment containing radioactive liquid effluent was performed to identify the tank whose postulated failure could release the most radioactivity to the environment. Tanks from the Liquid Waste Management System (LWMS) and the Condensate Storage & Transfer System (CS&TS) were evaluated.

Mitigating design features considered acceptable by BTP 11-6 (Reference 2.4-210) and DC/COL-ISG-013 (Reference 2.4-225) are incorporated into the design of Unit 3 to preclude an accidental release of liquid effluents. Descriptions of these features are also included below.

LWMS tanks containing radioactivity are located on levels B1F and B2F of the Radwaste Building. The Radwaste Building is designed in accordance with RG 1.143 and according to seismic requirements as specified in DCD Table 3.2-1. In addition, compartments containing high level liquid radwaste are steel lined up to a height capable of containing the release of all liquid radwaste in the compartment. Releases as a result of major cracks in tanks result in the release of the liquid radwaste to the compartment and then to the building sump system for containment in other tanks or emergency tanks. Based on the LWMS tank ranking using activity concentrations and volumes identified in DCD Tables 12.2-13a through 12.2-13g, the Equipment Drain Collection Tank

contains the highest activity of any LWMS tank. However, the mitigating design features described above preclude a release of the contents of the Equipment Drain Collection Tank, or any LWMS tank, to the environment.

The Condensate Storage Tank (CST), part of the CS&TS, is the largest above-grade tank that contains radioactivity outside of containment. The CS&TS, described in DCD Section 9.2.6, meets GDC 60 by compliance with RG 1.143, Position C.1.2 for design features provided to control the release of liquid effluents containing radioactive material. The basin surrounding the tank is designed to prevent uncontrolled runoff in the event of a tank failure. The basin volume is sized to contain the total tank capacity. Tank overflow is also collected in this basin. A sump located inside the retention basin has provisions for sampling collected liquids prior to routing them to the LWMS or the storm sewer as per sampling and release requirements. These design features are intended to preclude the uncontrolled release of liquids from the CST to the environment via the liquid pathway.

NAPS ESP PC 3.E(3) The mitigating design features described above demonstrate that the radioactive waste management systems, structures, and components for Unit 3, as defined in RG 1.143, include features to preclude accidental releases of radionuclides into potential liquid pathways. Nevertheless, in accordance with SRP 11.2, an analysis of accidental releases of radioactive liquid effluent to the environment is performed. Descriptions and results of these analyses are provided herein.

Based on the ranking of tanks and applicable mitigating design features discussed above, the CST is used as the source in the analysis of an accidental release of liquid effluent to the environment. The radionuclide concentrations expected to be present in the CST are as shown in Table 2.4-206.

2.4.13.2 **Conceptual Model**

As indicated above, the CST is assumed to be the source of the release, with a capacity of 1,290,480 gallons and radionuclide concentrations as shown in Table 2.4-206. The CST is at grade elevation of about 289.5 ft NAVD88 (290.36 ft NGVD29) to the west of the northern portion of the

Turbine Building (Figure 2.4-219). The tank is postulated to rupture, and 80 percent of the liquid volume (1,032,500 gal) is assumed to be released following the guidance provided in BTP 11-6. Following the tank rupture, it is assumed that the basin surrounding the CST contains the released volume and a pathway is created that allows the entire 1,032,500 gallons to enter the groundwater (unconfined aquifer) instantaneously.

2.4.13.2.1 Surface Water Pathway

Because the basin surrounding the CST would contain the released volume, precluding an uncontrolled release directly to surface waters, only a postulated release to groundwater is considered. As described above, the CS&TS, which includes the CST, is designed in accordance with RG 1.143.

2.4.13.2.2 Groundwater Pathway

With the postulated instantaneous release of the contents of the CST to groundwater, radionuclides enter the unconfined aquifer and migrate with the groundwater in the direction of decreasing hydraulic head. Hydraulic head contour maps for the unconfined aquifer presented in Figures 2.4-207 through 2.4-214b indicate that the groundwater pathway from the CST is north-northeast toward Lake Anna, a groundwater discharge area. In particular, the hydrogeologic data suggest that the groundwater pathway terminates in the Unit 3 intake channel (i.e., the portion of Lake Anna enclosed by the cofferdam). The flow path is assumed to be a straight line between the CST and the south edge of the intake channel, a distance of about 770 ft based on Figure 2.4-219. This assumed flow path is consistent with that predicted using the post-construction groundwater flow model developed for Unit 3 (Figure 2.4-220). As indicated in Section 2.4.12.1.2, groundwater flow occurs in both the saprolite and underlying, shallow bedrock. During saturated zone transport, radionuclide concentrations of the liquid released to the groundwater are reduced by the processes of adsorption, hydrodynamic dispersion, and radioactive decay.

As described in Section 2.4.12.1.3, there is an existing water-supply well in the power block area (Well No. 2 on Figure 2.4-215). This well is upgradient of a postulated release from the CST and will be closed and grouted to accommodate the construction of Unit 3. There are no other

existing water-supply or monitoring wells between the postulated release point and Lake Anna.

Lake Anna serves as a groundwater discharge area for the unconfined aquifer. The radionuclides associated with a liquid release would enter the surface water system via Lake Anna. The portion of Lake Anna closest to the release point is the cove (i.e., Unit 3 intake channel) that was created for the abandoned Units 3 and 4. As shown in Figure 2.4-204, the water-supply intake for Unit 3 is at the end of the intake channel, which is physically separated from the rest of the lake by a cofferdam, but hydraulically connected to the lake by a set of culverts. The intake provides make-up water to the normal plant circulating water and service water cooling systems, and supplies water to the station water system for demineralized water and fire protection use. Because flow through the intake channel is induced when Unit 3 is operating, the subsequent surface water pathways for any radionuclides discharged with the groundwater to the intake channel depend on the operating status of the plant.

Once the released contents reach the intake channel, two scenarios are considered: Unit 3 not operating (primary conceptual model) and Unit 3 operating (alternate conceptual model).

2.4.13.2.2.1 **Primary Conceptual Model - Unit 3 Not Operating**

For the primary conceptual model, in which the plant is not operating, any contaminated groundwater discharging to Lake Anna would simply be mixed and diluted with surface water in the intake channel. Because the intake channel communicates with the rest of the lake by the cofferdam culverts, hydraulic interaction between the two surface water bodies would occur only when there are changes in lake level or during runoff events. Therefore, for the primary conceptual model, it is assumed that the release is completely mixed within the volume of water in the intake channel.

For the primary conceptual model, compliance is demonstrated at the culverts that connect the Unit 3 intake channel to a controlled portion of Lake Anna (Figure 2.4-204). Note that the intake channel is approximately 4000 ft from the Exclusion Area Boundary (EAB) (Figure 2.1-1R), which is designated as the compliance point in the context of 10 CFR 20. If the release were to leave the intake channel through the culverts, it would undergo further mixing and dilution,

producing lower concentrations. Therefore, demonstrating compliance within the intake channel is conservative.

The operating status of Units 1 and 2 is ignored in this analysis because this conceptual model assumes the entire plant is not operating. Units 1 and 2 (if operating) would impact the analysis only when surface water leaves the intake channel by further mixing and diluting the postulated release. Therefore, because the primary conceptual model demonstrates compliance prior to water exiting the intake channel, effects of Units 1 and 2 operation are not considered.

2.4.13.2.2.2 **Alternate Conceptual Model - Unit 3 Operating**

For the alternate conceptual model, in which Unit 3 is operating, any contaminated groundwater discharging to the intake channel would be abstracted from the lake by the water-supply intake for Unit 3. Any radionuclides introduced into the make-up water systems ultimately would be discharged with the cooling tower blowdown to the discharge canal. This blowdown discharge would be mixed and diluted with surface water in the discharge canal. The discharge canal is hydraulically connected to the WHTF, which in turn discharges to Lake Anna through Dike 3. Any radionuclides released from the discharge canal would undergo additional mixing and dilution in the WHTF as well as Lake Anna prior to discharge from the North Anna Dam to North Anna River.

As described in SSAR Section 2.1.1.3, the liquid effluent release limits for Unit 3 apply at the end of the discharge canal, which is designated as the release point to unrestricted areas in the context of 10 CFR 20. This would be the compliance point if Unit 3 were operating. The operating status of Units 1 and 2 is ignored in this analysis because the radionuclide concentrations are determined just prior to being discharged as blowdown (from Unit 3) to the discharge canal. Units 1 and 2 operation would only provide additional dilution in the discharge canal.

As noted in ESP-ER Table 2.3-4, the Doswell Water Treatment Plant is the nearest and only municipal water system currently supplied from the North Anna River. The treatment plant is about 20 miles downstream of the North Anna Dam and near the confluence with the Little River.

2.4.13.3 Radionuclide Transport Analysis

A radionuclide transport analysis has been conducted to estimate the radionuclide concentrations that might expose existing and future water users based on an instantaneous release of the radioactive liquid from

the CST. Analysis of liquid effluent release commences with a screening model, using demonstratively conservative assumptions and coefficients. Radionuclide concentrations resulting from the screening analysis are then compared against the effluent concentration limits (ECLs) identified in 10 CFR 20, Appendix B, Table 2, Column 2, to determine acceptability. Further analysis, using more realistic modeling techniques, is conducted for the radionuclides of interest as identified in the screening analysis. Finally, the resulting radionuclide concentrations are used to calculate total dose. The total dose is compared to the 10 CFR 20.1301 dose limit for a member of the public discussed in DC/COL-ISG-013 (Reference 2.4-225).

2.4.13.3.1 Methodology

This analysis accounts for the parent radionuclides assumed present in the CST plus progeny radionuclides that are generated subsequently during transport. The analysis considered all progeny in the decay chain sequences that are important for dosimetric purposes. International Commission on Radiation Protection (ICRP) Publication 107 (Reference 2.4-211) was used to identify the member for which the decay chain sequence can be truncated. For some of the radionuclides assumed present in the CST, consideration of up to three members of the decay chain sequence was required. The derivation of the equations governing the transport of the parent and progeny radionuclides follows.

Transport of the parent radionuclide along a groundwater pathline is governed by the advection-dispersion-reaction equation (Reference 2.4-212), which is given as equations and associated citations renumbered to 2.4.13-1 through 2.4.13-19]:

$$R\frac{\partial C}{\partial t} = D\frac{\partial^2 C}{\partial x^2} - v\frac{\partial C}{\partial x} - \lambda RC \qquad (2.4.13\text{-}1)$$

where: C = radionuclide concentration in terms of atom density; R = retardation factor; D = coefficient of longitudinal hydrodynamic dispersion; ν = average linear velocity; and λ = radioactive decay constant. The retardation factor is defined from the relationship:

$$R = 1 + \frac{\rho_b K_d}{n_e} \qquad (2.4.13\text{-}2)$$

where: ρ_b = bulk density; K_d = distribution coefficient; and n_e = effective porosity. The average linear velocity is determined using Darcy's law, which is:

$$v = -\frac{K}{n_e}\frac{dh}{dx} \quad (2.4.13\text{-}3)$$

where: K = hydraulic conductivity; and dh/dx = hydraulic gradient. The radioactive decay constant can be written as:

$$\lambda = \frac{\ln 2}{t_{1/2}} \quad (2.4.13\text{-}4)$$

where: $t_{1/2}$ = radionuclide half-life.

Using the method of characteristics approach described in Reference 2.4-213, the material derivative of concentration can be written as:

$$\frac{dC}{dt} = \frac{\partial C}{\partial t} + \frac{dx}{dt}\frac{\partial C}{\partial x} \quad (2.4.13\text{-}5)$$

Conservatively neglecting hydrodynamic dispersion, the characteristic equations for Equation 2.4.13-1 can be expressed as follows:

$$\frac{dC}{dt} = -\lambda C \quad (2.4.13\text{-}6)$$

$$\frac{dx}{dt} = \frac{v}{R} \quad (2.4.13\text{-}7)$$

The solutions of the system of equations comprising Equation 2.4.13-6 and Equation 2.4.13-7 can be obtained by integration to yield the characteristic curves of Equation 2.4.13-1. For the parent radionuclide, the equations representing the characteristic curves can be obtained as:

$$C_1 = C_{10}\exp(-\lambda_1 t) \quad (2.4.13\text{-}8)$$

$$t = R_1 L / v \quad (2.4.13\text{-}9)$$

where: C_1 = activity concentration of the parent radionuclide; C_{10} = initial activity concentration of the parent radionuclide; λ_1 = radioactive decay constant for the parent radionuclide; R_1 = retardation factor for the parent radionuclide; and L = groundwater pathline length.

Similar relationships exist for progeny radionuclides. For the first progeny in the decay chain, the advection-dispersion-reaction equation is:

$$R_2\frac{\partial C_2}{\partial t} = D\frac{\partial^2 C_2}{\partial x^2} - v\frac{\partial C_2}{\partial x} + d_{12}\lambda_1 R_1 C_1 - \lambda_2 R_2 C_2 \quad (2.4.13\text{-}10)$$

where: subscript 2 denotes the first progeny radionuclide; and d_{12} = fraction of parent radionuclide transitions that result in production of progeny radionuclide. The characteristic equations for Equation 2.4.13-10, assuming $R_1 \approx R_2$ and again conservatively neglecting hydrodynamic dispersion, can be derived as:

$$\frac{dC_2}{dt} = d_{12}\lambda_1 C_1 - \lambda_2 C_2 \quad (2.4.13\text{-}11)$$

$$\frac{dx}{dt} = \frac{v}{R_2} \quad (2.4.13\text{-}12)$$

Recognizing that Equation 2.4.13-11 is formally similar to Equation B.43 of Reference 2.4-214, these equations can be integrated to yield an expression for the activity concentration of the first progeny radionuclide:

$$C_2 = K_1 \exp(-\lambda_1 t) + K_2 \exp(-\lambda_2 t) \quad (2.4.13\text{-}13)$$

$$t = R_2 L / v \quad (2.4.13\text{-}14)$$

for which:

$$K_1 = \frac{d_{12}\lambda_2 C_{10}}{\lambda_2 - \lambda_1}$$

$$K_2 = C_{20} - \frac{d_{12}\lambda_2 C_{10}}{\lambda_2 - \lambda_1}$$

The advection-dispersion-reaction equation for the second progeny in the decay chain is:

$$R_3 \frac{\partial C_3}{\partial t} = D \frac{\partial^2 C_3}{\partial x^2} - v \frac{\partial C_3}{\partial x} + d_{13}\lambda_1 R_1 C_1 + d_{23}\lambda_2 R_2 C_2 - \lambda_3 R_3 C_3 \quad (2.4.13\text{-}15)$$

where: subscript 3 denotes the second progeny radionuclide; d_{13} = fraction of parent radionuclide transitions that result in production of second progeny radionuclide; and d_{23} = fraction of first progeny radionuclide transitions that result in production of second progeny radionuclide. The characteristic equations for Equation 2.4.13-15, assuming $R_1 \approx R_2 \approx R_3$ and again conservatively neglecting hydrodynamic dispersion, can be derived as

$$\frac{dC_3}{dt} = d_{13}\lambda_1 C_1 + d_{23}\lambda_2 C_2 - \lambda_3 C_3 \quad (2.4.13\text{-}16)$$

$$\frac{dx}{dt} = \frac{v}{R_3} \quad (2.4.13\text{-}17)$$

Considering the formal similarity of Equation 2.4.13-16 to Equation B.54 of Reference 2.4-214, Equation 2.4.13-16 and Equation 2.4.13-17 can be integrated to yield an expression for the activity concentration of the second progeny radionuclide:

$$C_3 = K_1 \exp(-\lambda_1 t) + K_2 \exp(-\lambda_2 t) + K_3 \exp(-\lambda_3 t) \qquad (2.4.13\text{-}18)$$

$$t = R_3 L / v \qquad (2.4.13\text{-}19)$$

for which:

$$K_1 = \frac{d_{13}\lambda_3 C_{10}}{\lambda_3 - \lambda_1} + \frac{d_{23}\lambda_2 d_{12}\lambda_3 C_{10}}{(\lambda_3 - \lambda_1)(\lambda_2 - \lambda_1)}$$

$$K_2 = \frac{d_{23}\lambda_3 C_{20}}{\lambda_3 - \lambda_2} - \frac{d_{23}\lambda_2 d_{12}\lambda_3 C_{10}}{(\lambda_3 - \lambda_2)(\lambda_2 - \lambda_1)}$$

$$K_3 = C_{30} - \frac{d_{13}\lambda_3 C_{10}}{\lambda_3 - \lambda_1} - \frac{d_{23}\lambda_3 C_{20}}{\lambda_3 - \lambda_2} + \frac{d_{23}\lambda_2 d_{12}\lambda_3 C_{10}}{(\lambda_3 - \lambda_1)(\lambda_3 - \lambda_2)}$$

2.4.13.3.2 Screening Analysis

Using the methodology developed above, a screening analysis was performed considering advection and radioactive decay only to eliminate from consideration those radionuclides in the source term that would be well below the 10 CFR 20, Appendix B, Table 2 ECLs under very conservative modeling assumptions (i.e., no adsorption and no dispersion). For this limiting case, activity concentrations for parent and relevant progeny radionuclides were calculated at the point where liquid effluent from a postulated accidental release from the CST would discharge from the groundwater to Lake Anna. This point has been identified to be the Unit 3 intake channel (i.e., the portion of Lake Anna enclosed by the cofferdam) that will serve as the forebay for the Unit 3 makeup water intake, as discussed previously. This portion of the lake is within the restricted area as defined in SSAR Section 2.1.1.3 and illustrated on Figure 2.1-1R. Activity concentrations for the parent and first two progeny radionuclides at the point of groundwater discharge can be calculated from Equations 2.4.13-8, 2.4.13-13, and 2.4.13-18 with time, *t*, being equal to the groundwater travel time.

The groundwater travel time between the point of the postulated release and the point of discharge to the intake channel is calculated based on the following data:

Hydraulic conductivity, *K* = 9.9 ft/d

Hydraulic gradient, *dh/dx* = –0.050

Effective porosity, n_e = 0.25

Transport distance, L = 770 ft

The hydraulic conductivity value represents the maximum observed value for the site, based on test data summarized in Table 2.4-16R. The hydraulic gradient and effective porosity were established as described in Section 2.4.12.1.2.

Based on these values, Equation 2.4.13-3 is used to calculate the average linear velocity as:

$$v = -\frac{K}{n_e}\frac{dh}{dx} = \frac{9.9}{0.25} \times 0.050 = 1.98 \text{ ft/d}$$

Using Equation 2.4.13-9, the groundwater travel time is then:

$$t = L / v = 770 / 1.98 / 365 \text{ days/year} = 1.07 \text{ years}$$

A particle tracking simulation was conducted using the post-construction groundwater flow model developed for the site, as discussed in Section 2.4.12.4, to evaluate the flow path from a hypothetical release of liquid effluent from the CST. Particles were placed in each model cell under the footprint of the CST. The minimum travel time of a particle from the CST is approximately 18 years or approximately 17 times greater than the travel time assumed in this accidental release analysis. Figure 2.4-220 presents the particle traces simulated in the groundwater model. The travel time of 18 years is based on all the input parameter values used to develop the post-construction groundwater levels presented in Section 2.4.12 and an effective porosity value of 0.25. The difference in travel times between the groundwater model and the present transport calculation is primarily due to the difference in hydraulic conductivity values used in each of these two analyses. The calibrated hydraulic conductivity value in the northern part of the model domain, where the simulated particle pathlines are located, is about 1.14 ft/day, while the transport calculation uses the maximum measured hydraulic conductivity at the site, i.e., 9.9 ft/day. Therefore, the analysis presented in this transport calculation is conservative compared to an analysis based on the post-construction groundwater conditions predicted by the groundwater flow model.

2.4.13.3.2.1 **Considering Advection and Radioactive Decay Only**

Taking R_1=R_2=R_3=1 and using Equations 2.4.13-8, 2.4.13-13, and 2.4.13-18, as appropriate, the source term concentrations were decayed for a period of 1.07 years. Radioactive decay data and decay chain specifications were taken from NUREG/CR-5512 (Reference 2.4-214) and ICRP Publication 107 (Reference 2.4-211). Results are provided in Table 2.4-206, under the column heading "Advection and Decay" and include the groundwater concentration, *C*, at the point of discharge to Lake Anna and the ratio of groundwater concentration to the associated effluent concentration limit, *C*/ECL. Ratios of less than 1×10^{-6} were taken to be zero. Radionuclides for which the *C*/ECL value is greater than 1×10^{-6} include H-3, Mn-54, Fe-55, Fe-59, Co-58, Co-60, Ni-63, Zn-65, Sr-89, Sr-90, Y-90, Y-91, Zr-95, Nb-95, Ru-106, Ag-110m, Te-129m, Cs-134, Cs-137, Ce-144, and Pu-239 (shaded in Table 2.4-206), and are considered to be the radionuclides of interest for the purpose of assessing compliance with 10 CFR 20. The *C*/ECL values for the remaining radionuclides are so small that they do not play a role in assessing regulatory compliance, even when summed; these radionuclides were eliminated from further consideration.

2.4.13.3.2.2 **Considering Advection, Radioactive Decay and Adsorption**

The radionuclides of interest identified above were further evaluated considering adsorption in addition to advection and radioactive decay. Distribution coefficient, K_d, values were determined by laboratory analysis of site soil samples (Reference 2.4-219). Unit 3 does not require the use of (nor are there plans to use) chelating agents, which can alter radionuclide K_d values. For the purpose of assessing 10 CFR 20 compliance, each radionuclide was assigned its minimum site-specific K_d value as obtained by laboratory testing. Site-specified K_d values were determined for Mn, Fe, Co, Ni, Zn, Sr, Ru, Ag, Cs, Ce, and Pu for 20 saprolite and weathered rock samples. These samples were obtained from borings B-901, B-904, B-913, B-917, B-919, B-920, B-928, B-929, B-931, B-932, B-949, and B-951, the locations of which are shown on Figures 2.5.4-217 and 2.5.4-218. K_d values for these samples were determined using the batch method in accordance with ASTM D 4646-03 at Savannah River National Laboratory using site water obtained from the unconfined aquifer. The results are summarized in Table 2.4-207. Site-specific K_d values are not available for some radionuclides, including isotopes of yttrium (Y), rubidium (Rb), barium (Ba), rhodium (Rh),

zirconium (Zr), niobium (Nb), praseodymium (Pr), tellurium (Te), and neptunium (Np). In the case of the yttrium isotopes, Y-90, Y-91m, and Y-91, the K_d value was assumed to be the same as strontium, Sr-90 and Sr-91 serving as parent radionuclides. For Rb-89, the parent of Sr-89, the K_d value was assumed to be equal to that of Sr-89. The K_d value for Rh-106 was assumed to be the same as its parent, Ru-106. For Te, Zr and Nb, a K_d value of zero is assumed. The K_d value for Ba-137m was assumed to be the same as its parent, Cs-137. For Pr-144, a daughter product of Ce-144, its K_d value was assumed to be the same as for cerium. In the case of Np-239, the parent of Pu-239, its K_d value was assumed to be the same as for plutonium. For H-3, a component of water, the K_d value is zero by definition. The K_d values used in the transport analysis are provided in Table 2.4-206.

Retardation factors for the radionuclides of interest were calculated using Equation 2.4.13-2 with the K_d values as described above, an effective porosity of 0.25, and a bulk density of 1.83 g/cm^3. The bulk density was estimated using a soil grain specific gravity of 2.65 and total porosity of 0.31, which were determined on a site-specific basis (Section 2.4.12.1.2). The concentration of each radionuclide was then determined at the point of groundwater discharge to Lake Anna (i.e., Unit 3 intake channel) using Equations 2.4.13-8, 2.4.13-13, and 2.4.13-18, as necessary, and the appropriate initial concentration, decay rate, and retardation factor. Table 2.4-206 provides the results under the column heading “Advection, Decay, and Adsorption.” As before for the groundwater concentration (C) to ECL ratios, C/ECL values less than 1×10^{-6} were taken to be zero. Radionuclides for which the C/ECL value is greater than 1×10^{-6} include H-3, Co-60, Ni-63, Sr-90, Y-90, Zr-95, Nb-95, Te-129m, Cs-137, and Pu-239 (shaded in Table 2.4-206).

2.4.13.3.3 **Primary Conceptual Model**

If Unit 3 were not operating, constituents in groundwater discharging to Lake Anna would simply be mixed and diluted with surface water in the intake channel. This intake channel communicates with the rest of Lake Anna by cofferdam culverts as shown in Figure 2.4-204.

The radionuclide concentrations in the intake channel were determined by dividing the concentrations of the radionuclides of interest (Section 2.4.13.3.2.2) by a dilution factor, which is calculated as the volume of water in the intake channel divided by the released volume. This approach assumes complete mixing in the intake channel, that the

volume of water in the intake channel does not change with the influx of groundwater, and that all radionuclides begin discharging to the intake channel at the same time (i.e., the difference in travel time due to adsorption is conservatively neglected). Using a volume of water in the intake channel of approximately 3,570,000 ft^3 (assuming a water level of 249.39 ft NAVD88 (250.25 ft NGVD29)) and a released volume of 138,010 ft^3, a dilution factor of approximately 26 is calculated (3,570,000/ 138,010).

Dividing the concentrations of the radionuclides of interest (Table 2.4-206) by the dilution factor produces radionuclide concentrations in the intake channel. Radionuclides for which the C/ECL ratio is greater than 1×10^{-6} include H-3, Co-60, Sr-90, Y-90, Te-129m, Cs-137, and Pu-239. The concentrations in the intake channel and C/ECL ratios for these radionuclides are presented in Table 2.4-214. The sum of fractions for these radionuclides is approximately 0.4, which is less than one (unity), indicating that 10 CFR 20 limits are met in the intake channel without the plant operating. Note that radionuclides without an ECL (listed in Table 2.4-206) result in small concentrations after dilution and are not expected to be significant dose contributors.

2.4.13.3.4 Alternate Conceptual Model

As described previously, any constituent in the groundwater discharging to Lake Anna during plant operation is expected to be: 1) mixed and diluted with surface water in the intake channel; 2) subsequently abstracted from the intake channel by the water-supply intake for Unit 3, introduced into the closed-cycle circulating water system, service water system, or station water system, and circulated through cooling towers; and 3) discharged with the cooling tower blowdown to the discharge canal.

For the alternate conceptual model (Unit 3 operating), radionuclides released from the groundwater are diluted with uncontaminated water from the intake channel during entrainment. In addition, prior to being discharged as blowdown to the discharge canal, the radionuclide concentrations would increase based on the operating cycles of concentration (COC) due to water evaporation within the cooling tower. Therefore, the radionuclide concentrations, prior to entering the discharge canal, can be determined by dividing by the concentrations of the radionuclides of interest (Section 2.4.13.3.2.2) by a dilution factor, which is calculated as:

$$DF = \frac{Q_W}{Q_{release} * COC} \qquad (2.4.13\text{-}20)$$

where: Q_W = total water withdrawal flow rate from Lake Anna, $Q_{release}$ = volumetric flow rate of liquid effluent in the subsurface, and COC = cycles of concentration. Equation 2.4.13-20 assumes all radionuclides concentrate equally as the cooling tower water evaporates. However, volatile radionuclides, such as H-3, would evaporate with the cooling tower water and would not concentrate (i.e., COC=1). Consequently, applying the same COC (Unit 3 cooling towers are designed to operate between 4 and 9 COC) to all radionuclides as part of the dilution factor computation is conservative, especially considering that H-3 represents the majority of the sum of fractions presented in Table 2.4-206.

In calculating $Q_{release}$, it is important to recognize that differential transport rates result from the adsorption process. Consequently, any radionuclides associated with an accidental release of liquid effluent to the groundwater could arrive at the intake channel shoreline at different times. However, conservatively, assuming that all radionuclides begin to discharge to the intake channel after a travel time of 1.07 years, $Q_{release}$ can be estimated as a function of the cross-sectional flow area of the liquid effluent plume and the Darcy velocity. It is assumed that the cross-sectional flow area has a height, b, equal to the saturated thickness of the water table aquifer (30 ft), and a width, w, equal to the total width of the intake channel (500 ft). The flow rate of the liquid effluent release in the subsurface can then be estimated as:

$$Q_{release} = -K\frac{dh}{dx}bw \qquad (2.4.13\text{-}21)$$

Using this equation and the values above, $Q_{release}$ can be evaluated as:

$$Q_{release} = 9.9 \times 0.50 \times 30 \times 500 = 7425 \text{ ft}^3/\text{d} = 0.086 \text{ ft}^3/\text{s}$$

Using Equation 2.4.13-20, a value of $Q_{release}$ of 0.086 ft^3/s, a minimum total water withdrawal flow rate from Lake Anna (QW) of 29.3 ft^3/s, and a maximum operating COC of 9, a dilution factor of approximately 38 is calculated.

Compared to a dilution factor of 26 from the primary conceptual model, the dilution factor for the alternate conceptual model is larger. Therefore, radionuclide concentrations using the dilution factor from the primary conceptual model are higher than those of the alternate conceptual

model. Thus, the alternate conceptual model is bounded by the primary conceptual model and is not considered further.

The results presented above demonstrate that use of the maximum observed hydraulic conductivity and minimum site-specific K_d values result in sum of fraction values less than one (unity) within the restricted area, both during plant operation (due to a larger dilution factor) and when the plant is not operating. Because 10 CFR 20 limits (i.e., unity) are met within the restricted area, the same limits will be achieved with even greater margin in unrestricted areas as a consequence of additional mixing and dilution. With respect to the 10 CFR 20.1301 dose limit, a dose evaluation was performed using the radionuclide concentrations from the primary conceptual model (Section 2.4.13.3.3 and Table 2.4-214).

2.4.13.3.5 **Dose Evaluation**

In addition to meeting the 10 CFR 20, Appendix B limits, the dose due to the radionuclide concentrations in the intake channel (Table 2.4-214) must also meet the 10 CFR 20.1301 dose limit for a member of the public. Lake Anna is a potential source of drinking water as well as of aquatic foods. It is also used for recreational activities. The LADTAP II computer program (Reference 2.4-226) is used to calculate doses to an individual from the following exposure pathways:

- Consumption of water from Lake Anna
- Consumption of fish and invertebrate from Lake Anna
- Swimming, boating, and shoreline activities at Lake Anna

Lake Anna is not used for irrigation, as indicated in Table 12.2-20aR. The input parameters for LADTAP II are the same as those shown in Table 12.2-20aR except that no dilution is credited beyond the concentrations shown in Table 2.4-214. LADTAP II requires the source isotopic activity to be input in the units of Ci/yr. The concentrations in Table 2.4-214 are converted into release rates (Ci/yr) by multiplying by an arbitrary flow rate, which is then entered as the liquid effluent discharge rate. LADTAP II divides the isotopic activity by the same arbitrary flow rate to obtain the initial concentrations, causing the flow rate to cancel out (i.e., the value of the arbitrary flow rate does not matter). With the transit time to the dose receptor input as zero, LADTAP II calculates

concentrations at the receptor that are identical to those in Table 2.4-214. The resulting total body dose from all exposure pathways is 28 mrem to a child, the age group receiving the maximum dose. This dose is within the 10 CFR 20.1301 limit of 100 mrem.

2.4.13.4 Compliance with 10 CFR 20

A conservative analysis of a postulated, accidental release of liquid effluents in groundwater has been conducted. The analysis was performed using demonstratively conservative coefficients and assumptions, and physical conditions likely to give the most adverse dispersion of liquid effluent. It is concluded that an accidental release of liquid from the ESBWR CST to the environment would result in radionuclide concentrations and associated dose in the nearest potable water supply, located in an unrestricted area, that are below the 10 CFR 20 limits.

NAPS COL 2.0-25-A

2.4.14 Technical Specifications and Emergency Operation Requirements

The design plant grade elevation for safety-related SSCs is located above the design basis flood level, as stated in Section 2.4.2, and above the maximum groundwater elevation, as stated in Section 2.4.12. Safety-related SSCs for the plant are protected from external floods as discussed in Section 3.4. The elevation of exterior access openings, which are above the PMF and local PMP flood levels, and the design of exterior penetrations below design flood and groundwater levels, which are appropriately sealed, result in a design and site combination that do not necessitate emergency procedures or meet the criteria for Technical Specification LCOs to ensure safety-related functions at the plant.

The plant elevation is also above flood and groundwater elevations for Regulatory Treatment of Non-Safety Systems (RTNSS) SSCs used to provide the makeup water to the UHS (IC/PCCS pools) from 72 hours to 7 days after an accident. The Seismic Category I FWSC SSCs are therefore also protected from external floods. Therefore, no technical specifications or emergency procedures are required to prevent hydrological phenomena from degrading the UHS.

NAPS ESP COL 2.4-2

Unit 3 will be required to shut down when the water level in Lake Anna decreases below Elevation 241.14 ft NAVD88 (242.0 ft NGVD29).

Because this operational restriction is not related to protection of safety-related SSCs or degradation of the UHS, low lake level is not a Technical Specification LCO.

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2.4-225 DC/COL-ISG-013, Assessing the Radiological Consequences of Accidental Releases of Radioactive Materials from Liquid Waste Tanks for Combined License Applications, U.S. Nuclear Regulatory Commission, January 2013.

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NAPS COL 2.0-12-A
NAPS ESP VAR 2.4-4

Table 2.4-1R Lake Anna Storage Allocation

Purpose	Volume (acre-feet)
Minimum recreational pool and inactive storage below 246 ft NGVD29*	255,000
Conservation and active storage, 246 to 250.25 ft NGVD29*	53,300
Flood control storage, 250.25 to 265 ft NGVD29*	241,700
Total Storage	550,000

* The conversion from NGVD29 datum elevations to NAVD88 datum elevations is –0.86 ft

NAPS COL 2.0-22-A
NAPS ESP VAR 2.4-4

Table 2.4-6R Lake Anna Low Water Level Durations

Lake Level (ft NGVD29*)	Two Unit	Three Unit
248.0	4.7%	5.5%
246.0	0.9%	1.1%
244.0	0%	0%
242.0	0%	0%

Two Unit - Unit 1 and 2 using once-through cooling

Three Unit - Units 1 and 2 using once-through cooling and Unit 3 using closed-cycle cooling system with dry and wet cooling towers.

* The conversion from NGVD29 datum elevations to NAVD88 datum elevations is –0.86 ft

NAPS COL 2.0-23-A

Table 2.4-15R Quarterly Groundwater Level Elevations

Observation Well No.	Well Depth[a] (ft)	Reference Point Elev.[b] (ft)	Reference Point Stickup[c] (ft)	Top of Well Screen[b] Elev. (ft)	Well Screen Length (ft)	Groundwater Level Elevations[b] Date of Measurement 12/17/02	03/17/03	06/17/03	09/29/03	02/01/05	11/29/06	02/28/07	05/30/07	08/29/07	11/28/07
OW-841	34.3	251.6	1.5	228.1	9.7	248.9	249.6	249.6	249.3	249.1	249.5	249.1	248.7	248.4	248.4
OW-842	49.6	336.7	1.5	297.8	9.6	307.5	308.9	310.8	312.0	314.2	313.4	313.8	314.2	313.0	311.6
OW-843	49.2	320.6	1.5	282.1	9.7	285.1	288.1	290.8	290.2	290.7	288.6	289.8	290.2	286.6	285.0
OW-844	24.6	273.5	1.5	257.6	9.6	265.5	266.7	267.3	266.4	266.2	266.5	266.3	265.6	263.5	263.4
OW-845	55.0	297.3	1.5	253.0	9.7	272.7	274.9	277.4	277.3	277.1	276.2	276.2	276.9	275.1	273.9
OW-846	32.7	297.3	1.5	273.5	9.8	272.5	274.8	277.1	277.0	276.8	276.0	276.0	276.6	274.8	273.7
OW-847	49.8	319.7	1.5	280.6	9.6	285.4	287.0	289.5	290.8	293.3	[d]	[d]	294.2	292.5	292.6
OW-848	47.3	284.5	1.5	240.8	5.0	241.7	242.9	243.6	244.0	243.2	243.9	243.2	242.6	242.4	242.0
OW-849	49.8	298.5	1.5	259.4	9.7	265.5	269.5	271.7	270.8	269.5	270.2	[d]	270.0	267.6	265.9
OW-901	108	311.3	1.70	214.6	10	N/A	N/A	N/A	N/A	N/A	285.1	287.0	288.5	284.7	282.4
OW-945	54.5	283.1	1.52	240.1	10	N/A	N/A	N/A	N/A	N/A	[d]	[d]	271.6	267.5	266.6
OW-946	43.4	335.6	1.54	303.6	10	N/A	N/A	N/A	N/A	N/A	302.9	302.8	312.6	309.9	307.5
OW-947	58.0	315.1	1.78	268.3	10	N/A	N/A	N/A	N/A	N/A	297.6	297.8	297.9	296.0	295.3
OW-949	104.5	336.9	1.24	243.2	10	N/A	N/A	N/A	N/A	N/A	313.7	313.9	314.4	313.3	312.1
OW-950	92.0	284.5	1.51	203.0	10	N/A	N/A	N/A	N/A	N/A	239.8	238.7	238.4	237.8	237.1
OW-951	67.1	250.7	0.99	194.6	10	N/A	N/A	N/A	N/A	N/A	249.4	249.6	249.4	249.0	249.0
P-10	22.5	285.5	2.4	266.1	5	273.5	273.9	274.3	274.3	274.4	274.6	274.5	274.3	273.9	273.8
P-14	N/A	326.2	N/A	N/A	N/A	270.7	271.3	271.9	272.2	272.9	273.1	273.1	273.2	272.6	272.3
P-18	N/A	328.1	N/A	N/A	N/A	284.8	285.6	286.6	287.5	289.0	289.6	289.8	290.0	289.7	288.8
P-19	58.5	321.4	N/A	N/A	5	283.4	284.3	285.4	286.4	288.0	[d]	[d]	289.6	288.7	287.9
P-20	61.0	319.7	N/A	N/A	5	274.0	274.5	274.9	274.1	275.8	276.2	276.0	276.0	275.8	275.6
P-21	58.5	318.3	N/A	N/A	5	Dry	260.3	261.1	261.5	262.5	262.8	262.7	263.0	262.4	261.3
P-22	60.0	319.6	N/A	N/A	5	275.9	276.9	277.7	278.0	278.6	278.9	278.7	278.5	277.7	277.1
P-23	41.2	295.5	1.9	257.8	5	260.2	261.7	262.4	262.2	262.6	262.7	262.4	262.4	260.9	260.6
P-24	25.0	292.5	2.3	270.4	5	275.5	276.2	277.5	277.4	277.5	277.9	277.9	277.2	276.5	276.0
WP-3 (NAPS ESP VAR 2.4-3)	N/A	309.9	N/A	266.5	5	291.7	293.0	294.8	294.3	294.1	294.4	294.2	294.1	292.4	292.2
Lake Anna Water Level Elevation[e]						249.0	251.0	251.3	251.0	251.0	251.0	251.0	250.7	249.2	248.4
Service Water Reservoir Water Level Elevation[e]						315.5	314.2	315.5	315.5	N/A	315.4	315.3	315.4	315.1	314.6

NAPS COL 2.0-23-A

Table 2.4-15R Quarterly Groundwater Level Elevations

OW-800 series wells installed in December 2002 as part of ESP Subsurface Investigation Program
OW-900 series wells installed in November 2006 as part of Unit 3 Subsurface Investigation Program
P- wells installed previously to monitor NAPS Units 1 and 2 Service Water Reservoir
WP- well installed previously as part of Interim Spent Fuel Storage Installation monitoring program
a Below ground surface at time of installation
b Vertical Datum is NAVD88
c Above ground surface at time of installation
d Valid reading not obtained.
e Vertical Datum is NAVD88 (originally measured in NGVD29, converted to NAVD88 by subtracting 0.86 ft).
N/A – not available

NAPS COL 2.0-23-A

Table 2.4-16R Hydraulic Conductivity Value

Observation Well No.	Depth Interval Tested (ft)	Elevation	Material	Hydraulic Conductivity cm/sec	Hydraulic Conductivity ft/day
PT-1 [a]	Near-surface	Unknown	Saprolite	2.8×10^{-5}	0.08
PT-2 [a]	Near-surface	Unknown	Saprolite	1.4×10^{-5}	0.04
P-10 [b]	14.5–22.5	269.5–261.5	Saprolite	6.1×10^{-4} to 6.1×10^{-5}	1.7 to 0.17
P-24 [b]	16.8–25.0	274.3–266.1	Saprolite	2.9×10^{-4} to 6.6×10^{-6}	0.8 to 0.02
P-23 [b]	33.7–41.2	260.7–253.2	Saprolite	6.6×10^{-5}	0.19
OW-844 [c]	12.7–24.6	259.3–247.4	Saprolite	9.9 to 8.9×10^{-5}	0.28 to 0.25
OW-841 [c]	20.1–34.3	230.0–215.8	Saprolite	8.2 to 7.8×10^{-4}	2.3 to 2.2
OW-846 [c]	20.3–32.7	275.5–263.1	Saprolite	1.2×10^{-3} to 6.8×10^{-4}	3.4 to 1.9
OW-847 [c]	35.0–49.8	283.2–268.4	Saprolite	2.3 to 2.1×10^{-4}	0.66 to 0.58
OW-842 [c]	35.3–49.6	299.9–285.6	Saprolite	3.3×10^{-4}	0.93
OW-849 [c]	35.6–49.8	261.4–247.2	Saprolite	1.1×10^{-3} to 7.0×10^{-4}	3.2 to 2.0
OW-843 [c]	36.4–49.2	282.7–269.9	Saprolite	4.9 to 4.5×10^{-4}	1.4 to 1.3
OW-848 [c]	39.1–47.3	243.9–235.7	Saprolite	1.2×10^{-3} to 9.9×10^{-4} [d]	3.4 to 2.8 [d]
OW-845 [c]	39.7–55.0	256.1–240.8	Quartz Gneiss	1.1×10^{-3} to 6.3×10^{-4} [e]	3.1 to 1.8 [e]
OW-945 [f]	41.5–51.5	240.1–230.1	Saprolite	1.4 to 1 x 10^{-3}	3.8 to 2.8
OW-946 [f]	30.4–40.4	303.6–293.6	Saprolite	3.5 to 2.6 x 10^{-3}	9.9 to 7.4
OW-947 [f]	45.0–55.0	268.3–258.3	Saprolite	2.4 to 1.6 x 10^{-4}	0.67 to 0.46
OW-949 [f]	92.5–102.5	243.2–233.2	Quartz Gneiss	8.4 to 6.7 x 10^{-4}	2.4 to 1.9
Packer Test Results					
B-949 [f]	84.0–89	250.8–245.8	Quartz Gneiss	1.7 x 10^{-4}	0.48
	94.5–99.5	240.3–235.3	Quartz Gneiss	2.2 x 10^{-3}	6.28

NAPS COL 2.0-23-A

Table 2.4-16R Hydraulic Conductivity Value

Observation Well No.	Depth Interval Tested (ft)	Elevation	Material	Hydraulic Conductivity cm/sec	Hydraulic Conductivity ft/day
Laboratory Test Results					
B-48 [a]	3.5	290.5	Sandy silt	1×10^{-6}	0.003
B-8 [a]	5.5	293.5	Fine sand, tr. silt	1×10^{-6}	0.003
B-2 [a]	15.5	269.5	Fine to med. sand, w/clayey silt	4×10^{-5}	0.11
B-15 [a]	36	281	Silty fine sand	1.3×10^{-5}	0.04

a. SSAR Reference 43
b. SSAR Reference 56
c. SSAR Appendix 2.5.4 B
d. Results may not be accurate due to static water level approximately 0.5 ft below top of well screen.
e. Results may not be accurate due to short duration of stable water level recovery measurements.
f. Appendix 2.5.4AA

NAPS COL 2.0-23-A
NAPS ESP VAR 2.4-2
ESP COR

Table 2.4-17R North Anna Power Station Water Supply Wells

Well	Depth (ft)	Measured Yield (gpd)	Design Yield (gpd)	Water Treatment
No. 2 [a,b]	335	12,960	Unknown	Unknown (normally not in use)
No. 3A [a,b]	185	74,880		Unknown
No. 4 (new) [a,b]	305	63,360	35,200 [c]	None
No. 6 [a,b]	375	79,200	44,000 [c]	None
No. 4 (old) [a,b] (not used)	200	77,760	NA	NA
NANIC [a,d]	260	106,560	19,600	Calcite filtration
Security Training Building	640	Unknown	Unknown	Unknown
No. 7 [c]	730	89,280	49,600	None
Metrology Laboratory	116	Unknown	Unknown	Unknown

a. SSAR Reference 50
b. SSAR Reference 48
c. Reference 2.4-203
d. SSAR Reference 49

NAPS COL 2.0-13-A

Table 2.4-201 Unit 3 Sub-Basin Drainage Areas

Sub-Basin	Drainage Area (ft^2)	Drainage Area (acres)
B	378,813	8.70
W1	382,258	8.77
W2	291,447	6.69
W3	488,556	11.22
S1	90,065	2.07
S2	215,848	4.95
E1	256,391	5.89
E2	175,517	4.03
E3	132,632	3.04
U1&2	221,878	5.09
Total	2,633,405	60.45

NAPS COL 2.0-13-A

Table 2.4-202 Unit 3 Sub-Basin Point of Interest (POI) Drainage Areas

Sub-Basin	Contributing Upstream Sub-Basins	Total POI Drainage Area (acres)
B*	All	60.45
W1	W1,W2,W3,S1,S2	33.70
W2	W2, W3, S1, S2	24.93
W3	W3	11.22
S1	S1, S2	7.02
S2	S2	4.95
E1	E1,E2,E3	12.96
E2	E2,E3	7.07
E3	E3	3.04

Includes the drainage area from Sub-Basin U1&2

NAPS COL 2.0-13-A

Table 2.4-203 Unit 3 Site PMP Peak Discharges

Sub-Basin	POI Drainage Area (acres)	Composite Runoff Coefficient	Time of Concentration (min)	Rainfall Intensity (in/hr)	PMP Peak Discharge (cfs)
B	60.45	0.98	20.4	31.7	1877.9
W1	33.70	0.98	20.4	31.7	1046.9
W2	24.93	0.97	19.8	32.0	773.8
W3	11.22	0.93	11.2	48.0	500.9
S1	7.02	1.00	17.4	34.5	242.2
S2	4.95	1.00	14.8	39.0	193.1
E1	12.96	0.99	8.1	49.0	628.7
E2	7.07	1.00	7.2	65.5	463.1
E3	3.04	1.00	6.2	68.5	208.2

NAPS COL 2.0-13-A

Table 2.4-204 Unit 3 Site PMP Water Levels

Ditch	Cross Section	Discharge (cfs)	Maximum Water Level (ft NAVD88)*	Ditch/ Channel Bottom Width (ft)	Ditch Channel Invert El. (ft NAVD88)*	Bank El. (ft NAVD88)*
Outfall	500	1877.9	271.8	300	260.0	271.0
	390	1877.9	271.8	325	260.0	269.0
	250	1877.9	271.8	Weir	N/A	N/A
	100	1877.9	265.0	70	218.0	264.0
	0	1877.9	265.0	210	218.0	264.0
West	1820	500.9	294.3	4	292.5	294.0
	1695	500.9	291.0	4	288.5	290.0
	1538	500.9	289.2	4	286.5	288.0
	1475	500.9	289.0	18	285.0	288.0
	1420	500.9	289.0	Weir	N/A	N/A
	1315**	500.9	288.0	5	282.0	286.0
	1280**	500.9	288.0	5	281.5	286.0
	1183**	773.8	287.9	7	281.0	286.0
	1053**	773.8	287.8	7	279.7	286.0
	935**	773.8	287.8	8	279.2	285.0
	715**	773.8	287.6	9	279.0	284.0
	690**	773.8	287.6	Weir	N/A	N/A
	485**	1046.9	283.1	0	278.9	280.0
	408**	1046.9	281.3	0	276.9	279.0
	280**	1046.9	278.0	0	273.9	275.0
	200**	1046.9	277.0	0	273.5	274.0
	95**	1046.9	275.2	0	273.0	273.5
	0**	1046.9	271.8	0	270.8	270.8
South	895**	193.1	288.4	6	284.7	287.0
	820**	193.1	288.3	5.5	284.3	287.0
	647**	193.1	288.2	5	283.7	287.0
	490**	193.1	288.1	4	283.2	287.0

NAPS COL 2.0-13-A

Table 2.4-204 Unit 3 Site PMP Water Levels

Ditch	Cross Section	Discharge (cfs)	Maximum Water Level (ft NAVD88)*	Ditch/ Channel Bottom Width (ft)	Ditch Channel Invert El. (ft NAVD88)*	Bank El. (ft NAVD88)*
South (contd)	460**	193.1	288.1	4	282.9	287.0
	445**	193.1	288.1	Weir	N/A	N/A
	435**	193.1	288.1	4	282.6	286.0
	400**	193.1	288.1	4	282.4	286.0
	330**	193.1	288.1	4	282.0	286.0
	320**	193.1	288.1	Weir	N/A	N/A
	195**	242.2	288.0	4	281.5	286.0
	95**	242.2	288.0	4	281.0	286.0
East	1280**	208.2	288.1	4	283.0	287.0
	1160**	208.2	288.0	4	282.8	287.0
	900**	463.1	287.2	4	281.5	287.0
	725**	463.1	286.8	4	280.5	287.0
	600**	628.7	285.8	4	280.0	286.0
	540**	628.7	285.5	4	279.6	286.0
	435**	628.7	283.8	4	279.0	284.0
	335**	628.7	281.4	4	277.0	281.0
	187**	628.7	278.5	4	274.0	279.0
	145**	628.7	276.5	4	273.0	277.0
	60**	628.7	271.6	4	266.0	275.0
	0**	628.7	271.8	4	260.0	274.0

* Conversion from NAVD88 datum elevations to NGVD29 datum elevations is +0.86 ft

** Cross Section is located in the power block area

NAPS COL 2.0-23-A

Table 2.4-205 North Anna Power Station Groundwater Use [a]
January 1, 2006 to December 31, 2006
(Millions of Gallons)

Month	Well #4 (new)	Well #6	Well #7
January	0.2545	0.0072	0
February	0.2895	0	0.0001
March	0.6233	0.0002	0.0002
April	0.0854	0.2029	0
May	0.0006	0.2901	0
June	0	0.3228	0
July	0.0013	0.3007	0.0001
August	0.0005	0.3933	0.0008
September	0.0763	0.2379	0
October	0.2123	0.0529	0
November	0.226	0.0311	0
December	0.1978	0.0081	0
Total	1.9675	1.8472	0.0012
Monthly Average	0.1640	0.1539	0.0001

a. Reference 2.4-208

NAPS COL 2.0-24-A **Table 2.4-206 Groundwater Concentrations at Point of Discharge to Lake Anna**

Source Term Characteristics										Advection and Decay					Advection, Decay, and Adsorption				
Principal Radionuclide	Decay Chain Progeny	Half-life(a) (days)	d_{12}(b)	d_{13}(b)	d_{23}(b)	Decay Constant ($days^{-1}$)(c)	CST Concentration (MBq/m^3)	CST Concentration ($\mu Ci/cm^3$)	ECL ($\mu Ci/cm^3$)(d)	K_1(e)	K_2(e)	K_3(f)	Ground-water Concent-ration (C) ($\mu Ci/cm^3$)(g)	C/ECL Ratio(h)	K_d(i) (cm^3/g)	R(j)	Travel Time(k) (days)	Ground-water Concent-ration (C) ($\mu Ci/cm^3$)(g)	C/ECL Ratio(h)
H-3		4.51E+03				1.54E-04	3.70E+02	9.99E-03	1.00E-03				9.41E-03	9.41E+00		1.0	3.89E+02	9.41E-03	9.41E+00
Na-24		6.25E-01				1.11E+00	3.50E-02	9.45E-07	5.00E-05				4.65E-194	0.00E+00			3.89E+02	4.65E-194	0.00E+00
P-32		1.43E+01				4.85E-02	7.30E-04	1.97E-08	9.00E-06				1.28E-16	0.00E+00			3.89E+02	1.28E-16	0.00E+00
Cr-51		2.77E+01				2.50E-02	5.50E-02	1.49E-06	5.00E-04				8.82E-11	0.00E+00			3.89E+02	8.82E-11	0.00E+00
Mn-54		3.13E+02				2.21E-03	6.40E-04	1.73E-08	3.00E-05				7.30E-09	2.43E-04	4.5	33.9	1.32E+04	3.49E-21	0.00E+00
Mn-56		1.07E-01				6.48E+00	4.00E-01	1.08E-05	7.00E-05				0.00E+00	0.00E+00			3.89E+02	0.00E+00	0.00E+00
Fe-55		9.86E+02				7.03E-04	1.80E-02	4.86E-07	1.00E-04				3.70E-07	3.70E-03	4504	32970.3	1.28E+07	0.00E+00	0.00E+00
Fe-59		4.45E+01				1.56E-02	5.50E-04	1.49E-08	1.00E-05				3.48E-11	3.48E-06	4504	32970.3	1.28E+07	0.00E+00	0.00E+00
Co-58		7.08E+01				9.79E-03	1.80E-03	4.86E-08	2.00E-05				1.08E-09	5.40E-05	6.5	48.6	1.89E+04	2.29E-88	0.00E+00
Co-60		1.93E+03				3.59E-04	3.60E-03	9.72E-08	3.00E-06				8.45E-08	2.82E-02	6.5	48.6	1.89E+04	1.10E-10	3.66E-05
Ni-63		3.51E+04				1.97E-05	1.80E-05	4.86E-10	1.00E-04				4.82E-10	4.82E-06	12.7	94.0	3.65E+04	2.36E-10	2.36E-06
Cu-64		5.29E-01				1.31E+00	5.20E-02	1.40E-06	2.00E-04				7.05E-228	0.00E+00			3.89E+02	7.05E-228	0.00E+00
Zn-65		2.44E+02				2.84E-03	1.80E-02	4.86E-07	5.00E-06				1.61E-07	3.22E-02	11.8	87.4	3.40E+04	5.82E-49	0.00E+00
Rb-89		1.06E-02				6.54E+01	3.50E-01	9.45E-06	9.00E-04				0.00E+00	0.00E+00	3.6	27.4	1.06E+04	0.00E+00	0.00E+00
	Sr-89	5.05E+01	1.0000			1.37E-02	1.50E-01	4.05E-06	8.00E-06	-1.98E-09	4.05E-06		1.95E-08	2.43E-03	3.6	27.4	1.06E+04	1.59E-69	0.00E+00
Sr-90		1.06E+04				6.54E-05	2.50E-02	6.75E-07	5.00E-07				6.58E-07	1.32E+00	3.6	27.4	1.06E+04	3.37E-07	6.73E-01
	Y-90	2.67E+00	1.0000			2.60E-01	4.40E-04	1.19E-08	7.00E-06	6.75E-07	-6.63E-07		6.58E-07	9.40E-02	3.6	27.4	1.06E+04	3.37E-07	4.81E-02
Sr-91		3.96E-01				1.75E+00	6.90E-02	1.86E-06	2.00E-05				4.43E-302	0.00E+00	3.6	27.4	1.06E+04	0.00E+00	0.00E+00
	Y-91m	3.45E-02	0.5780			2.01E+01			2.00E-03	1.18E-06	-1.18E-06		2.80E-302	0.00E+00	3.6	27.4	1.06E+04	0.00E+00	0.00E+00
	Y-91	5.85E+01		0.4220	1.0000	1.18E-02	7.30E-04	1.97E-08	8.00E-06	-1.34E-08	6.96E-10	3.24E-08	3.23E-10	4.04E-05	3.6	27.4	1.06E+04	5.96E-63	0.00E+00
Sr-92		1.11E-01				6.25E+00	1.60E-01	4.32E-06	4.00E-05				0.00E+00	0.00E+00			3.89E+02	0.00E+00	0.00E+00
	Y-92	1.48E-01	1.0000			4.68E+00	9.80E-02	2.65E-06	4.00E-05	-1.29E-05	1.55E-05		0.00E+00	0.00E+00			3.89E+02	0.00E+00	0.00E+00
Y-93		4.21E-01				1.65E+00	6.90E-02	1.86E-06	2.00E-05				1.59E-284	0.00E+00			3.89E+02	1.59E-284	0.00E+00
Zr-95		6.40E+01				1.08E-02	1.50E-04	4.05E-09	2.00E-05				6.00E-11	3.00E-06		1.0	3.89E+02	6.00E-11	3.00E-06
	Nb-95m	3.61E+00	0.0070			1.92E-01			3.00E-05	3.00E-11	-3.00E-11		4.45E-13	0.00E+00		1.0	3.89E+02	4.45E-13	0.00E+00
	Nb-95	3.52E+01		0.9930	1.0000	1.97E-02	1.50E-04	4.05E-09	3.00E-05	9.00E-09	3.43E-12	-4.96E-09	1.31E-10	4.37E-06		1.0	3.89E+02	1.31E-10	4.37E-06
Mo-99		2.75E+00				2.52E-01	1.30E-01	3.51E-06	2.00E-05				9.45E-49	0.00E+00			3.89E+02	9.45E-49	0.00E+00

NAPS COL 2.0-24-A

Table 2.4-206 Groundwater Concentrations at Point of Discharge to Lake Anna

Source Term Characteristics										Advection and Decay					Advection, Decay, and Adsorption				
Principal Radionuclide	Decay Chain Progeny	Half-life[a] (days)	d_{12}[b]	d_{13}[b]	d_{23}[b]	Decay Constant (days^{-1})[c]	CST Concentration (MBq/m^3)	CST Concentration (µCi/cm^3)	ECL (µCi/cm^3)[d]	K_1[e]	K_2[e]	K_3[f]	Ground-water Concent-ration (C) (µCi/cm^3)[g]	C/ECL Ratio[h]	K_d[i] (cm^3/g)	R[j]	Travel Time[k] (days)	Ground-water Concent-ration (C) (µCi/cm^3)[g]	C/ECL Ratio[h]
	Tc-99m	2.51E-01	0.8760			2.76E+00	3.60E-02	9.72E-07	1.00E-03	3.38E-06	-2.41E-06		9.11E-49	0.00E+00			3.89E+02	9.11E-49	0.00E+00
Ru-103		3.93E+01				1.76E-02	3.60E-04	9.72E-09	3.00E-05				1.02E-11	0.00E+00			3.89E+02	1.02E-11	0.00E+00
	Rh-103m	3.90E-02	0.9970			1.78E+01	3.60E-04	9.72E-09	6.00E-03	9.70E-09	1.95E-11		1.02E-11	0.00E+00			3.89E+02	1.02E-11	0.00E+00
Ru-106		3.68E+02				1.88E-03	5.50E-05	1.49E-09	3.00E-06				7.14E-10	2.38E-04	272	1992.0	7.75E+05	0.00E+00	0.00E+00
	Rh-106	3.45E-04	1.0000			2.01E+03	5.50E-05	1.49E-09	N/A	1.49E-09	-1.39E-15		7.14E-10	N/A	272	1992.0	7.75E+05	0.00E+00	N/A
Ag-110m		2.50E+02				2.77E-03	1.80E-05	4.86E-10	6.00E-06				1.65E-10	2.76E-05	2.5	19.3	7.51E+03	4.46E-19	0.00E+00
	Ag-110	2.85E-04	0.0133			2.43E+03			N/A	6.46E-12	-6.46E-12		2.20E-12	N/A	2.5	19.3	7.51E+03	5.93E-21	N/A
Te-129m		3.36E+01				2.06E-02	4.50E-02	1.22E-06	7.00E-06				3.99E-10	5.69E-05		1.0	3.89E+02	3.99E-10	5.69E-05
	Te-129	4.83E-02	0.6500			1.44E+01			4.00E-04	7.91E-07	-7.91E-07		2.59E-10	0.00E+00		1.0	3.89E+02	2.59E-10	0.00E+00
Te-131m		1.25E+00				5.55E-01	1.80E-03	4.86E-08	8.00E-06				1.08E-101	0.00E+00			3.89E+02	1.08E-101	0.00E+00
	Te-131	1.74E-02	0.2220			3.98E+01			8.00E-05	1.09E-08	-1.09E-08		2.43E-102	0.00E+00			3.89E+02	2.43E-102	0.00E+00
	I-131	8.04E+00		0.7780	1.0000	8.62E-02	1.70E+00	4.59E-05	1.00E-06	-8.98E-09	2.37E-11	4.59E-05	1.26E-19	0.00E+00			3.89E+02	1.26E-19	0.00E+00
Te-132		3.26E+00				2.13E-01	8.40E-04	2.27E-08	9.00E-06				2.79E-44	0.00E+00			3.89E+02	2.79E-44	0.00E+00
	I-132	9.58E-02	1.0000			7.24E+00	1.20E+01	3.24E-04	1.00E-04	2.34E-08	3.24E-04		2.87E-44	0.00E+00			3.89E+02	2.87E-44	0.00E+00
I-133		8.67E-01				7.99E-01	1.10E+01	2.97E-04	7.00E-06				2.80E-139	0.00E+00			3.89E+02	2.80E-139	0.00E+00
	Xe-133m	2.19E+00	0.0289			3.17E-01			N/A	-5.62E-06	5.62E-06		1.97E-59	N/A			3.89E+02	1.97E-59	N/A
	Xe-133	5.24E+00		0.9711	1.0000	1.32E-01			N/A	-5.60E-05	-4.03E-06	6.01E-05	2.82E-27	N/A			3.89E+02	2.82E-27	N/A
I-134		3.65E-02				1.90E+01	1.90E+01	5.13E-04	4.00E-04				0.00E+00	0.00E+00			3.89E+02	0.00E+00	0.00E+00
I-135		2.75E-01				2.52E+00	1.50E+01	4.05E-04	3.00E-05				0.00E+00	0.00E+00			3.89E+02	0.00E+00	0.00E+00
	Xe-135m	1.06E-02	0.1540			6.53E+01			N/A	6.49E-05	-6.49E-05		0.00E+00	N/A			3.89E+02	0.00E+00	N/A
	Xe-135	3.81E-01		0.8460	0.9940	1.82E+00			N/A	-1.06E-03	1.85E-06	1.06E-03	0.00E+00	N/A			3.89E+02	0.00E+00	N/A
Cs-134		7.53E+02				9.21E-04	8.10E-01	2.19E-05	9.00E-07				1.53E-05	1.70E+01	64.9	476.1	1.85E+05	2.12E-79	0.00E+00
Cs-136		1.31E+01				5.29E-02	7.10E-02	1.92E-06	6.00E-06				2.22E-15	0.00E+00			1.85E+05	2.22E-15	0.00E+00
Cs-137		1.10E+04				6.30E-05	2.30E+00	6.21E-05	1.00E-06				6.06E-05	6.06E+01	64.9	476.1	1.85E+05	5.33E-10	5.33E-04
	Ba-137m	1.77E-03	0.9460			3.91E+02	1.30E-03	3.51E-08	N/A	5.87E-05	-5.87E-05		5.73E-05	N/A	64.9	476.1	1.85E+05	5.04E-10	N/A
Cs-138		2.24E-02				3.09E+01	7.00E-01	1.89E-05	4.00E-04				0.00E+00	0.00E+00			3.89E+02	0.00E+00	0.00E+00
Ba-140		1.27E+01				5.46E-02	1.70E-01	4.59E-06	8.00E-06				2.78E-15	0.00E+00			3.89E+02	2.78E-15	0.00E+00

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Table 2.4-206 Groundwater Concentrations at Point of Discharge to Lake Anna

Source Term Characteristics										Advection and Decay					Advection, Decay, and Adsorption				
Principal Radionuclide	Decay Chain Progeny	Half-life(a) (days)	d_{12}(b)	d_{13}(b)	d_{23}(b)	Decay Constant ($days^{-1}$)(c)	CST Concentration (MBq/m^3)	CST Concentration ($\mu Ci/cm^3$)	ECL ($\mu Ci/cm^3$)(d)	K_1(e)	K_2(e)	K_3(f)	Ground-water Concent-ration (C) ($\mu Ci/cm^3$)(g)	C/ECL Ratio(h)	K_d(i) (cm^3/g)	R(j)	Travel Time(k) (days)	Ground-water Concent-ration (C) ($\mu Ci/cm^3$)(g)	C/ECL Ratio(h)
	La-140	1.68E+00	1.0000			4.13E-01	7.30E-03	1.97E-07	9.00E-06	5.29E-06	-5.09E-06		3.20E-15	0.00E+00			3.89E+02	3.20E-15	0.00E+00
Ce-141		3.25E+01				2.13E-02	5.50E-04	1.49E-08	3.00E-05				3.71E-12	0.00E+00			3.89E+02	3.71E-12	0.00E+00
Ce-144		2.84E+02				2.44E-03	5.50E-05	1.49E-09	3.00E-06				5.75E-10	1.92E-04	329.1	2410.0	9.37E+05	0.00E+00	0.00E+00
	Pr-144m	5.00E-03	0.0178			1.39E+02			N/A	2.64E-11	-2.64E-11		1.02E-11	N/A	329.1	2410.0	9.37E+05	0.00E+00	N/A
	Pr-144	1.20E-02		0.9822	1.0000	5.78E+01	5.50E-05	1.49E-09	6.00E-04	1.49E-09	1.89E-11	-1.89E-11	5.75E-10	0.00E+00	329.1	2410.0	9.37E+05	0.00E+00	0.00E+00
W-187		9.96E-01				6.96E-01	5.30E-03	1.43E-07	3.00E-05				4.15E-125	0.00E+00			3.89E+02	4.15E-125	0.00E+00
Np-239		2.36E+00				2.94E-01	4.20E-01	1.13E-05	2.00E-05				2.82E-55	0.00E+00	5.3	39.8	1.55E+04	0.00E+00	0.00E+00
	Pu-239	8.79E+06	1.0000			7.89E-08			2.00E-08	-3.04E-12	3.04E-12		3.04E-12	1.52E-04	5.3	39.8	1.55E+04	3.04E-12	1.52E-04
													Sum	8.9E+01					1.0E+01

Notes

(a) Values primarily from Table E.1 of Reference 2.4-214; Reference 2.4-211 for Sr-92, Rh-106, Ag-110, Xe-133m, Xe-133, Xe-135m, Xe-135, Ba-137m, Pr-144, and Pr-144m.

(b) Values primarily from Table E.1 of Reference 2.4-214; Reference 2.4-211 for Y-92, I-131, Xe-133m, Xe-133, Xe-135, and Pu-239.

(c) Equation 2.4.13-4.

(d) Values from 10 CFR 20, Appendix B, Table 2, Column 2.

(e) Equation 2.4.13-13 or 2.4.13-18, depending on position in decay chain.

(f) Equation 2.4.13-18.

(g) Equation 2.4.13-8, 2.4.13-13, or 2.4.13-18, depending on position in decay chain. Note that the travel time excluding adsorption is approximately 389 days; with adsorption, the travel time is as stated in Note (k).

(h) Values less than 1×10^{-6} are reported as zero; values greater than 1×10^{-6} are shaded.

(i) Reference 2.4-219 and Table 2.4-207.

(j) Equation 2.4.13-2.

(k) Travel time times Retardation factor

N/A = Not Applicable

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Table 2.4-207 Site-Specific K_d Values

Sample	K_d (cm^3/g)										
	Mn	Fe	Co	Ni	Zn	Sr	Ru	Ag	Cs	Ce	Pu
B-949/R3	>8,145	>45,497	>15,765	>1,616	>5,110	68.5	>1,148	>31,091	>19,504	>10,422	8,680
B-951/R5	>12,196	>20,291	>18,778	>892	>4,217	60.2	>1,200	>12,729	6,863	>10,232	443
B-901/R20	>7,858	>5,146	2,364	>615	>2,411	14.8	>632	>12,792	387	>6,753	295
B-901/R22	5,499	>14,207	5,459	>811	>4,147	33	>988	>9,903	574	>7,073	351
B-901/S5	4.5	>13,456	6.5	40.6	11.8	3.9	>272	28.6	68	329.1	5.3
B-901/S8	>6,525	>5,646	>9,423	12.7	>7,190	166.4	>1,448	28.6	181	>9,572	34.3
B-904/S10	36.9	>12,489	58.3	342	136	3.6	>328	73.2	241	4,175	96.5
B-913/S9	12,492	>14,397	13,082	129	>5,901	14.5	>1,429	43.4	796	>10,149	177
B-913/S10	7,903	>6,505	5,711	162	>6,702	8.4	>1,080	6	141	>9,182	735
B-917/S12	8,046	>30,209	5,747	643	>5,511	7.6	>1,171	25.7	154	>8,831	305
B-917/S14	>10,470	>16,121	6,559	17.7	>4,563	6.6	>936	32.6	118.9	>6,893	209
B-917/S15	4,692	>4,504	3,991	53.3	>2,764	3.8	>524	16.6	64.9	>5,419	192
B-919/S8	>4,121	>40,524	3,840	387	>3,426	14.8	>1,007	232	378	>7,750	896
B-920/S11	>15,785	>19,392	8,768	>623	>7,905	25.5	>1,593	>482	379	>12,056	311
B-928/S7	3,801	>6,104	3,244	>424	>8,103	7.6	>1,212	>304	104	>11,468	528
B-929/S12	3,453	>19,967	5,331	45	>6,270	7.1	>1,264	2.5	104.9	>8,887	536
B-931/S11	3,988	>28,132	5,151	>369	>6,070	4.7	>1,149	44.4	67.5	>10,519	333
B-932/S6	9,013	>16,288	6,739	766	>5,684	11.2	>1,367	>12,665	159	10,449	2,488
B-951/S7	>21,374	>25,330	>20,653	>806	>6,991	26.8	>1,665	>12,716	3,406	>12,914	3,874
B-951/S9	6,143	>24,220	8,818	>658	>6,162	12.7	>1,472	>8,190	336	>13,194	3,603

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Table 2.4-207 Site-Specific K_d Values

Sample	K_d (cm^3/g)										
	Mn	Fe	Co	Ni	Zn	Sr	Ru	Ag	Cs	Ce	Pu
Min =	4.5	4504	6.5	12.7	11.8	3.6	272	2.5	64.9	329.1	5.3
10% =	3111.4	5596.0	2133.4	38.3	2183.5	3.9	504.4	15.5	68.0	5294.6	90.3
25% =	4087.8	10993.0	3953.3	110.1	3966.8	7.0	975.0	28.6	115.4	7028.0	204.8
50% =	7191.5	16204.5	5729.0	405.5	5597.5	12.0	1160.0	152.6	211.0	9377.0	342.0
Max =	21374	45497	20653	1616	8103	166.4	1665	31091	19504	13194	8680
Mean =	7577.3	18421.3	7474.4	470.6	4963.7	25.1	1094.3	5070.3	1701.4	8813.4	1204.6

Table 2.4-208 [Deleted]

Table 2.4-209 [Deleted]

Table 2.4-210 [Deleted]

Table 2.4-211 [Deleted]

Table 2.4-212 [Deleted]

NAPS COL 2.0-22-A

Table 2.4-213 Lake Anna Storage Data for Water Balance Model

Elevation (ft NGVD29*)	Storage (acre-feet) North Anna Reservoir	WHTF	Total Lake Anna
240	161,900	33,300	195,200
250	244,300	60,800	305,100
260	352,750	105,300	458,050

* The conversion from NGVD29 datum elevations to NAVD88 datum elevations is –0.86 ft

NAPS COL 2.0-24-A

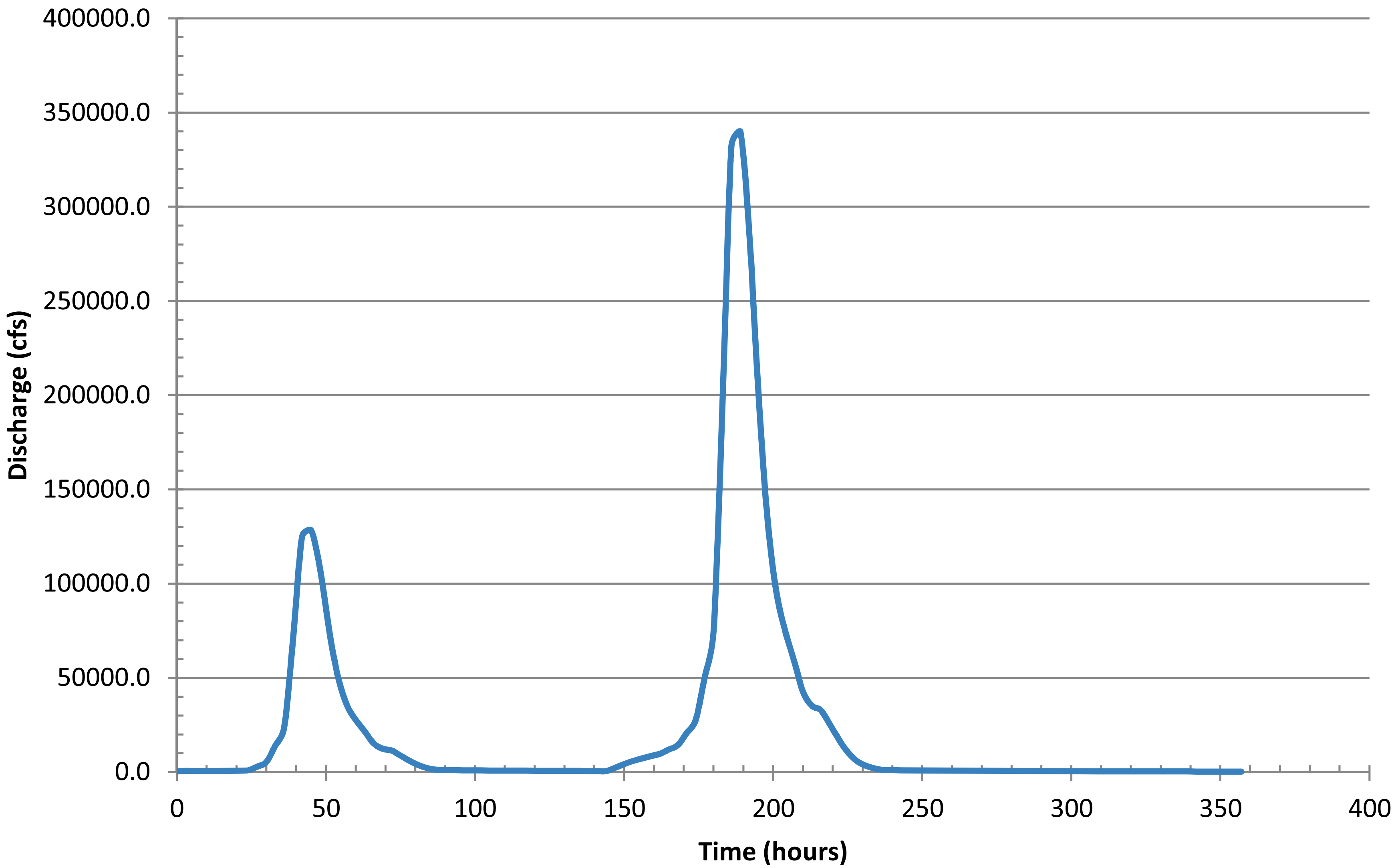
Table 2.4-214 Primary Conceptual Model – Concentrations in the Unit 3 Intake Channel

Radionuclide	Intake Channel Concentration (C) (μCi/cm^3)[(a)]	C/ECL Ratio
H-3	3.64E-04	3.64E-01
Co-60	4.25E-12	1.42E-06
Sr-90	1.30E-08	2.60E-02
Y-90	1.30E-08	1.86E-03
Te-129m	1.54E-11	2.20E-06
Cs-137	2.06E-11	2.06E-05
Pu-239	1.18E-13	5.88E-06
Sum		**3.9E-01**

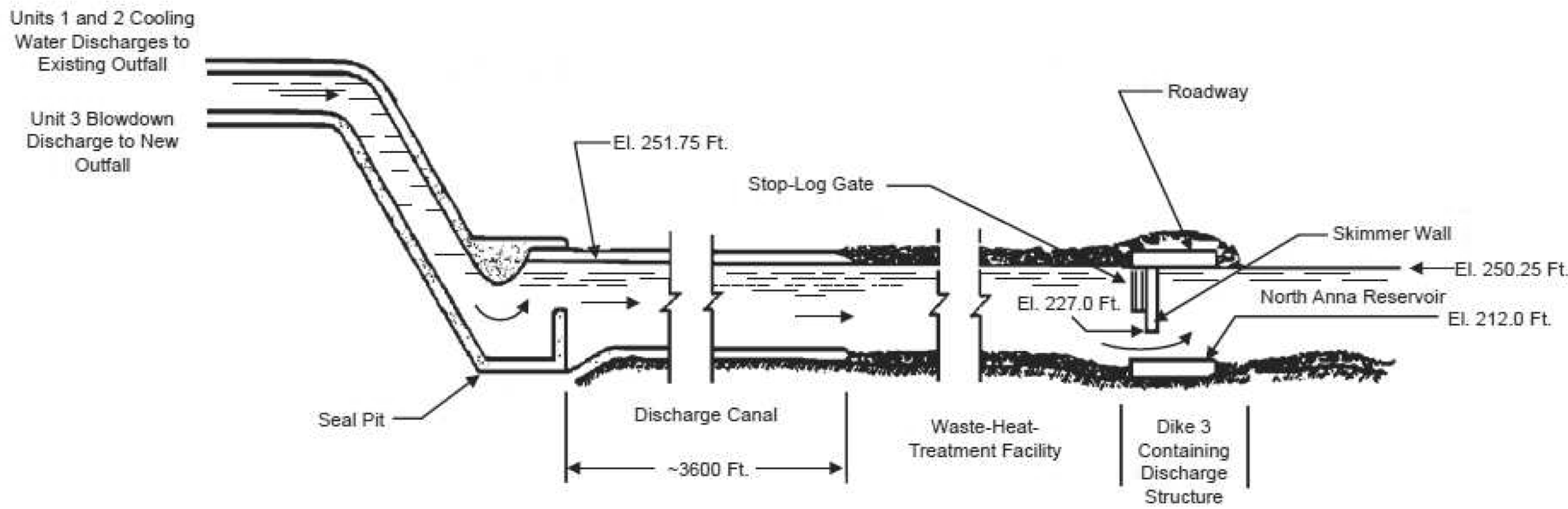
Notes: (a) Calculated using dilution factor in the intake channel (Section 2.4.13.3.3).
(b) Radionuclides that resulted in a C/ECL ratio of less than 1×10^{-6} are excluded.

BASIS: NEW

NAPS ESP VAR 2.4-5 **Figure 2.4-11R Combined North Anna Reservoir & WHTF PMP Inflow Hydrograph**

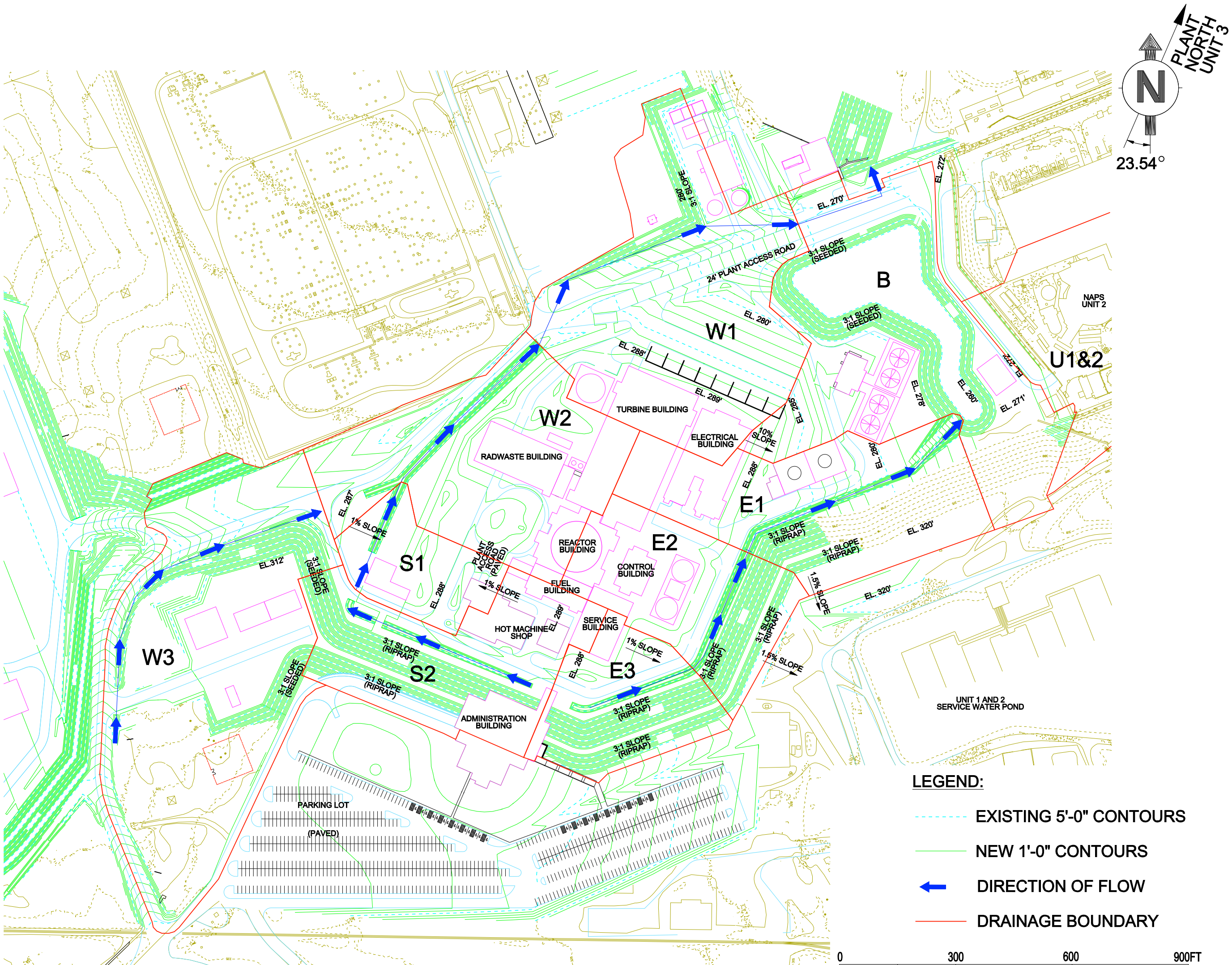


NAPS ESP VAR 2.4-4 **Figure 2.4-14R Schematic Cross-Sectional Diagram of Water Discharge System at Dike 3 WHTF**



Note: Elevations are in NGVD29, subtract 0.86 ft to convert to NAVD88

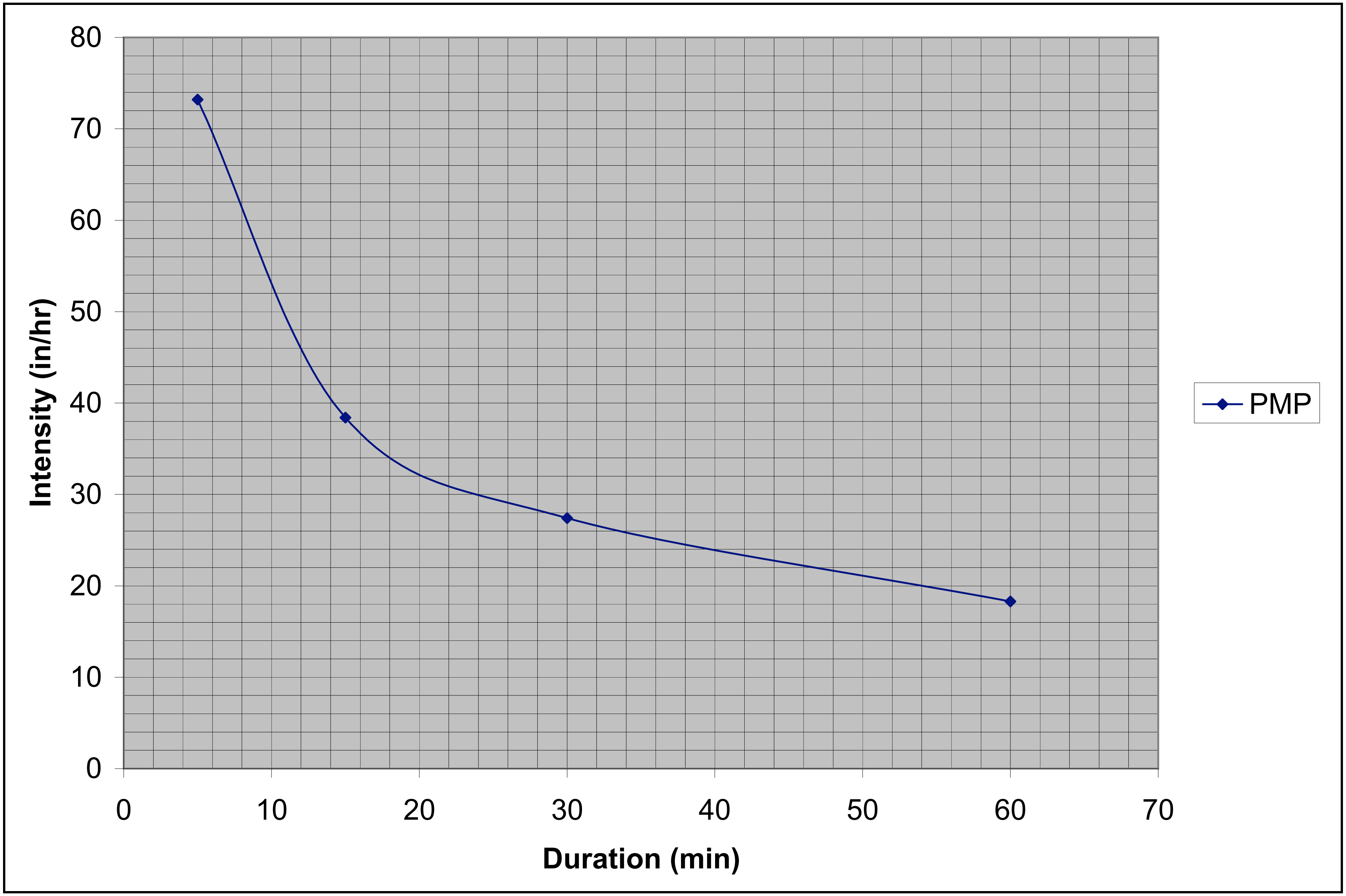
NAPS COL 2.0-13-A Figure 2.4-201 Site Layout and Sub-Basin Drainage Areas



NOTES:
1. ELEVATIONS SHOWN REFERENCE NAVD88 DATUM
2. CONVERSION FROM NAVD88 DATUM ELEVATIONS TO NGVD29 DATUM ELEVATIONS IS +0.86 FT
3. DESIGN PLANT GRADE-ELEVATION 290.0 FT NAVD88.

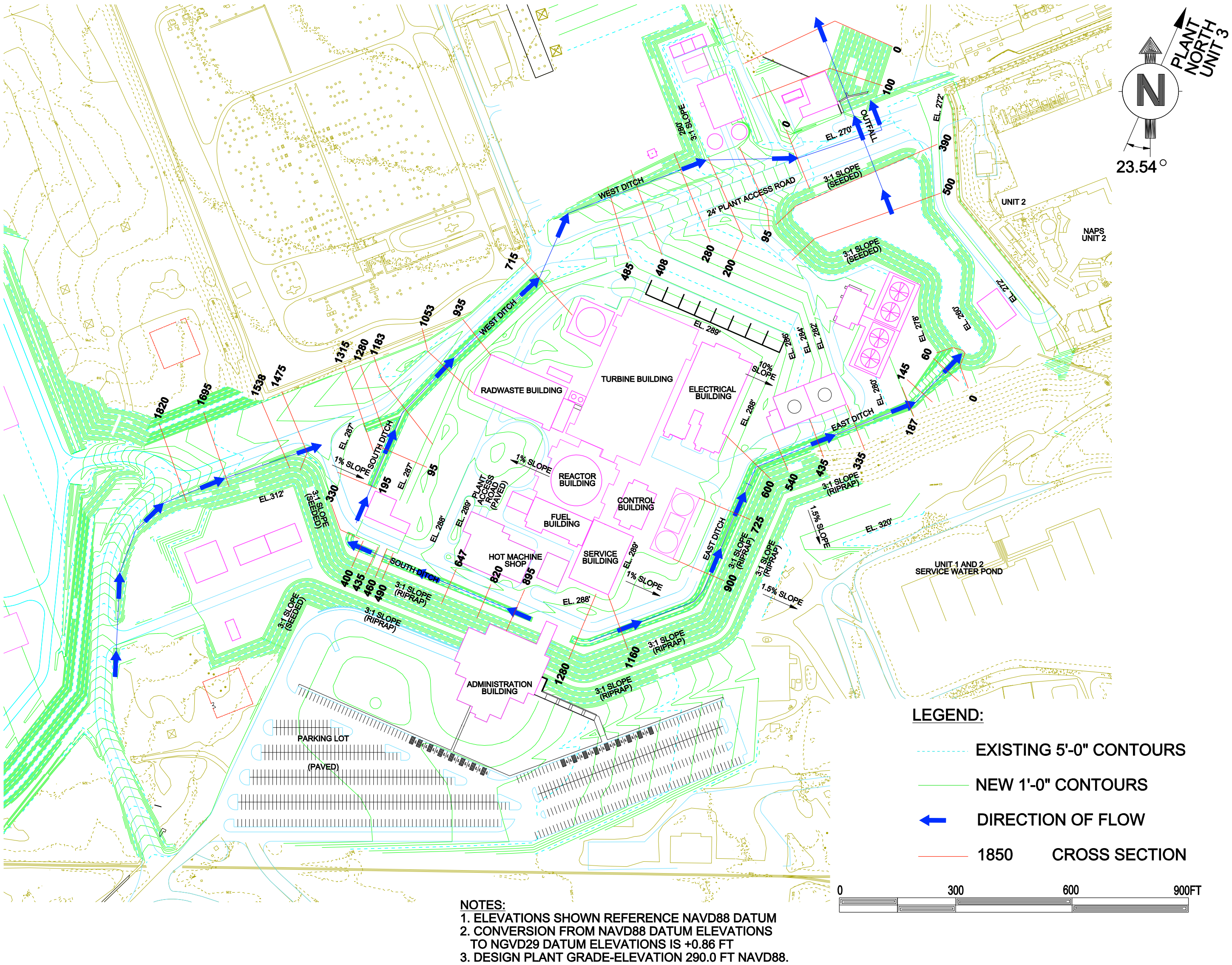
BASIS: ESBWR COLA

NAPS COL 2.0-13-A Figure 2.4-202 Unit 3 Site PMP Duration- Intensity Curve



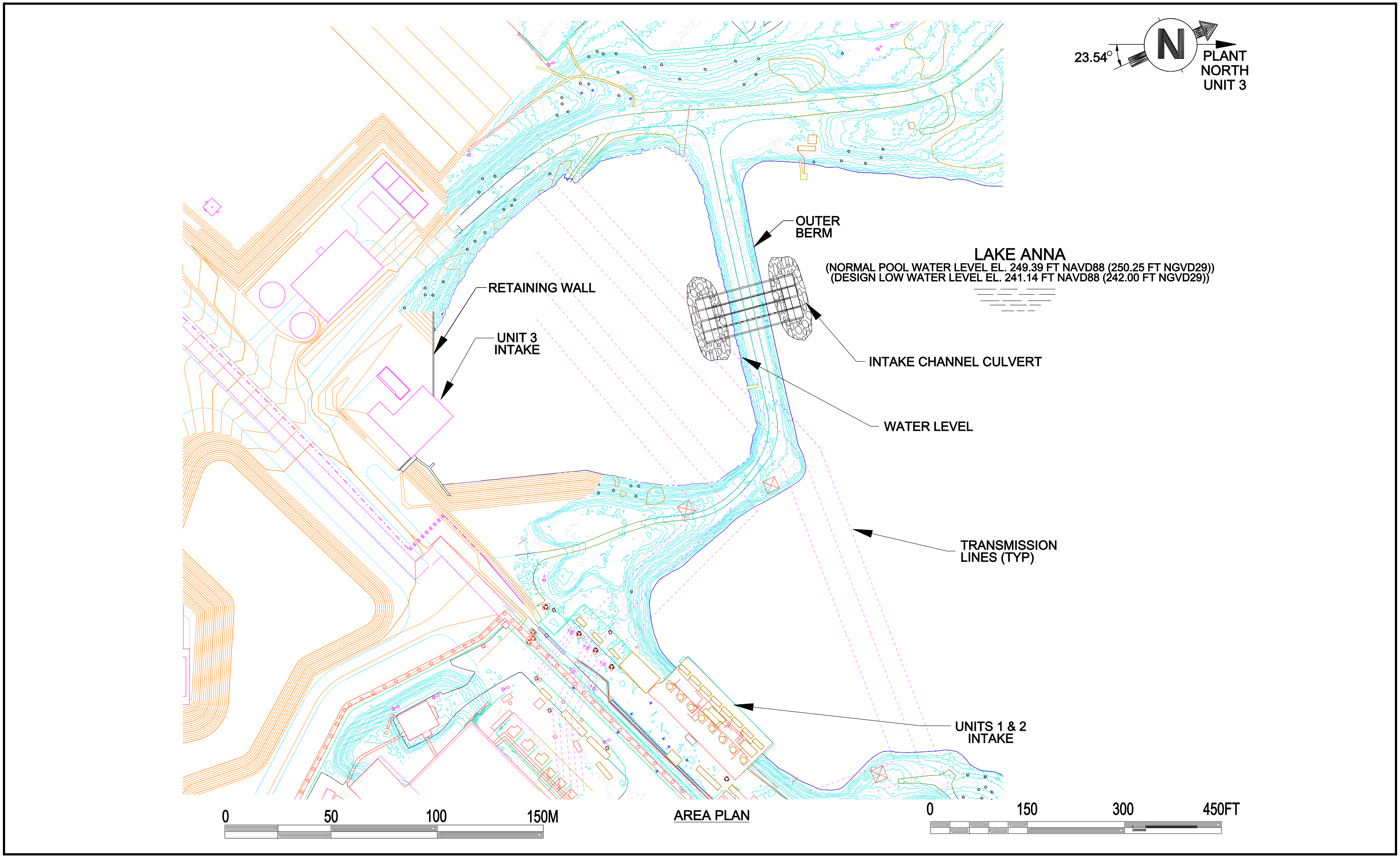
BASIS: ESBWR COLA

NAPS COL 2.0-13-A Figure 2.4-203 Cross-Section Locations



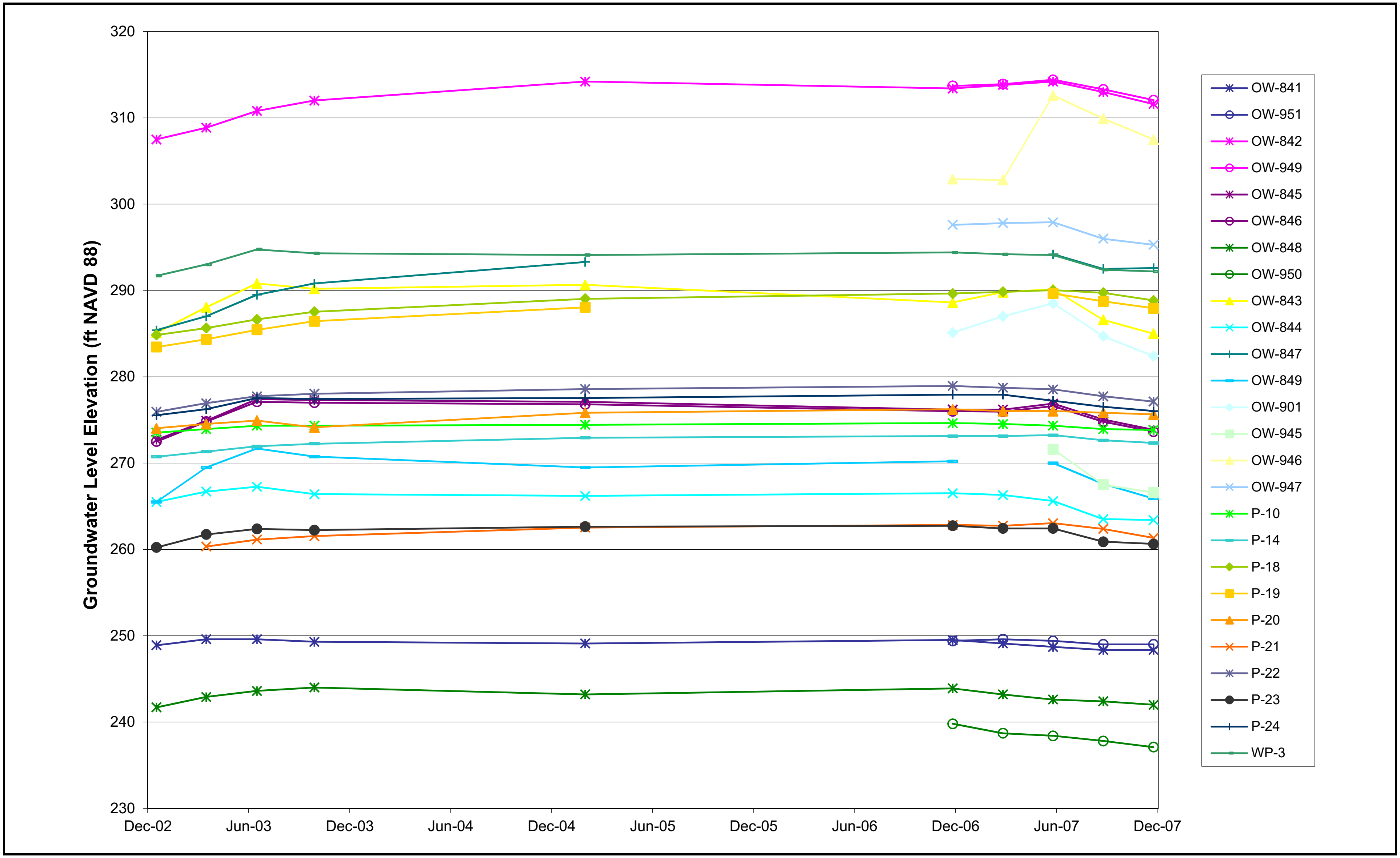
BASIS: ESBWR COLA

NAPS ESP COL 2.4-9 Figure 2.4-204 Unit 3 Station Water Intake Building Location

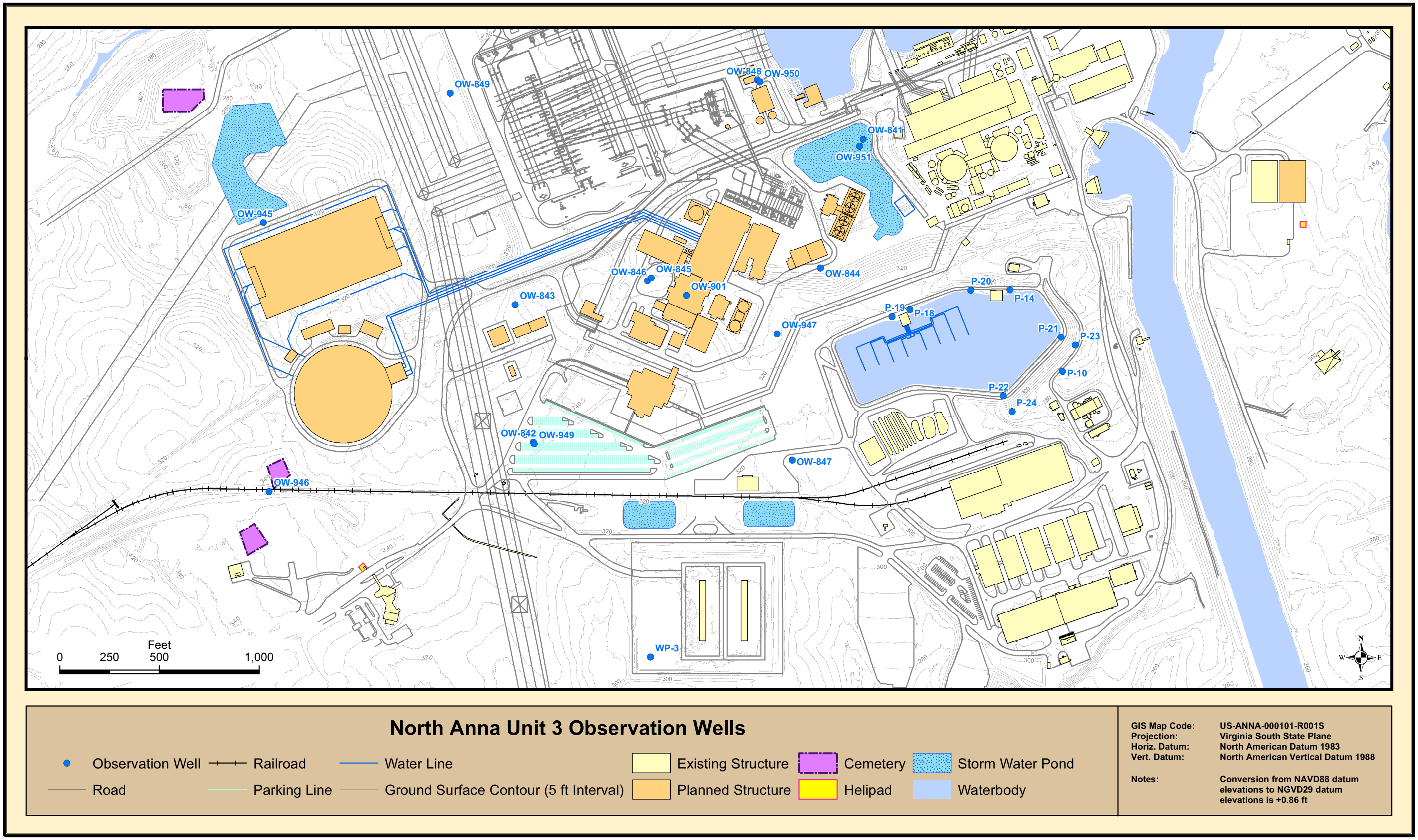


BASIS: ESBWR COLA

NAPS COL 2.0-23-A **Figure 2.4-205 Groundwater Level Hydrographs**

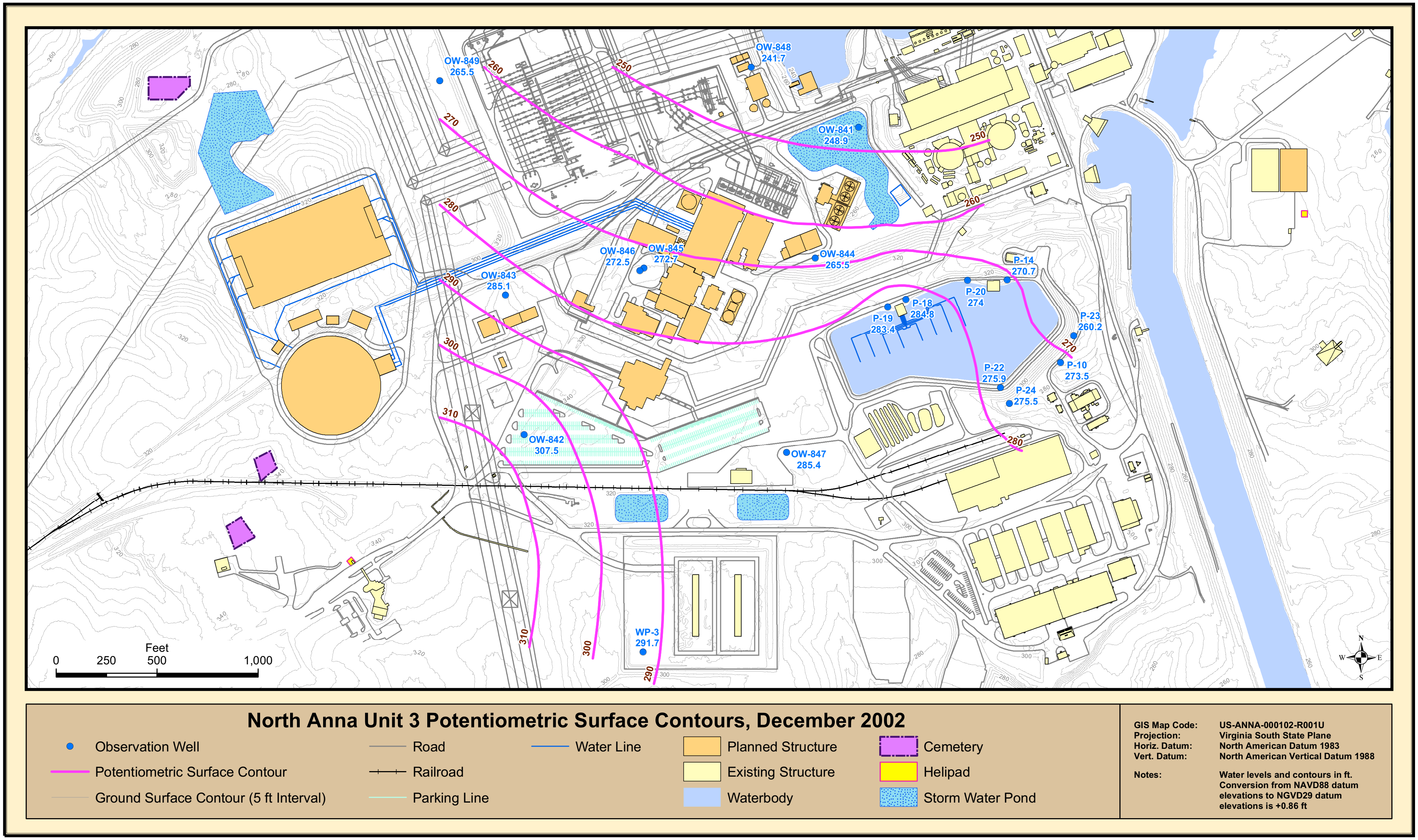


NAPS COL 2.0-23-A Figure 2.4-206 Observation Well Location Plan



BASIS: ESBWR COLA

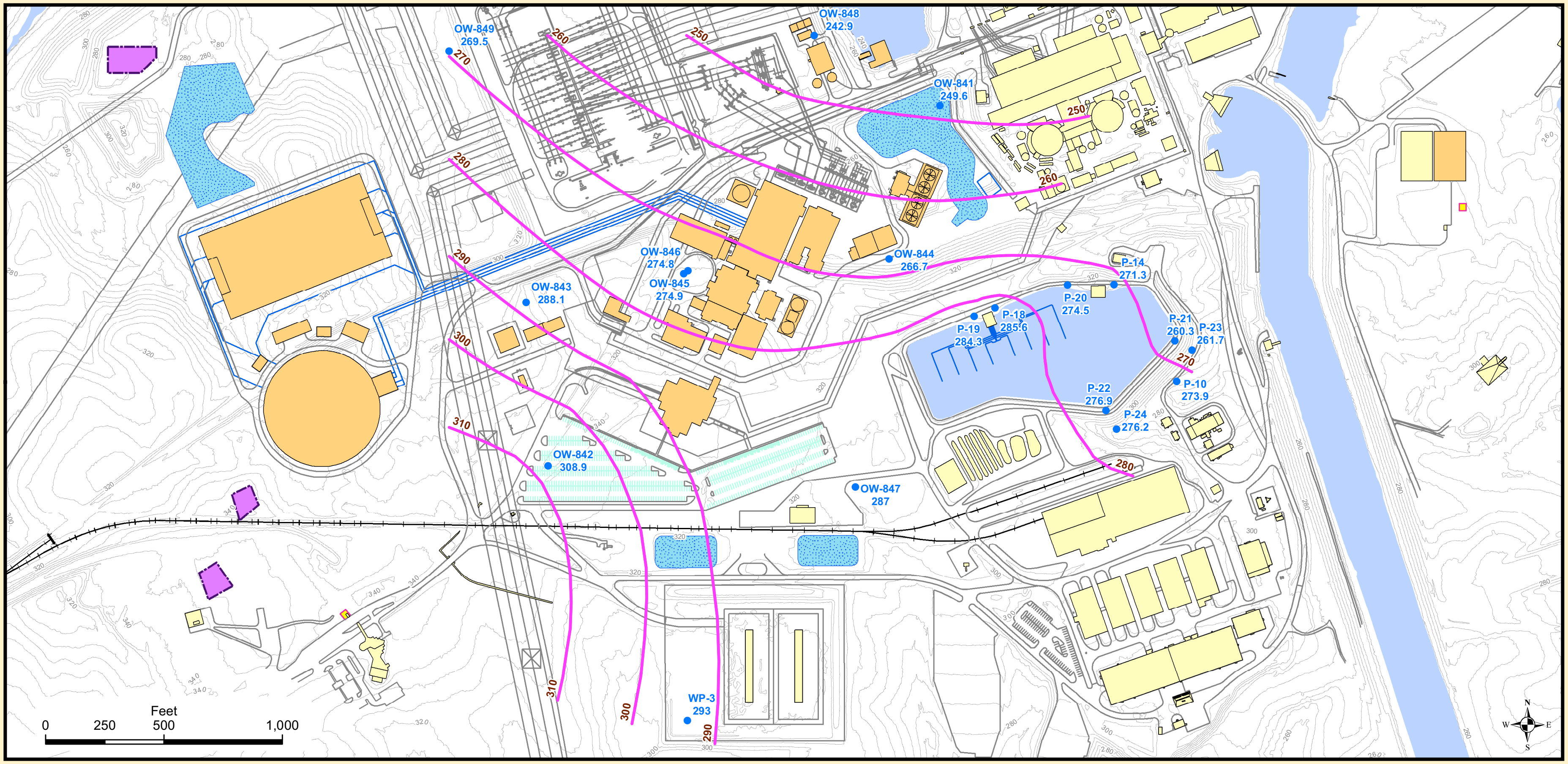
NAPS COL 2.0-23-A Figure 2.4-207 Piezometric Head Contour Map: December 2002



BASIS: ESBWR COLA

NAPS COL 2.0-23-A

Figure 2.4-208 Piezometric Head Contour Map: March 2003

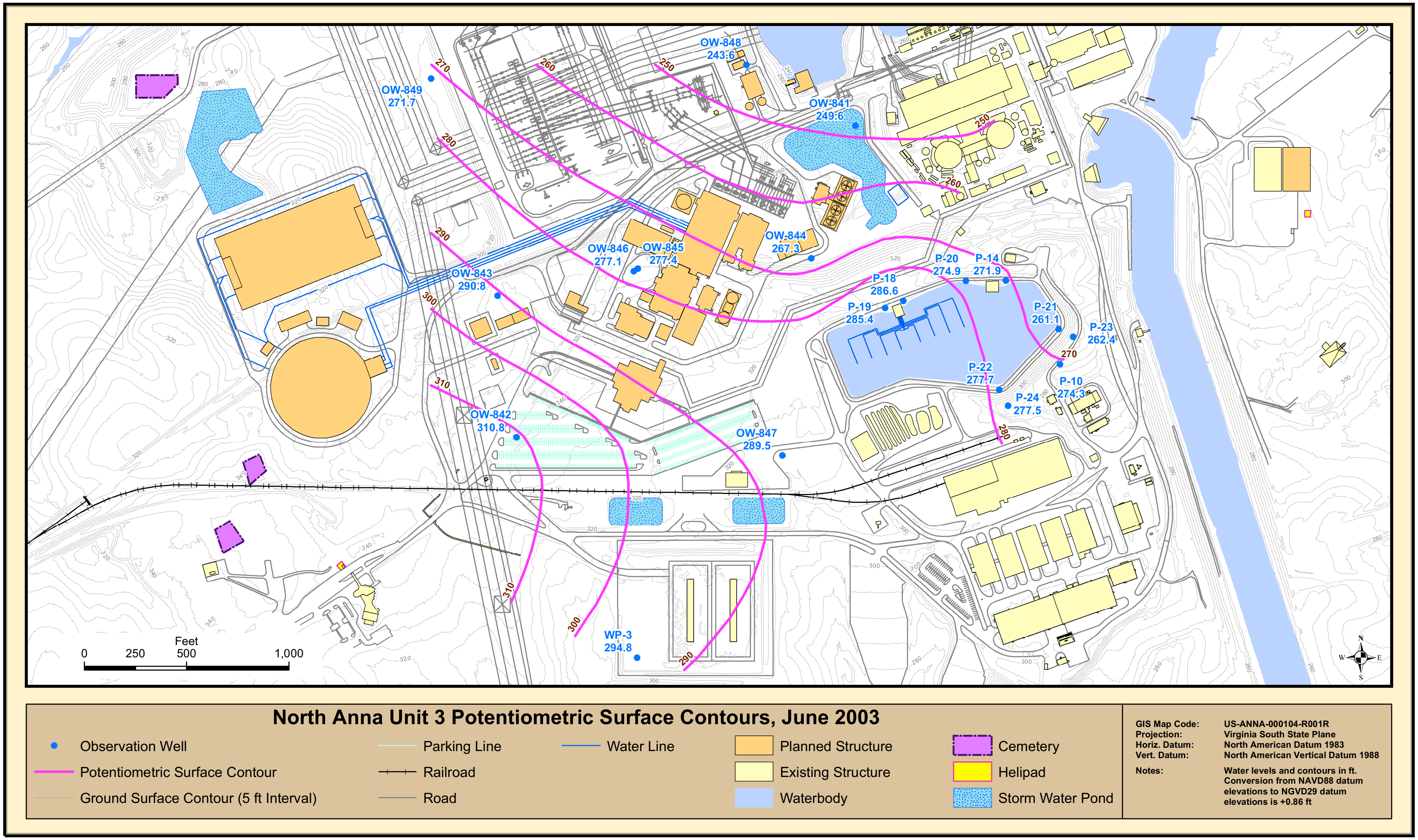


North Anna Unit 3 Potentiometric Surface Contours, March 2003

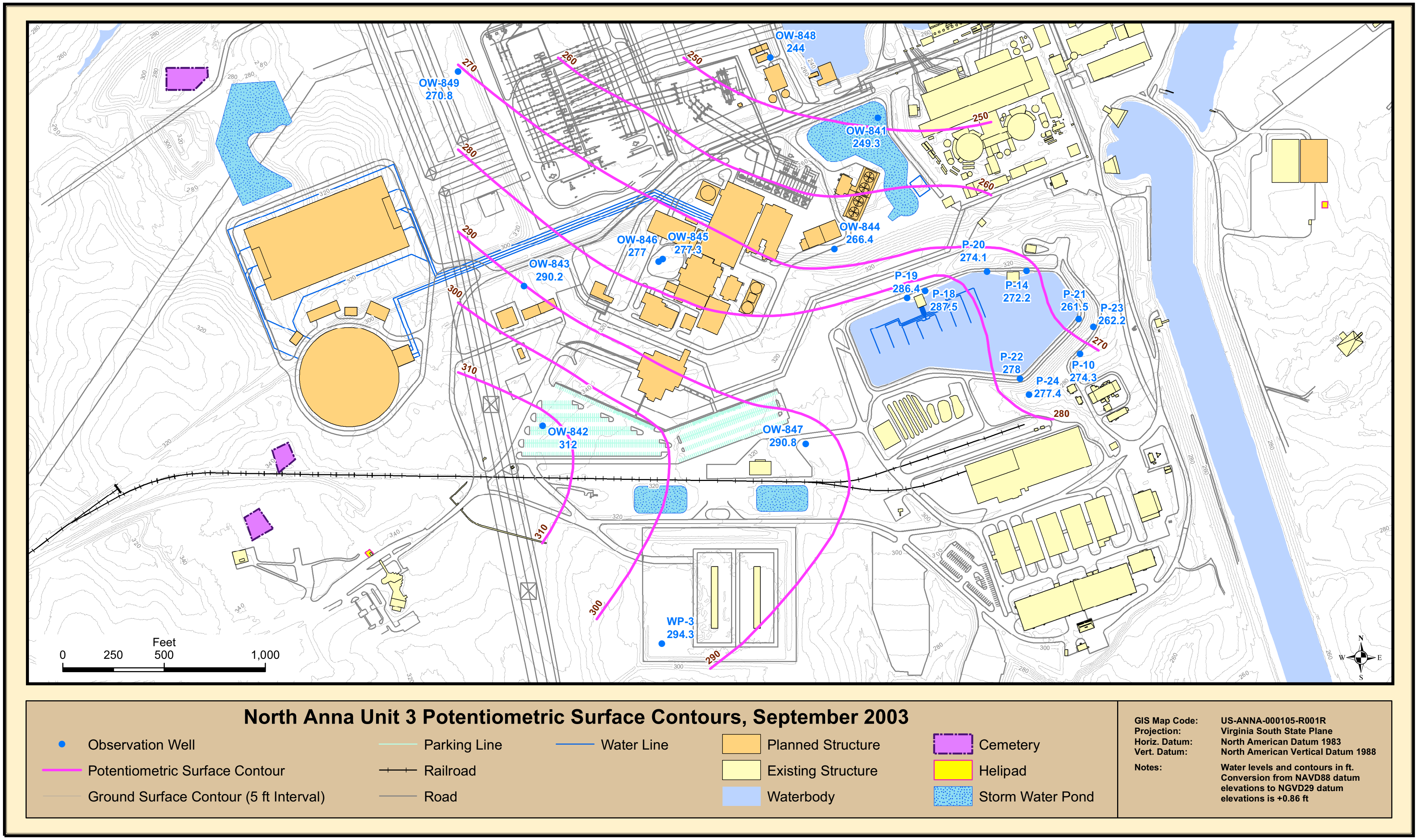
Observation Well	Road	Water Line	Planned Structure	Cemetery
Potentiometric Surface Contour	Railroad		Existing Structure	Helipad
Ground Surface Contour (5 ft Interval)	Parking Line		Waterbody	Storm Water Pond

GIS Map Code: US-ANNA-000103-R001T
Projection: Virginia South State Plane
Horiz. Datum: North American Datum 1983
Vert. Datum: North American Vertical Datum 1988
Notes: Water levels and contours in ft. Conversion from NAVD88 datum elevations to NGVD29 datum elevations is +0.86 ft

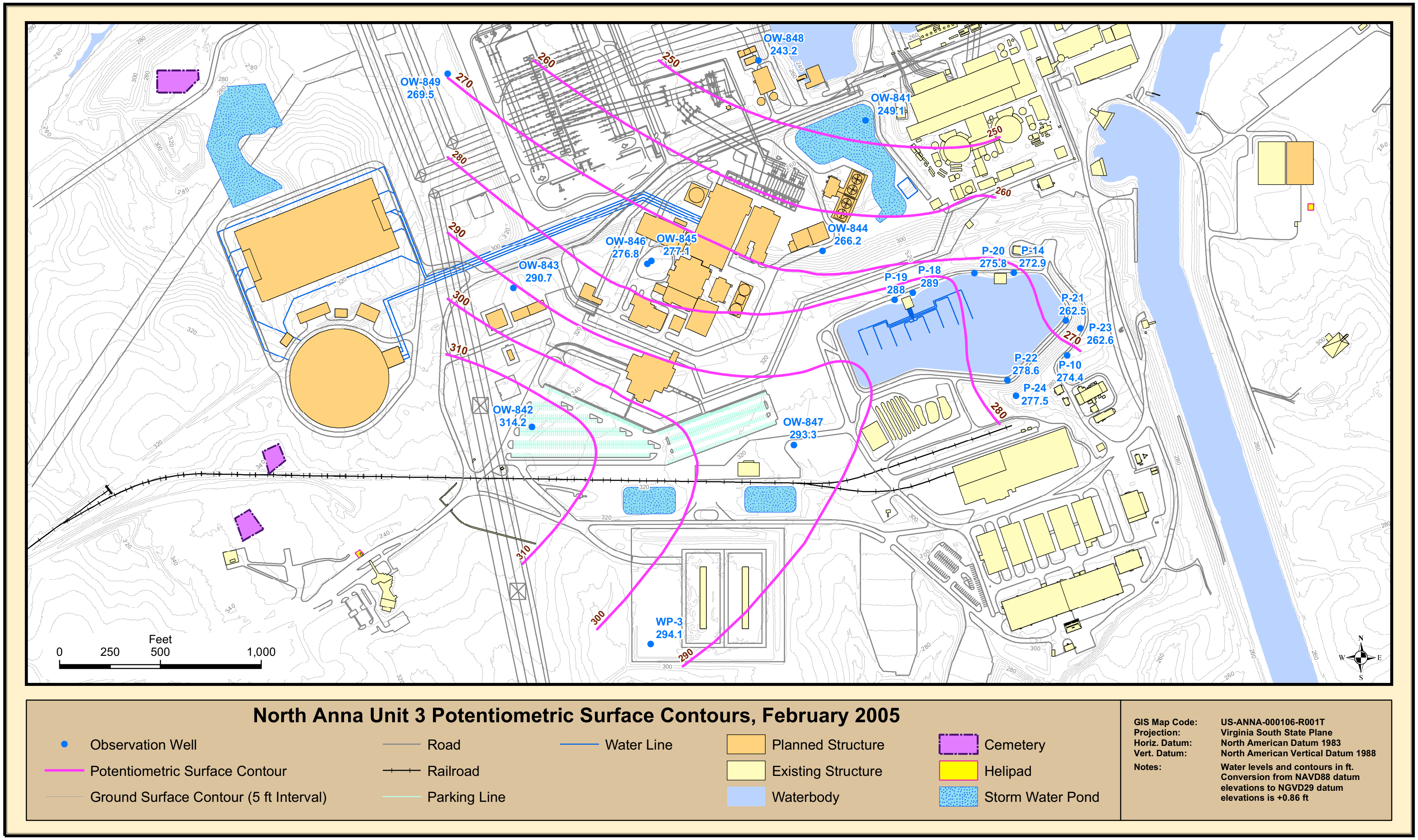
NAPS COL 2.0-23-A **Figure 2.4-209 Piezometric Head Contour Map: June 2003**



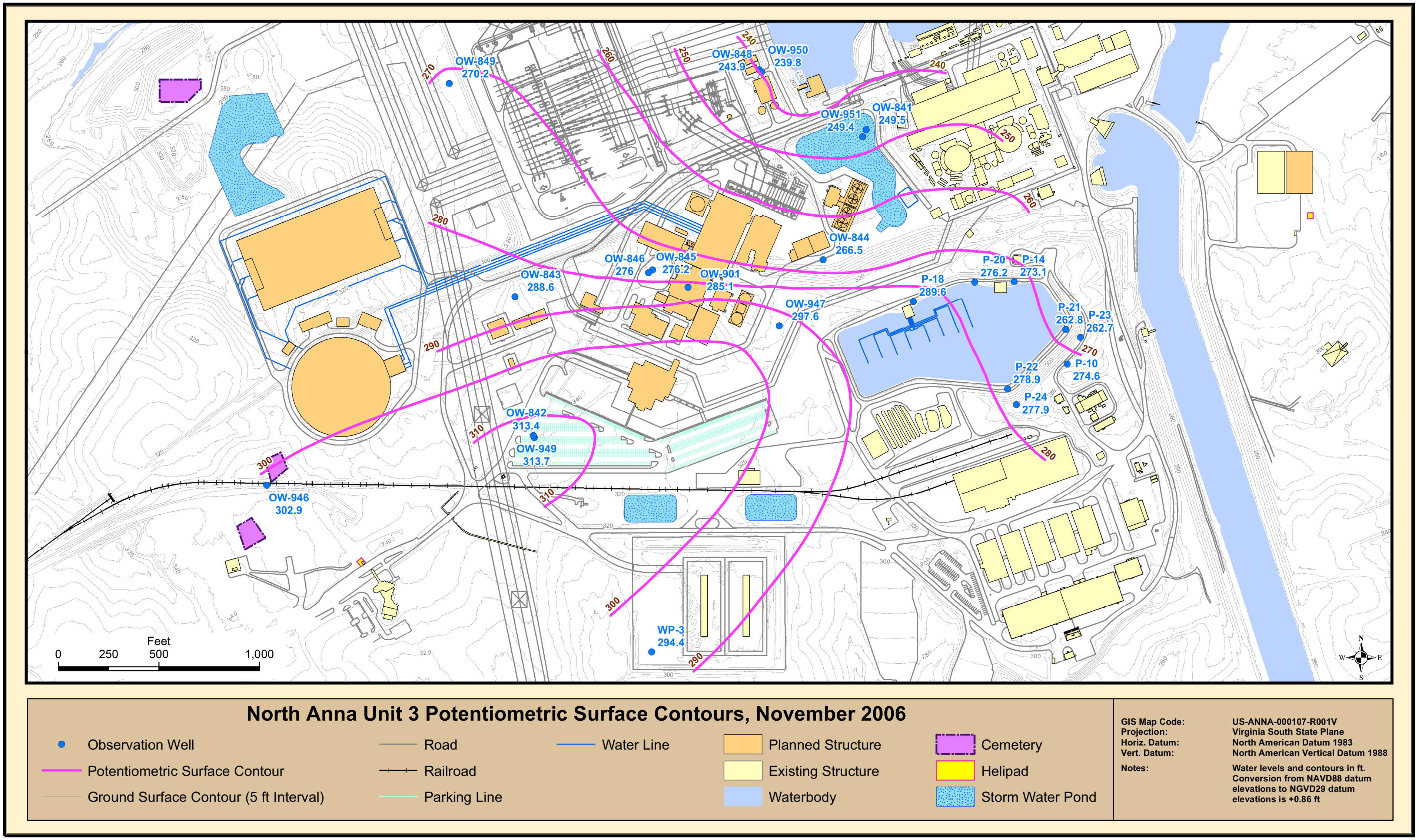
NAPS COL 2.0-23-A **Figure 2.4-210 Piezometric Head Contour Map: September 2003**



NAPS COL 2.0-23-A **Figure 2.4-211 Piezometric Head Contour Map: February 2005**

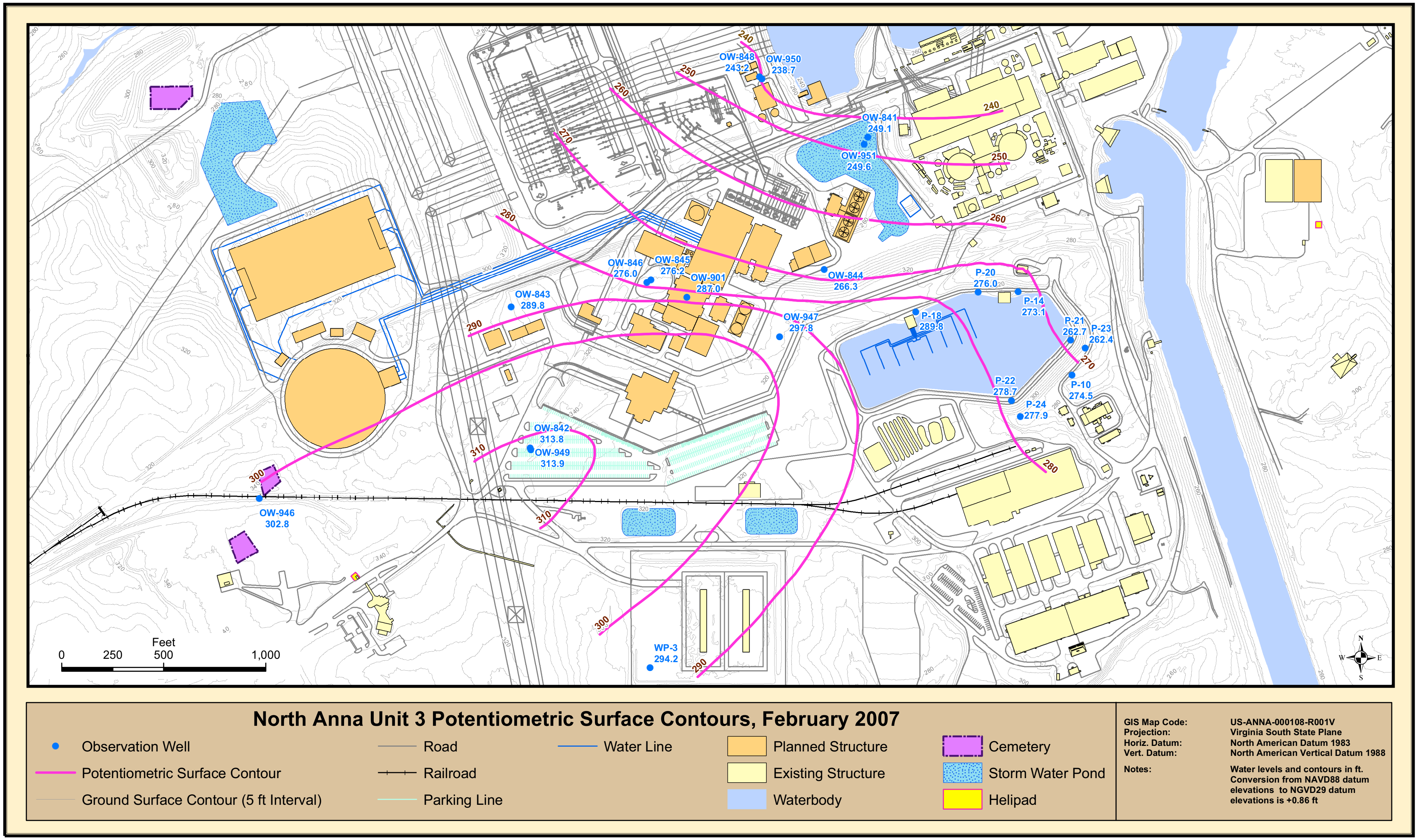


NAPS COL 2.0-23-A **Figure 2.4-212 Piezometric Head Contour Map: November 2006**



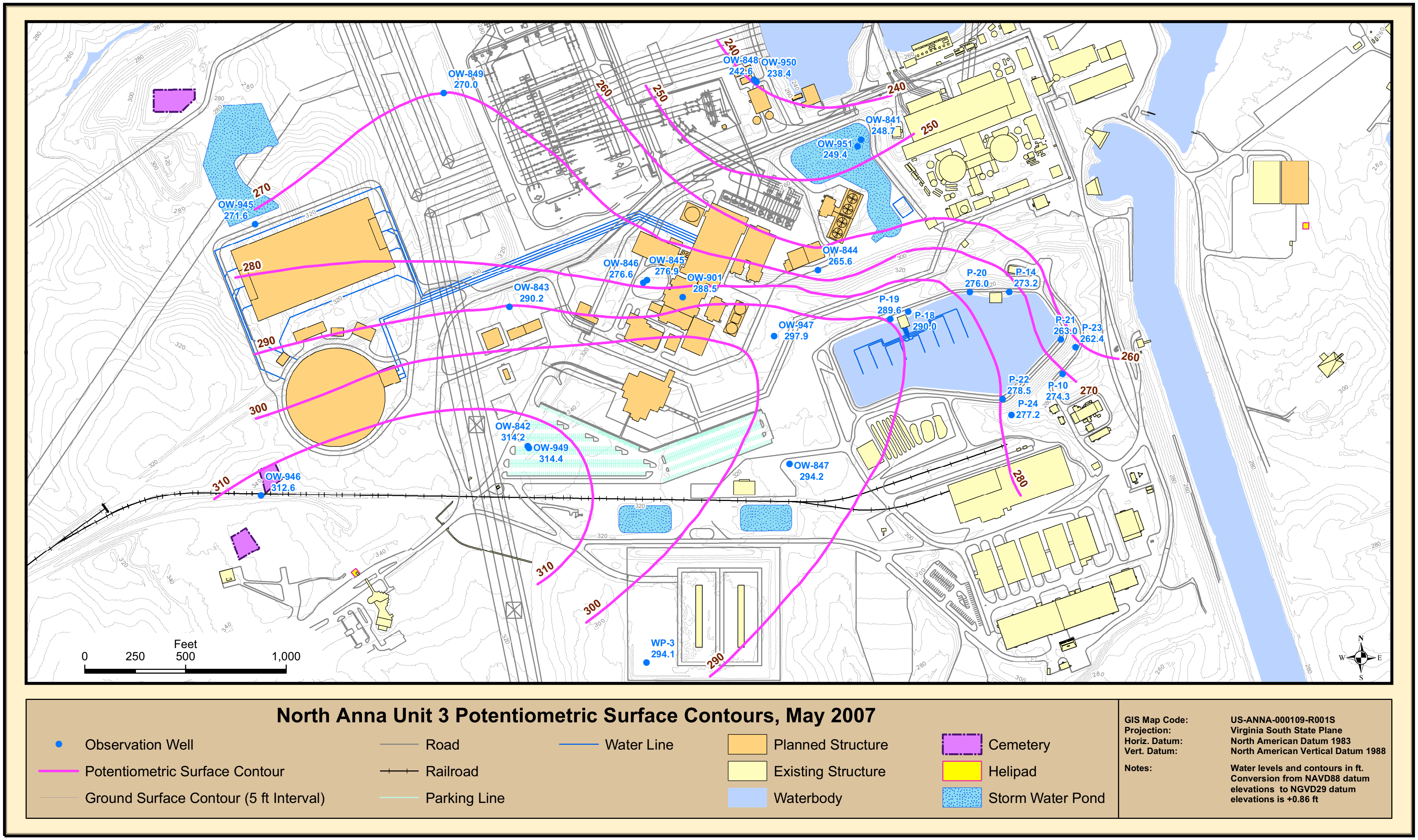
BASIS: ESBWR COLA

NAPS COL 2.0-23-A **Figure 2.4-213 Piezometric Head Contour Map: February 2007**



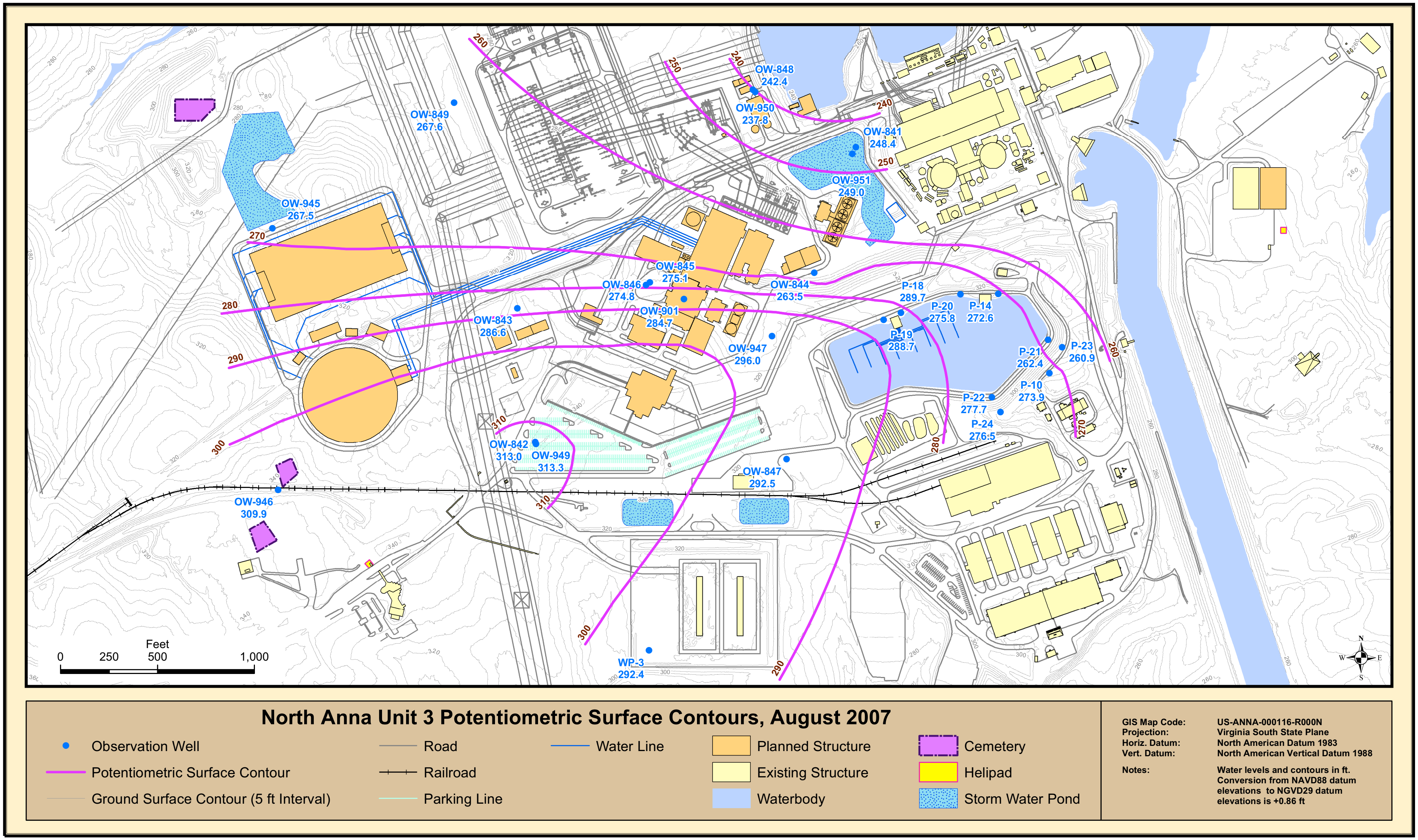
BASIS: ESBWR COLA

NAPS COL 2.0-23-A Figure 2.4-214 Piezometric Head Contour Map: May 2007



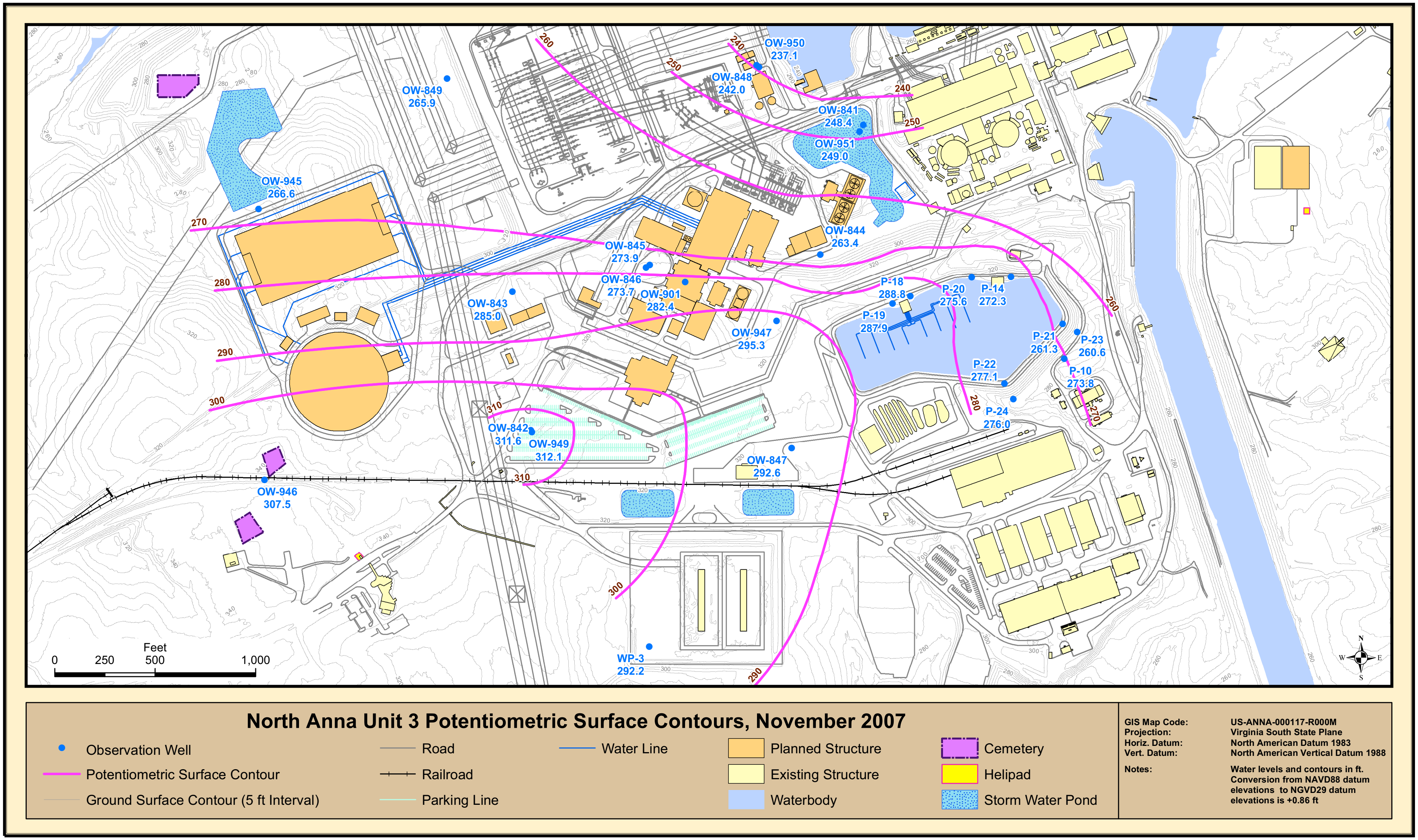
BASIS: NEW

NAPS COL 2.0-23-A **Figure 2.4-214a Piezometric Head Contour Map: August 2007**

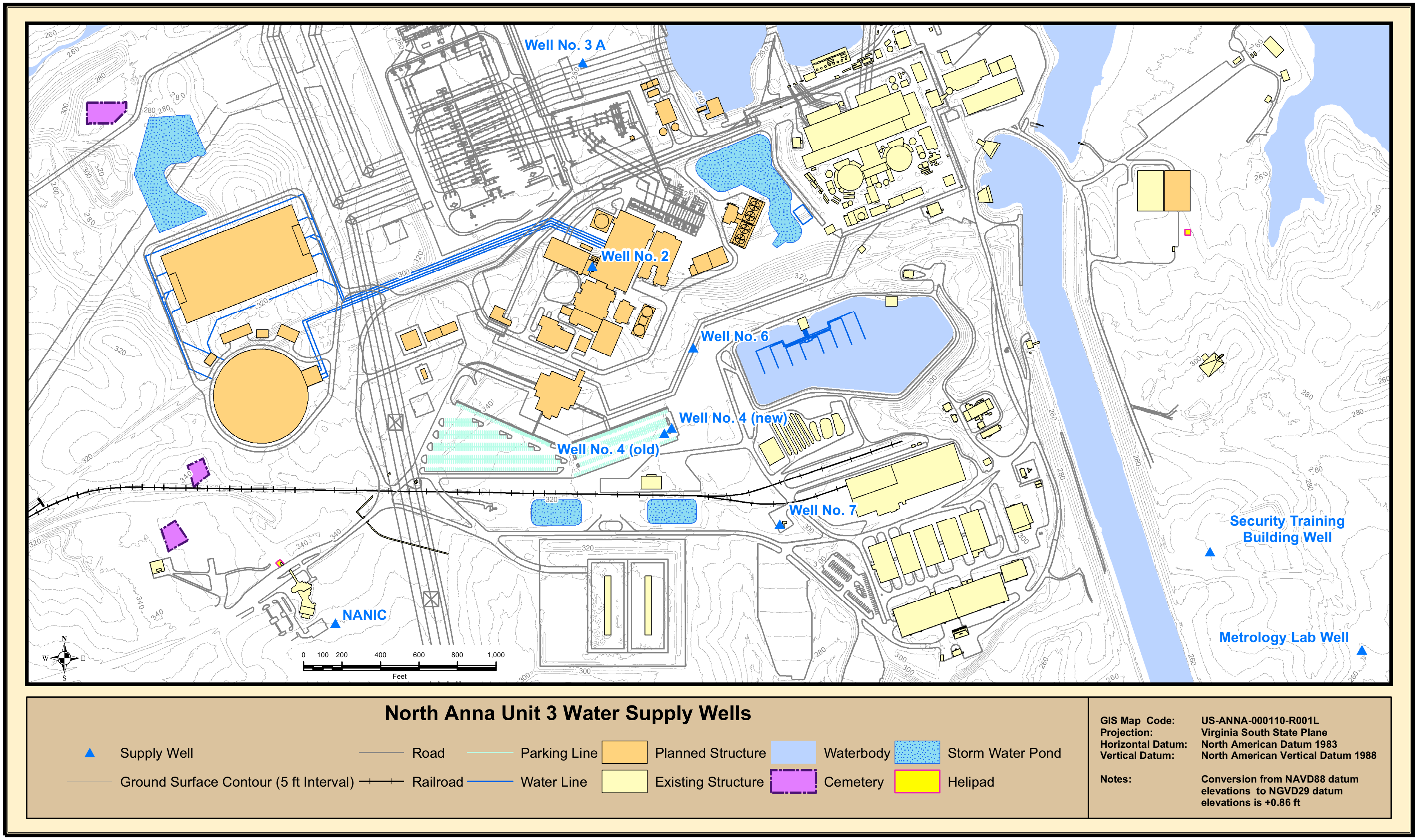


BASIS: NEW

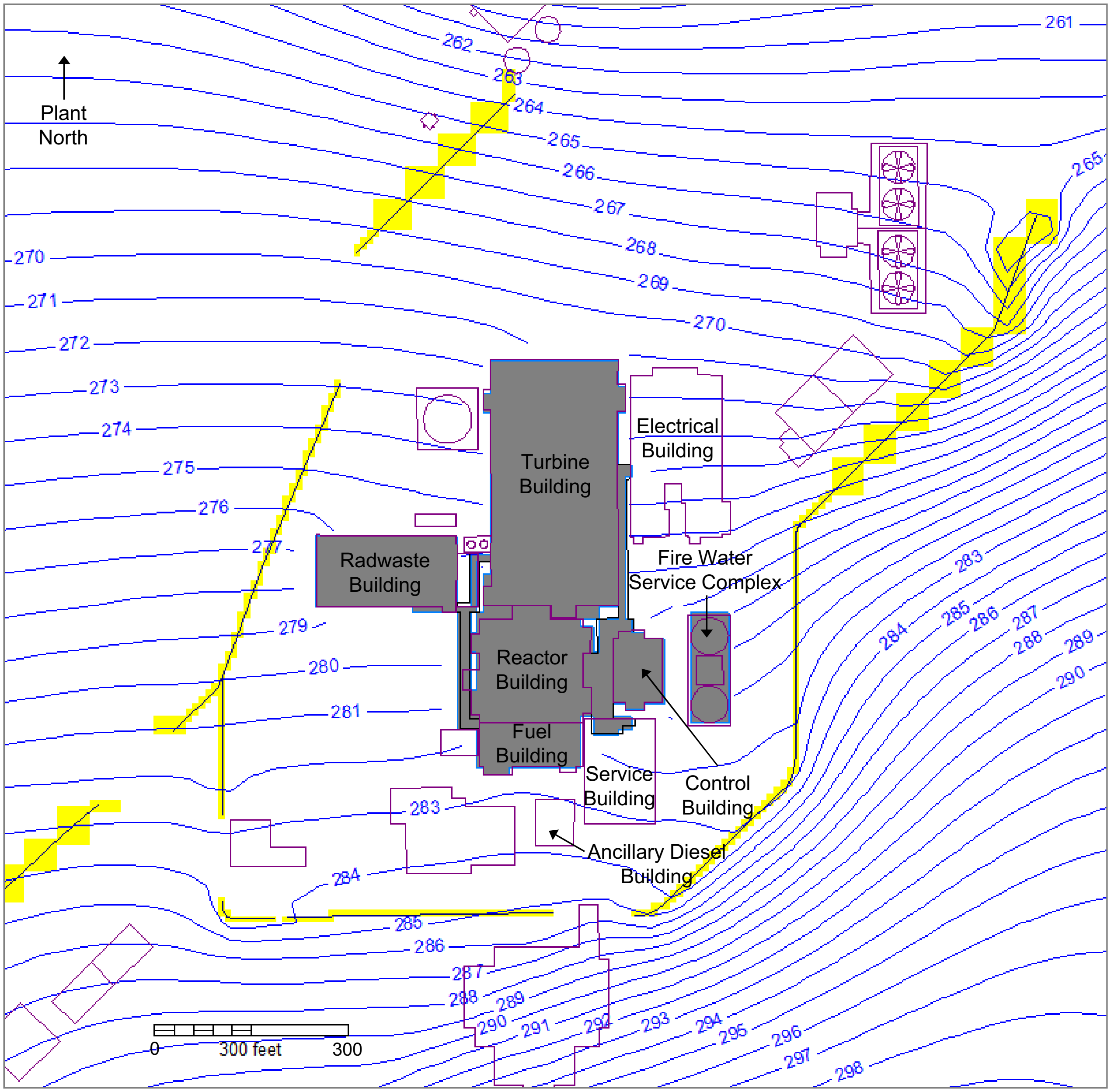
NAPS COL 2.0-23-A Figure 2.4-214b Piezometric Head Contour Map: November 2007



NAPS COL 2.0-23-A **Figure 2.4-215 Water Supply Well location Plan**



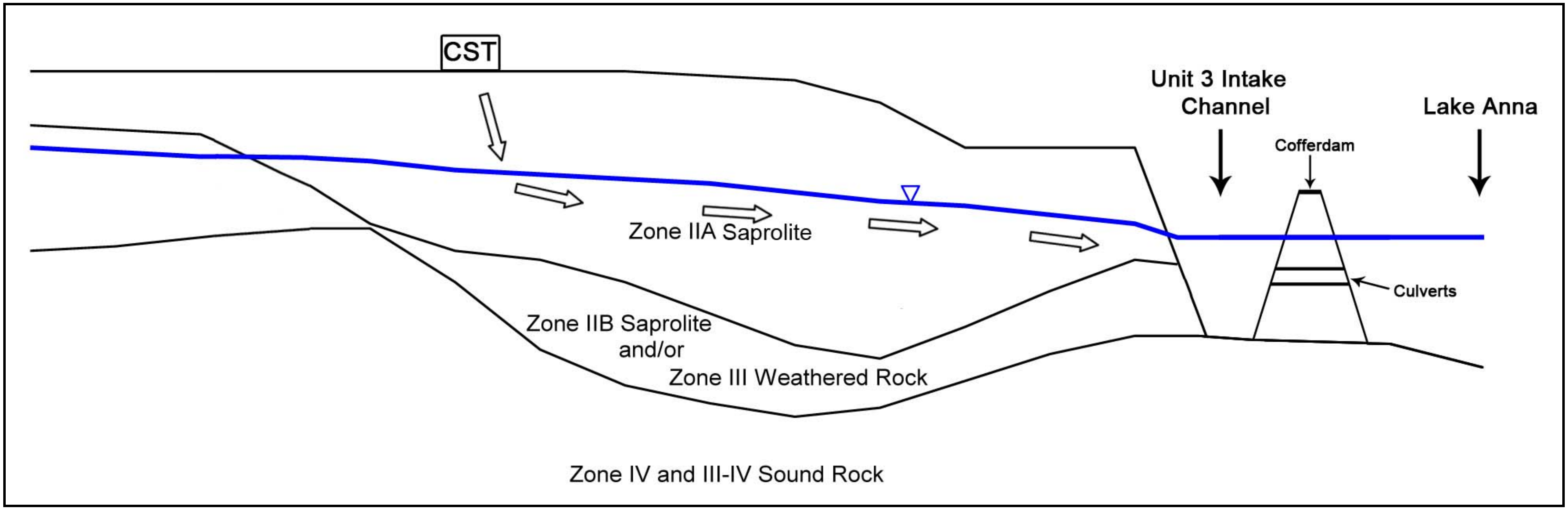
NAPS COL 2.0-23-A **Figure 2.4-216 Piezometric Head Contour Map of Post-Construction Groundwater Elevation Contours Around the Unit 3 Power Block (contours in ft)**



Note: Water levels in ft NAVD88. Yellow shading indicates site drainage ditches and gray shading indicates no flow boundary condition cells as implemented in the groundwater model.

BASIS: ESBWR COLA

NAPS COL 2.0-24-A **Figure 2.4-217 Model for Evaluating Radionuclide Transport in Groundwater**

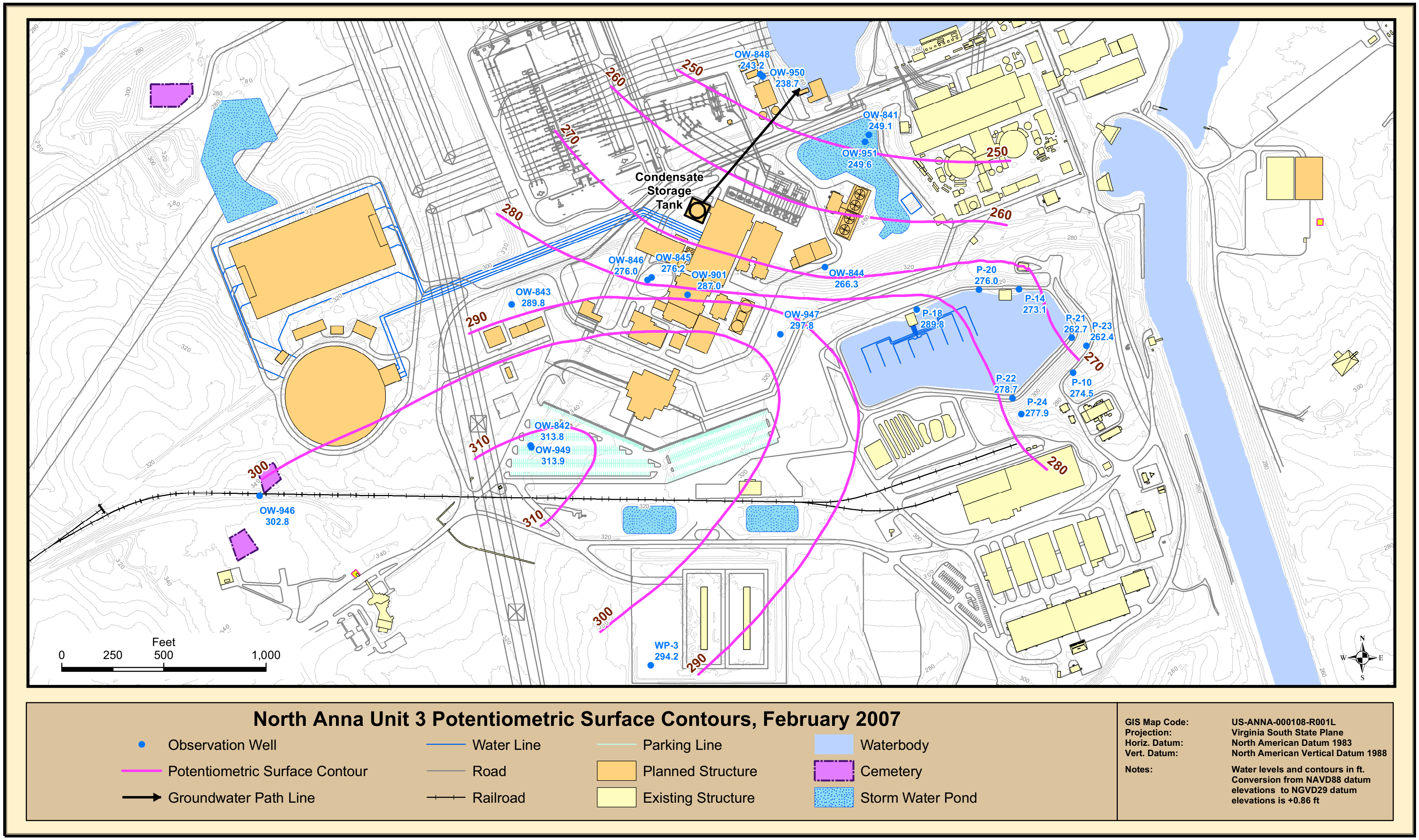


Not to scale. See Section 2.5.4 for description of subsurface material properties.

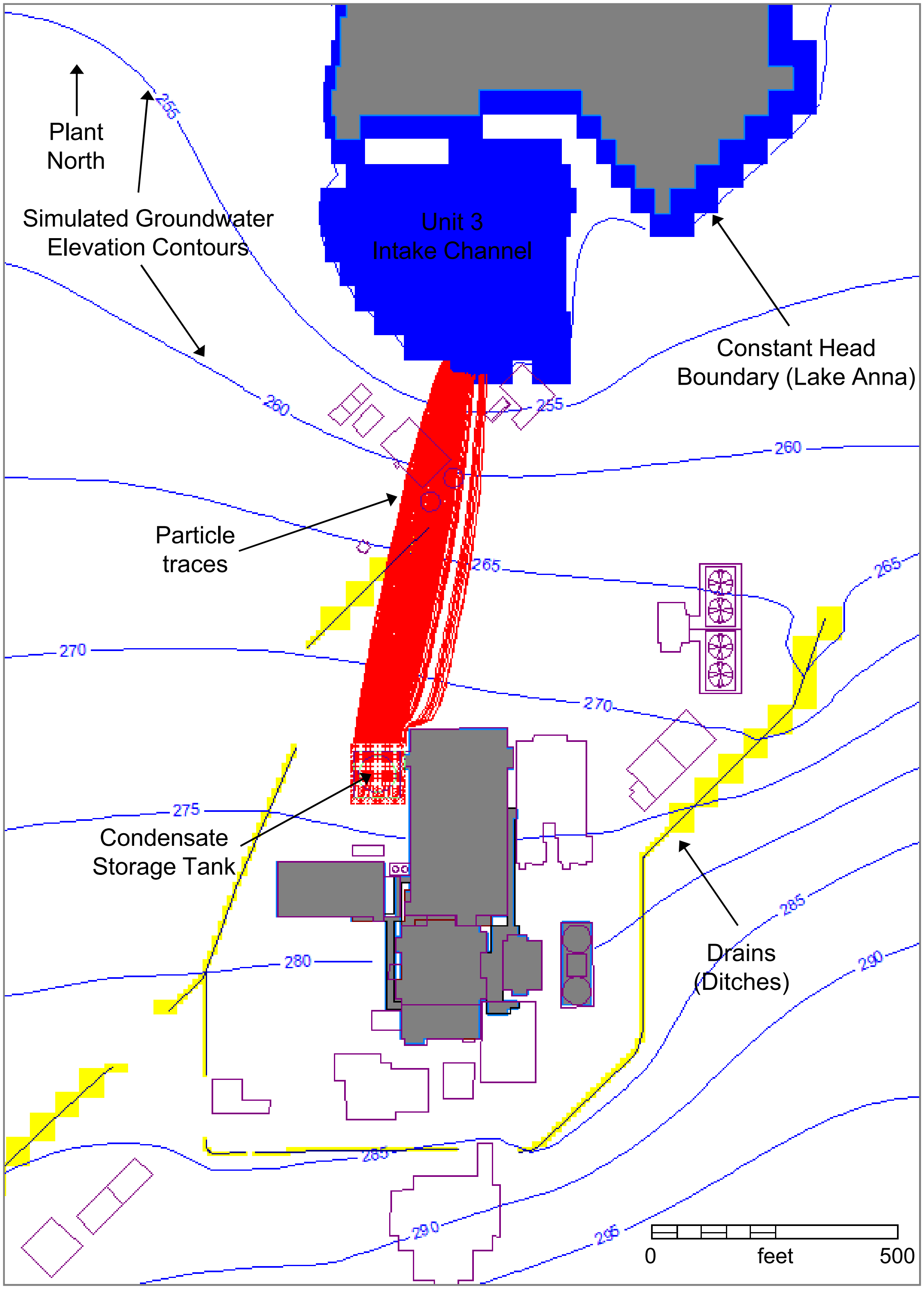
Figure 2.4-218 [Deleted]

BASIS: NEW

NAPS COL 2.0-24-A Figure 2.4-219 Plan View of Accidental Release to Groundwater

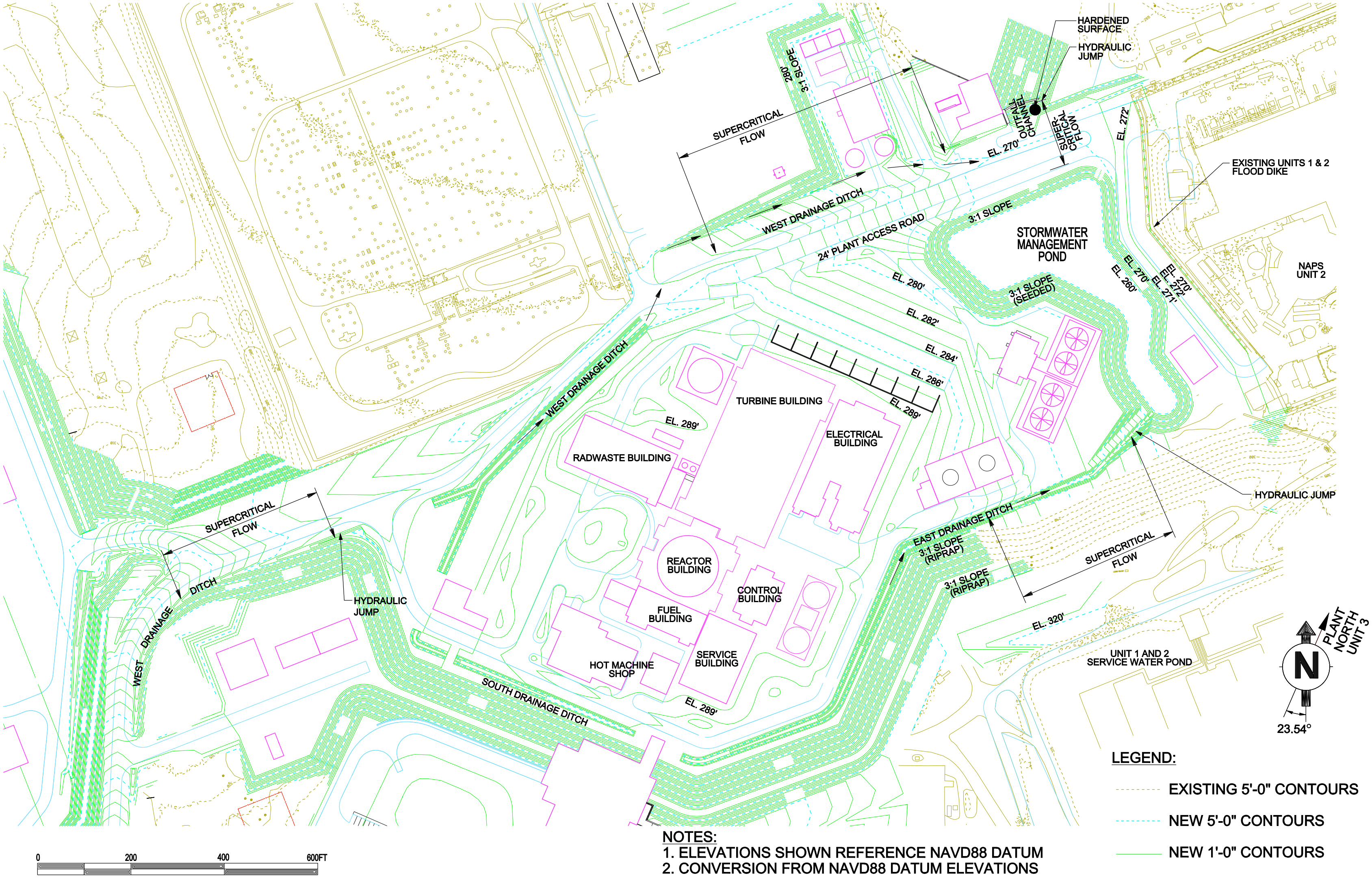


NAPS COL 2.0-24-A **Figure 2.4-220 Particle Traces from the Condensate Storage Tank**



BASIS: NEW

NAPS COL 2.0-13-A **Figure 2.4-221 Super Critical Flow Regime and Hydraulic Jump Locations**



LEGEND:

EXISTING 5'-0" CONTOURS

NEW 5'-0" CONTOURS

NEW 1'-0" CONTOURS

NOTES:
1. ELEVATIONS SHOWN REFERENCE NAVD88 DATUM
2. CONVERSION FROM NAVD88 DATUM ELEVATIONS TO NGVD29 DATUM ELEVATIONS IS +0.86 FT
3. DESIGN PLANT GRADE-ELEVATION 290.0 FT NAVD88.
4. LOCATIONS OF THE HYDRAULIC JUMPS ARE APPROXIMATE.

NAPS COL 2.0-14-A **Figure 2.4-222 North Anna Reservoir and WHTF Combined Unit Hydrograph**