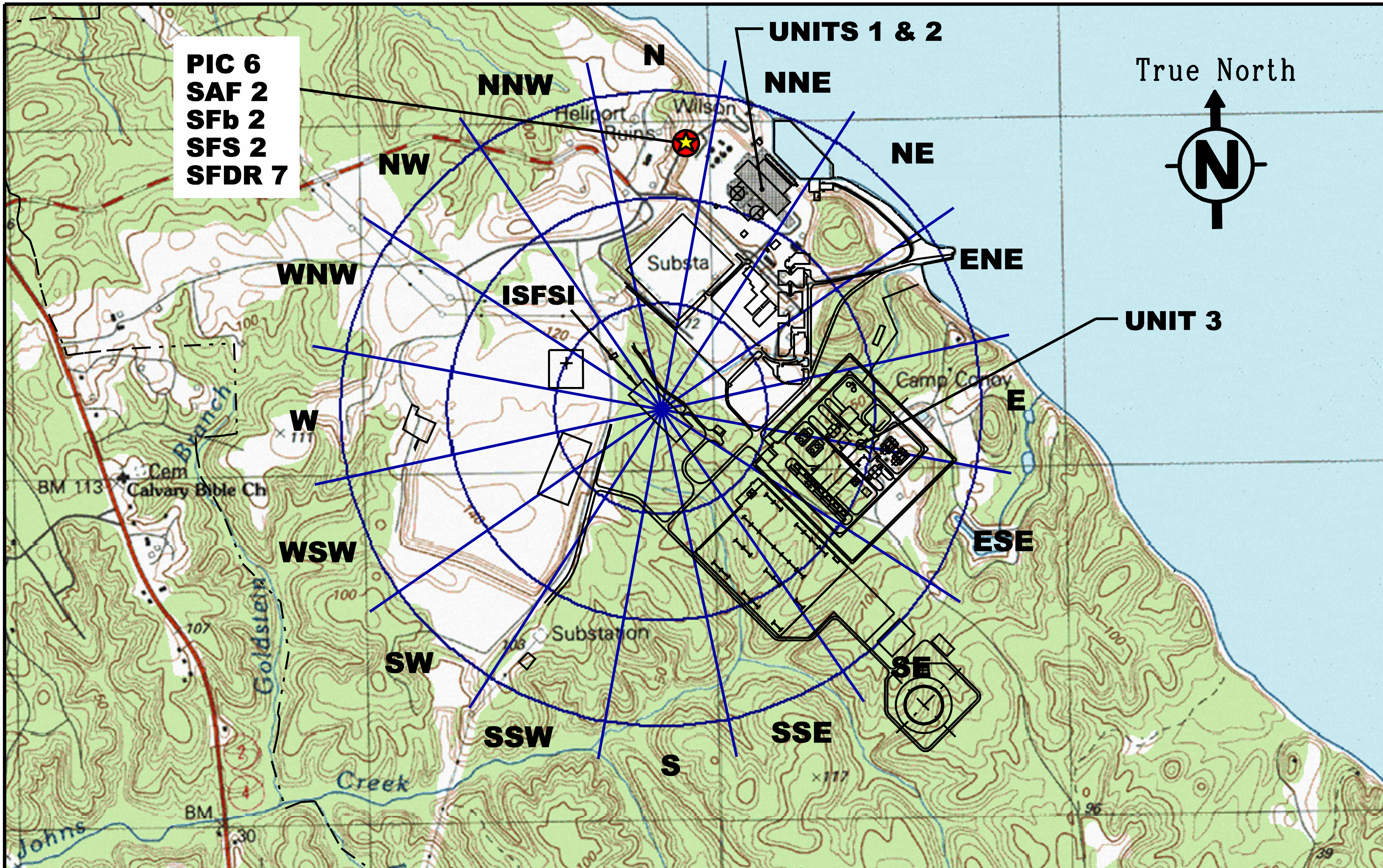

0 800 1600 2400

SCALE: FEET

0 250 500 750 1000

SCALE: METERS

FIGURE 6.2-3 **Rev. 2**

{CCNPP INDEPENDENT SPENT FUEL STORAGE INSTALLATION SAMPLING LOCATIONS}

CCNPP UNIT 3 ER

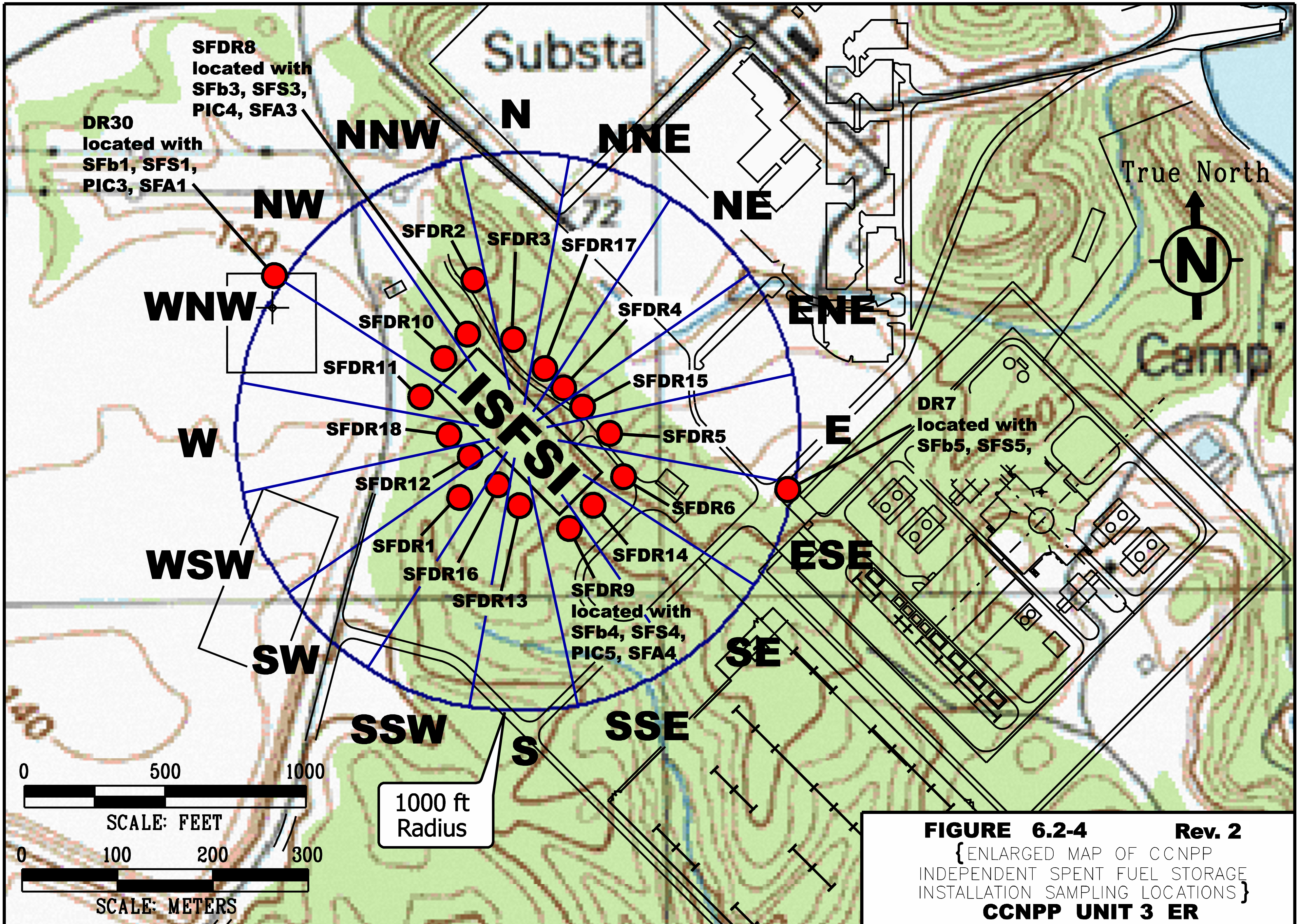

FIGURE 6.2-4 **Rev. 2**
{ENLARGED MAP OF CCNPP INDEPENDENT SPENT FUEL STORAGE INSTALLATION SAMPLING LOCATIONS}
CCNPP UNIT 3 ER

6.3 HYDROLOGICAL MONITORING

This section describes the hydrological monitoring program that will be implemented to monitor the effects of the **{**Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3**}**. Elements of the hydrological program relating to thermal, radiological, and chemical monitoring are described separately in Section 6.1, Section 6.2, and Section 6.6, respectively.

This section includes the pre-application monitoring program that discusses the **{**existing hydrological monitoring program at CCNPP Units 1 and 2 as well as the Unit 3 site and the**}** programs to monitor **{**CCNPP Unit 3**}** during the construction/pre-operational and operational phases.

Section 2.3.1 describes the vicinity watershed and stream flow data collected by the U.S. Geological Survey and the **{**Maryland Geological Survey**}**. Groundwater velocities, flow rates and sediment transport characteristics and shore erosion are discussed in Section 2.3.1. Section 2.3.2 describes surface and groundwater uses. Features of the **{**CCNPP**}** site, including boundaries and bathymetry of all surface water bodies adjacent to the site are provided in Section 2.3.1. The location of groundwater monitoring wells are provided in Figure 2.3.1-40 (for the construction site), Figure 2.3.2-13 (for other existing wells onsite), and Figure 2.3.2.-18 (for regional monitoring wells). The existing thermal and biological monitoring stations are discussed in Section 6.1 and Section 6.6 for surface water. No thermal or biological monitoring stations exist for groundwater and none are planned. Figures showing major geomorphic features and regional geology are shown in Section 2.3.1 and Section 2.6.

6.3.1 PREAPPLICATION MONITORING

{Hydrological monitoring at the CCNPP site includes both surface water and groundwater. Both monitoring programs comply with and are controlled by regulatory permit requirements and conditions described below.**}**

6.3.1.1 Surface Water

{CCNPP Units 1 and 2 conduct hydrological monitoring of surface water in accordance with the National Pollutant Discharge Elimination System (NPDES) program (MDE, 2004). Flows from storm water and plant-associated activities such as equipment blowdown and various system effluents are measured at different monitoring locations. Table 6.3-1 lists the monitoring locations and the permit flow requirements. Refer to Section 6.6 for a description of the monitoring locations as well as the NPDES monitoring program data analysis and quality control procedures.

In addition, water withdrawn from the Chesapeake Bay that is used for plant system cooling is monitored as part of the **{**Maryland Department of Environment (MDE) Water Appropriation and Use (WAU) permit program (MDE, 2000a). Flow is monitored monthly at the CCNPP Units 1 and 2 Intake Structure and reported to MDE semiannually.

Beginning in February 2007, three of five planned water samples were collected at the CCNPP Units 1 and 2 cooling water intake structure. During each sampling event, water samples were collected towards the end of the incoming (flood) and the outgoing (ebb) tides. Sample results and analytical parameters are presented in Table 2.3.3-8. Because of differences in analytical suites, not all results are directly comparable to the water quality samples collected by the Chesapeake Bay Program (CBP) as shown in Table 2.3.3-6. In general, the intake analyte concentrations and measurements are similar to the values measured in CBP water samples collected at the stations closest to the CCNPP (locations CB4.3W, CB4.3C, CB4.3E, and CB4.4) indicating that there are no significant pollutants in the influent cooling water for CCNPP Units 1 and 2.

6.3.1.2 Groundwater

{The CCNPP site has five production wells that supply process and domestic water within the existing CCNPP Units 1 and 2 protected area. Nine additional site wells supply water for domestic and industrial use in out lying areas as discussed Section 2.3.2.2. MDE requires periodic monitoring of the five production wells as part of a site WAU permit (MDE, 2000b). Data are acquired monthly and reported semiannually. Section 2.3.2.2 describes the well locations, permit limits, and withdrawal volumes.

Forty groundwater observation wells were installed across the site as shown in Figure 2.3.1-40. They were completed in the Surficial aquifer and water-bearing materials in the Chesapeake Group. The wells were located in order to provide adequate distribution with which to determine site groundwater levels, subsurface flow directions, and hydraulic gradients beneath the site. Well pairs were installed at selected locations to determine vertical gradients. Field hydraulic conductivity tests (slug tests) were conducted in each observation well. Monthly water level measurements from the groundwater observation wells began in July 2006 and will continue until July 2007.

To evaluate vertical hydraulic gradients, several observation wells were installed as well clusters. Well clusters are a series of wells placed at the same location, with each well monitoring a distinct water bearing interval. Four well clusters were installed to evaluate the hydraulic gradient between the Surficial aquifer and the Upper Chesapeake unit, and three well clusters were installed to evaluate the gradient between the Upper Chesapeake and Lower Chesapeake units.

Monthly water levels in the observation wells were measured to characterize seasonal trends in groundwater levels and flow directions for the CCNPP site. Preliminary results are discussed and shown in Section 2.3.1. Additional information on bathymetric characteristics of surface water, soil and groundwater characteristics, and transient hydrological parameters in the site vicinity are discussed in Section 2.3.1. Section 3.4 discusses the cooling system employed and its operational modes. Section 3.6 discusses the type of sanitary and chemical waste retention method. Section 2.7 discusses the meteorological parameters in the vicinity.**}**

6.3.2 CONSTRUCTION AND PRE-OPERATIONAL MONITORING

{Hydrological monitoring during CCNPP Unit 3 construction will include both surface water and groundwater. Both monitoring programs will comply with regulatory permit requirements and conditions described below. The objective of each program will be to establish a baseline for evaluating potential hydrologic changes, monitor anticipated impacts from site preparation and construction, and detect unexpected impacts.**}**

6.3.2.1 Surface Water

Surface water onsite will be monitored as part of the NPDES Construction General Permit as described in Section 1.3. Conditions of the permit will include compliance with erosion/sediment control and storm water management plans, which will be detailed in a required Storm Water Pollution Prevention Plan (SWPPP). The SWPPP also requires inspections as well as monitoring and record keeping.

In addition, **{**Chesapeake Bay**}** surface water will be monitored during construction of **{**both the CCNPP Unit 3 intake and discharge structures as well as refurbishment of the Barge Unloading Facility.**}** Monitoring will be part of the U.S. Corps of Engineers 401 permit as described in Section 1.3 to ensure compliance with applicable water quality (e.g., turbidity) and sediment transport requirements.

6.3.2.2 Groundwater

Groundwater monitoring during **{**CCNPP Unit 3**}** construction will include, as needed, data from groundwater observation wells installed across the **{**CCNPP**}** site as part of COL preapplication studies described in Section 2.3.1.2. The purpose will be to monitor the potential effects of dewatering on perched water levels.

{Some of the existing CCNPP Unit 3 area observation wells will be taken out of service prior to construction activities due to anticipated earth moving and construction requirements. Prior to construction activities, the observation well monitoring network will be evaluated in order to determine groundwater data gaps and needs created by the abandonment of existing wells. These data needs will be met by the installation of additional observation wells, if required. Additionally, the hydrologic properties and groundwater flow regimes of the shallow water bearing units (Surficial aquifer, and to a lesser extent, the Chesapeake units) will be impacted by the proposed earthmoving, regrading, and construction of infrastructure (buildings, parking lots, etc.). Revisions to the observation well network will be implemented to ensure that the resulting changes in the local groundwater regime from construction activities will be identified.

A WAU permit (COMAR, 2007) is expected to be acquired to address temporary dewatering, because the duration of the dewatering is expected to be greater than 30 days.

Disturbances to existing drainage systems will be avoided, if possible. Environmental controls (i.e., silt screens, dams, settling basins, and spill containment measures), will be implemented to reduce potential pollutants in storm water runoff and to minimize construction impacts to aquatic habitats. Prior to the start of construction, approval of storm water management and erosion/sediment control plans will be obtained in accordance with the NPDES Construction General Permit as described in Section 1.3. These controls will be incorporated into a Storm Water Pollution Prevention Plan (SWPPP). Similar to the {existing SWPPP}, storm water system manholes and handholds will continue to be periodically inspected and cleaned.

6.3.3 OPERATIONAL MONITORING

Hydrological monitoring during **{**CCNPP Unit 3**}** operation will be designed, as needed, to monitor the potential impacts from plant operation as well as detect unanticipated operational impacts.

During **{**CCNPP Unit 3**}** operation, plant water supply will be from the **{**Chesapeake Bay**}** at a **{**new intake structure adjacent to the existing CCNPP Units 1 and 2 intake structure**}**. The principle potable (fresh water) source will be from **{**desalination of Chesapeake Bay**}** water. **{**The Desalination Plant will provide all fresh water needs to CCNPP Unit 3 systems. Consequently, CCNPP Unit 3 operation will not require use of groundwater.**}** Operation of the **{**new Intake Structure, however, will require surface water monitoring and reporting as part of the WAU permit program as described in Section 1.3. In addition, discharge effluents to the Chesapeake Bay from CCNPP Unit 3 and Desalination Plant**}** operation will require monitoring as discussed in Section 6.6.

{The CCNPP Unit 3 Waste Water Treatment Plant (WWTP) would collect sewage and waste water generated from the portions of the plant outside the radiological control areas of the power block and would treat them using an extensive mechanical, chemical, and biological treatment processes. The treated effluent would be combined with the discharge stream from the onsite wasterwater retention basin and discharged to Chesapeake Bay. The discharge would be in accordance with local and state safety codes. The dewatered sludge would be hauled offsite for disposal at municipal facilities. The treated waste water would meet all applicable health standards, regulations, and TMDLs set by the Maryland Department of the

Environment and the U.S. EPA. Table 3.6-5 lists anticipated liquid and solid effluents associated with the sewage treatment plant. Parameters are expected to include flow rates, pollutant concentrations, and the biochemical oxygen concentration at the point of release.

Non-radioactive liquid effluents that could potentially drain to the Chesapeake Bay are limited under the NPDES permit. An anticipated list of permitted outfalls is included in Table 3.6-7. Other non-radioactive liquid waste effluents from sources including laboratory chemicals, laundry solutions and other decontamination solutions are listed in Table 3.6-8. Table 3.6-1 provides information on the various chemicals anticipated to be used for the various plant water systems. All of these chemical additives will have limiting discharge concentrations specified in the NPDES permit that will require monitoring.**}**

Chemical monitoring will be performed at the **{**new outfall**}** to assess the effectiveness of retention methods and effluent treatment systems, as well as to detect changes in water quality associated with plant operations. **{**Similar to CCNPP Units 1 and 2,**}** chemical monitoring will also be performed at **{**storm water runoff**}** outfalls and at internal monitoring points (i.e., sanitary waste effluents, wastewater retention basin influent and/or effluent). Effluent water chemistry will meet applicable Federal and State environmental regulatory requirements.

Finally, NRC regulations do not explicitly require routine, onsite groundwater monitoring during plant operation. However, a recent nuclear industry initiative by the Nuclear Energy Institute (NEI) and Electric Power Research Institute (EPRI) and NRC assessment (NRC, 2006) of existing nuclear reactors indicates that regulations relating to groundwater monitoring during plant operation for present and future nuclear reactors may change.

6.3.4 REFERENCES

{COMAR, 1972. Title 26, Subtitle 17, Water Management, Chapter 06, Water Appropriation or Use, Annotated Code Of Maryland Regulations (COMAR 26.17.06), 1972.

MDE, 2004. State Discharge Permit No. 02-DP-0817 (NPDES Permit No. MD0002399), Maryland Department Of Environment, Effective June 1, 2004.

MDE, 2000a. Water Management Administration, Water Appropriation and Use Permit No. CA71S001(03), Maryland Department of Environment, Effective July, 1, 2000.**}**

MDE, 2000b. Water Management Administration, Water Appropriation and Use Permit No. CA69G010(05), Maryland Department Of Environment, Effective July 1, 2000.**}**

NRC, 2006. Liquid Radioactive Release Lessons Learned Task Force, Nuclear Regulatory Commission, Final Report, September 1, 2006.

Table 6.3-1 {CCNPP Units 1 and 2} NPDES Hydrological Monitoring Program (Page 1 of 1)

Monitoring Station	Description	Parameter	Frequency	Sample Type
001	Once-through cooling water, various system sump and blowdown, reverse osmosis reject water, low volume waste, sewage treatment plant, storm water	Flow	Continuous	Recorded
101A	Sewage treatment plant	Flow	1/Week	Measured
102A	Low volume sources, sump water, and storm water	Flow	1/Month	Measured
103A	Auxiliary boiler blowdown	Flow	1/Year	Measured
104A	Demineralizer backwash (i.e., reverse osmosis rejects water)	Flow	1/Month	Measured
106A	Secondary cooling blowdown	Flow	1/Year	Measured
003	Intake screen backwash	Note (a)		
004	Intake screen backwash	Note (a)		
005	Pool filter backwash	Flow	1/Month	Measured

Note:

(a) No flow requirements.

6.4 METEOROLOGICAL MONITORING

This section describes the meteorological monitoring program that will be implemented for the **{**Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 on the CCNPP site**}**. It includes the pre-operational meteorological monitoring program consisting of **{**the existing meteorological monitoring program for CCNPP Units 1 and 2**}** and the operational meteorological monitoring program. There are no unusual circumstances anticipated during site preparation and construction that require additional meteorological monitoring.

{CCNPP onsite meteorological data were used as described below.**}** The other source of meteorological data used was from the U.S. National Weather Service (NWS). This data is certified by the National Climate Data Center (NCDC, 2007). **{**As such, a description of the data collection program is not included. No other sources of data were used.

The meteorological conditions of the CCNPP site and the surrounding area are taken into account by using onsite (CCNPP) and offsite (NWS) data sources. The onsite meteorological program which has been taking data since the 1970's provides an extensive data base for pre-application monitoring.**}**

6.4.1 PREOPERATIONAL METEOROLOGICAL MEASUREMENT PROGRAM

{The pre-operational meteorological measurement program described herein for Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 utilizes the existing operational meteorological measurement program and equipment established for CCNPP Units 1 and 2. Data from the CCNPP Units 1 and 2 operational meteorological measurement program were used in this analysis for CCNPP Unit 3. CCNPP Unit 3 is to be located approximately 2,000 ft (610 m) south of CCNPP Units 1 and 2.

This program was designed and maintained in accordance with the guidance provided in Safety Guide 23, "Onsite Meteorological Programs" (NRC, 1972). The pre-operational meteorological measurement program also meets the requirements of Regulatory Guide 1.23, Revision 1, "Meteorological Monitoring Programs for Nuclear Power Plants" (NRC, 2007), with the following deviations: no atmospheric moisture measurements (required for plants utilizing cooling towers), tower not sited at approximately the same elevation as finished plant grade, and tower, guyed wire, and anchor inspection performance of once every 5 years instead of an annual inspection for tower and guyed wire and an anchor inspection of once every 3 years. These deviations are discussed further in Section 6.4.7.**}**

6.4.1.1 Tower Location

{The meteorological tower for the CCNPP site is located in an open field off Calvert Cliffs Parkway north of the CCNPP Unit 1 and 2 Independent Spent Fuel Storage Installation (ISFSI). The elevation at the base of the tower is approximately 125 ft (38 m) above mean sea level.

Figure 6.4-1 shows the location of the meteorological tower as well as the topography of the CCNPP site. The meteorological tower has been sited for CCNPP Unit 1 and 2 according to the guidance provided in Safety Guide 23 (NRC, 1972). Figure 6.4-2 shows the general topographic features of the region.

The meteorological tower is located on level, open terrain at a distance at least 10 times the height of any nearby obstruction that exceeds one-half the height of the wind measurement with the exception of some trees that are located south of the tower. Even though there are no obstructions in any other sector and south is not the most prevalent wind direction, the tree heights and distances will be calculated and an evaluation performed to determine whether the trees should be removed. The tower is located far enough away from proposed CCNPP Unit 3 structures and topographical features to avoid airflow modifications. The terrain height difference between the meteorological tower and the CCNPP Unit 3 reactor area is approximately 40 ft (12 m). The distance between the meteorological tower and the CCNPP Unit 3 reactor is approximately 2,900 ft (884 m). Therefore, the terrain profile has a very gentle slope and has an insignificant impact on site dispersion conditions.**}**

6.4.1.2 Tower Design

{The meteorological tower is 197 ft (60 m) tall with a lattice frame. Data from instruments on the tower are sent to the Met Building which is located near the tower.

The meteorological tower is designed to be capable of withstanding wind speeds of up to 100 mph (44.7 m/sec).**}**

6.4.1.3 Instrumentation

{The tower instrumentation consists of wind speed, wind direction, and duplicate sets of aspirated temperature sensors located at 197 ft (60 m) and 33 ft (10 m) above ground level. A tipping bucket rain gauge is located approximately 30 ft (9.1 m) from the meteorological tower in an open field and a barometric pressure device is located in the Met Building. No moisture measurements (dew point or wet bulb temperature, relative humidity) are currently taken. Consequently, meteorological data needed in the analysis of the Ultimate Heat Sink and potential plumes from cooling tower operation will be taken from other sources.

CCNPP replaced their meteorological monitoring instrumentation in December 2005. The specifications of the previous instrumentation met or exceeded the accuracy and resolution requirements of the Regulatory Guide 1.23 Revision 1 (NRC, 2007).

The instruments are positioned on the meteorological tower in accordance with the guidance in Regulatory Guide 1.23, Revision 1 (NRC, 2007).

Table 6.4-1 provides the current meteorological instrument accuracy and resolution and compares them with regulatory guidance provided in Regulatory Guide 1.23, Revision 1, (NRC, 2007).

Signals from the sensors are collected and processed by two data loggers. Each data logger collects the data from the meteorological tower, and performs calculations of average values, wind direction sigma theta, and temperature difference between the 197 ft (60 m) and 33 ft (10 m) levels of the meteorological tower. The primary data logger sends the averaged data values to a personal computer (PC) that is dedicated to the meteorological measurement system. This PC is located in the Met Building and includes a printer for data output. The backup data logger is connected to a dial-up modem, which provides the capability for remote retrieval of meteorological data. The primary data logger and plant equipment are isolated from the telephone connection to the backup data logger.**}**

6.4.1.4 Instrument Maintenance and Surveillance Schedules

{The meteorological instruments are inspected and serviced at a frequency that assures at least a 90% data recovery rate for all parameters, including the combination of wind speed, wind direction, and delta temperature. The instrumentation specified in Regulatory Guide 1.23, Revision 1 are channel checked on a daily basis and instrument calibrations are performed semi-annually.

System calibrations encompass the entire data channel for each instrument, including recording devices and displays (those located at the tower, in emergency response facilities, and those used to compile the historical data set). The system calibrations are performed by either a series of sequential, overlapping, or total channel steps.}

6.4.1.5 Data Reduction and Compilation

{Wind and temperature data are averaged over 15 minute periods. The data loggers employ a validation mode that monitors the various sensors and activates alarms as necessary. The validation mode compares the data values from the 33 ft (10 m) and 197 ft (60 m) levels of the tower. The data loggers perform a daily check of the processor cards and will alarm if values are outside of specified limits.

Averaged data values from the data loggers are collected by the meteorological software, along with maximum and minimum values of ambient temperature and wind direction variance (sigma-theta). Hourly data values are determined from the 15 minute averaged values. Output options include various functions and averages as well as graphical displays.

The 15 minute averaged data are available for use in the determination of magnitude and continuous assessment of the impact of releases of radioactive materials to the environment during a radiological emergency (as required in 10 CFR 50.47 (CFR, 2007a) and 10 CFR 50 Appendix E (CFR, 2007b)). The hourly averaged data are available for use in:

1. Determining radiological effluent release limits associated with normal operations to ensure these limits are met for any individual located offsite.
2. Determining radiological dose consequences of postulated accidents meet prescribed dose limits at the Exclusion Area Boundary (EAB) and Low Population Zone (LPZ).
3. Evaluating personnel exposures in the control room during radiological and airborne hazardous material accident conditions.
4. Determining compliance with numerical guides for design objectives and limiting conditions for operation to meet the requirement that radioactive material in effluents released to unrestricted areas be kept as low as is reasonably achievable.
5. Determining compliance with dose limits for individual members of the public.

Annual summaries of meteorological data in the form of joint frequency distributions of wind speed and wind direction by atmospheric stability class are maintained onsite and are available upon request.

A summary of the 2000 through 2005 onsite meteorological data in the form of joint frequency distributions of wind speed and wind direction by atmospheric stability class are presented in Section 2.7. Wind roses (graphical depictions of joint frequency distribution tables) summarizing data from 1984 to 1992 for three National Weather Service (NWS) sites are also presented in Section 2.7.

A comparison of the CCNPP site and the Norfolk, Virginia, data (of the three NWS sites, the Norfolk, Virginia, site is closest to the Chesapeake Bay) reveals that both sites have the same prevailing wind direction – wind from the south-southwest. For the south-southwest wind direction, the wind speed is between 6.9 and 17.9 mph (3.1 and 8.0 mps) approximately 5% of the time at the CCNPP site and the wind speed is between 7.6 and 24.6 mph (3.4 and 11.0 mps) approximately 9% of the time at the Norfolk, Virginia, site. The most prevalent wind speed class at the CCNPP site, 4.7 to 6.7 mph (2.1 to 3.0 mps), occurs approximately 28% of the time. The most prevalent wind speed class at the Norfolk, Virginia, site, 7.6 to 12.5 mph (3.4 to 5.6 mps), occurs approximately 36% of the time. These results indicate that the CCNPP onsite data also represent long-term conditions at the site.}

6.4.1.6 Nearby Obstructions to Air Flow

{Downwind distances from the meteorological tower to nearby (within 0.5 mi (0.8 km)) obstructions to air flow were determined using U.S. Geological Survey topographical maps. Highest terrain is to the north and north-northwest. Lowest terrain is to the northeast, east-northeast, and east (Chesapeake Bay). Table 6.4-2 presents the distances to nearby obstructions to air flow in each downwind sector.

From the information provided in Table 6.4-2 and Figure 6.4-1 and Figure 6.4-2 and with the knowledge that the base of the tower is at an elevation of approximately 125 ft (38 m), it can be seen that there are no significant nearby obstructions to airflow.**}**

6.4.1.7 Deviations to Guidance from Regulatory Guide 1.23

{The pre-operational meteorological monitoring program for CCNPP Unit 3 complies with Regulatory Guide 1.23, Revision 1 (NRC, 2007), except as follows. No atmospheric moisture measurements are taken. Atmospheric moisture data needed in the analysis of the CCNPP Unit 3 Ultimate Heat Sink and potential plumes from CCNPP Unit 3 cooling tower operation will be taken from other sources. In addition, the meteorological tower is not sited at approximately the same elevation as finished CCNPP Unit 3 grade. This was done in order to assure that the meteorological tower is located on level, open terrain at a distance at least 10 times the height of any nearby obstruction that exceeds one-half the height of the wind measurement (i.e., the tower is located far enough away from CCNPP Unit 3 structures and topographical features to avoid airflow modifications). Further discussion is provided in Section 6.4.1.1.

The tower, guyed wire, and anchor inspections are performed once every 5 years instead of an annual inspection for tower and guyed wire and an anchor inspection of once every three years as provided in Regulatory Guide 1.23, Revision 1 (NRC, 2007). Note that this was not a requirement stipulated in Safety Guide 23 (NRC, 1972). Tower and guyed wire inspections will be performed annually and anchor inspections will be performed once every 3 years.**}**

6.4.2 OPERATIONAL METEOROLOGICAL MEASUREMENT PROGRAM

{The operational meteorological measurement program for CCNPP Unit 3 is based on the operational meteorological measurement program for CCNPP Units 1 and 2 with the addition of revised operational procedures. This program was designed according to the guidance provided in Safety Guide 23 (NRC, 1972) and has been upgraded for CCNPP Unit 3 to comply with Regulatory Guide 1.23, Revision 1 (NRC, 2007).**}**

6.4.2.1 Tower Location

{The meteorological tower for the CCNPP site is located in an open field off Calvert Cliffs Parkway north of the CCNPP Unit 1 and 2 ISFSI. The elevation at the base of the tower is approximately 125 ft (38 m) above mean sea level. Figure 6.4-1 shows the location of the meteorological tower as well as the topography of the CCNPP site. The tower is sited according to the guidance provided in Regulatory Guide 1.23, Revision 1 (NRC, 2007). Figure 6.4-2 shows the general topographic features of the region.

The meteorological tower is located on level, open terrain at a distance at least 10 times the height of any nearby obstruction that exceeds one-half the height of the wind measurement; i.e., the tower is located far enough away from CCNPP Unit 3 structures and topographical features to avoid airflow modifications. The terrain height difference between the meteorological tower and the CCNPP Unit 3 reactor area is approximately 40 ft (12 m). The distance between the meteorological tower and the CCNPP Unit 3 reactor is approximately 2,900 feet (884 m).

Therefore, the terrain profile has a very gentle slope and has an insignificant impact on site dispersion conditions.**}**

6.4.2.2 Tower Design

{The meteorological tower is 197 ft (60 m) tall with a lattice frame. Data from instruments on the tower are sent to the Met Building which is located near the tower. The primary meteorological tower is designed to be capable of withstanding wind speeds of up to 100 mph (44.7 m/sec).**}**

6.4.2.3 Instrumentation

{The tower instrumentation consists of wind speed, wind direction, and duplicate sets of aspirated temperature sensors located at 197 ft (60 m) and 33 ft (10 m) above ground level. A tipping bucket rain gauge is located approximately 30 ft (9.1 m) from the meteorological tower in an open field and a barometric pressure device is located in the Met Building.

The instruments are positioned on the meteorological tower in accordance with the guidance in Regulatory Guide 1.23, Revision 1 (NRC, 2007).

Table 6.4-1 presents meteorological instrument specifications and compares them with regulatory guidance provided in Regulatory Guide 1.23, Revision 1 (NRC, 2007).

Signals from the sensors are collected and processed by two data loggers. Each data logger collects the data from the meteorological tower, and performs calculations of average values, wind direction sigma theta, and temperature difference between the 197 ft (60 m) and 33 ft (10 m) levels of the meteorological tower. The primary data logger sends the averaged data values to a personal computer (PC) that is dedicated to the meteorological measurement system. This PC is located in the Met Building and includes a printer for data output. The backup data logger is connected to a dial-up modem, which provides the capability for remote retrieval of meteorological data. The primary data logger and plant equipment are isolated from the telephone connection to the backup data logger. In addition, the averaged data values are transmitted to the appropriate locations for operational and emergency response purposes (CCNPP Unit 3 Control Room, Technical Support Center, Emergency Operations Facility) and shall be submitted to the NRC's Emergency Response Data System as provided for in Section VI of Appendix E to 10 CFR Part 50 (CFR, 2007b).**}**

6.4.2.4 Instrument Maintenance and Surveillance Schedules

{The meteorological instruments are inspected and serviced at a frequency that assures at least a 90% data recovery rate for all parameters, including the combination of wind speed, wind direction, and delta temperature. The instrumentation specified in Regulatory Guide 1.23, Revision 1 are channel checked on a daily basis and instrument calibrations are performed semi-annually.

System calibrations encompass the entire data channel for each instrument, including recording devices and displays (those located at the tower, in emergency response facilities, and those used to compile the historical data set). The system calibrations are performed by either a series of sequential, overlapping, or total channel steps.

System calibrations encompass the entire data channel for each instrument, including recording devices and displays (those located at the tower, in emergency response facilities, and those used to compile the historical data set). The system calibrations are performed by either a series of sequential, overlapping, or total channel steps.**}**

6.4.2.5 Data Reduction and Compilation

{Wind and temperature data are averaged over 15 minute periods. The data loggers employ a validation mode that monitors the various sensors and activates alarms as necessary. The validation mode compares the data values from the 33 ft (10 m) and 197 ft (60 m) levels of the tower. The data loggers perform a daily check of the processor cards and will alarm if values are outside of specified limits.

Averaged data values from the data loggers are collected by the meteorological software, along with maximum and minimum values of ambient temperature and wind direction variance (sigma-theta). Hourly data values are determined from the 15 minute averaged values. Output options include various functions and averages as well as graphical displays.

The 15 minute averaged data are available for use in the determination of magnitude and continuous assessment of the impact of releases of radioactive materials to the environment during a radiological emergency (as required in 10 CFR 50.47 (CFR, 2007a) and 10 CFR 50 Appendix E (CFR, 2007b)). The hourly averaged data are available for use in:

1. Determining radiological effluent release limits associated with normal operations to ensure these limits are met for any individual located offsite.
2. Determining radiological dose consequences of postulated accidents meet prescribed dose limits at the EAB and LPZ.
3. Evaluating personnel exposures in the control room during radiological and airborne hazardous material accident conditions.
4. Determining compliance with numerical guides for design objectives and limiting conditions for operation to meet the requirement that radioactive material in effluents released to unrestricted areas be kept as low as is reasonably achievable.
5. Determining compliance with dose limits for individual members of the public.

Annual summaries of meteorological data in the form of joint frequency distributions of wind speed and wind direction by atmospheric stability class are maintained onsite and are available upon request.

A summary of the 2000 through 2005 onsite meteorological data in the form of joint frequency distributions of wind speed and wind direction by atmospheric stability class is presented in Section 2.7.

The impact of data from the two consecutive annual cycles, including the most recent one year period on the site-specific meteorological data will be evaluated and results provided in an update to this COL application.

Wind roses (graphical depictions of joint frequency distribution tables) summarizing data from 1984 to 1992 for three NWS sites are also presented in Section 2.7.

A comparison of the CCNPP site and the Norfolk, Virginia, data (of the three NWS sites, the Norfolk, Virginia, site is closest to the Chesapeake Bay) reveals that both sites have the same prevailing wind direction – wind from the south-southwest. For the south-southwest wind direction, the wind speed is 6.9 to 17.9 mph (3.1 to 8.0 mps) approximately 5% of the time at the CCNPP site and the wind speed is 7.6 to 24.6 mph (3.4 to 11.0 mps) approximately 9% of the time at the Norfolk, Virginia, site. The most prevalent wind speed class at the CCNPP site, 4.7 to 6.7 mph (2.1 to 3.0 mps), occurs approximately 28% of the time. The most prevalent wind speed class at the Norfolk, Virginia, site, 7.6 to 12.5 mph (3.4 to 5.6 mps), occurs approximately 36% of the time. These results indicate that the CCNPP onsite data also represent long-term conditions at the site.**}**

6.4.2.6 Nearby Obstructions to Air Flow

{Downwind distances from the meteorological tower to nearby (within 0.5 mi (0.8 km)) obstructions to air flow were determined using U.S. Geological Survey topographical maps. Highest terrain is to the north and north-northwest. Lowest terrain is to the northeast, east-northeast, and east (Chesapeake Bay). Table 6.4-2 presents the distances to nearby obstructions to air flow in each downwind sector.

From the information provided in Table 6.4-2, Figure 6.4-1, and Figure 6.4-2 and with the knowledge that the base of the tower is at an elevation of approximately 125 ft (38 m), it can be seen that there are no significant nearby obstructions to airflow.**}**

6.4.2.7 Deviations to Guidance from Regulatory Guide 1.23

{The meteorological tower is not sited at approximately the same elevation as finished plant grade. This was done in order to assure that the meteorological tower is located on level, open terrain at a distance at least 10 times the height of any nearby obstruction that exceeds one-half the height of the wind measurement; i.e., the tower is located far enough away from CCNPP Unit 3 structures and topographical features to avoid airflow modifications. Further discussion is provided in Section 6.4.2.1.**}**

6.4.3 REFERENCES

CFR, 2007a. Title 10, Code of Federal Regulations, Part 50.47, Emergency Plans, 2007.

CFR, 2007b. Title 10, Code of Federal Regulations, Part 50, Appendix E, Emergency Planning and Preparedness for Production and Utilization Facilities, 2007.

NRC, 1972. Onsite Meteorological Programs, Safety Guide 23 (Regulatory Guide 1.23 Revision 0), Nuclear Regulatory Commission, February 1972.

NRC, 2007. Meteorological Monitoring Programs for Nuclear Power Plants, Regulatory Guide 1.23, Revision 1, Nuclear Regulatory Commission, March 2007.

Table 6.4-1 Tower Instrument Specifications and Accuracies for Meteorological Monitoring Program (Preoperational and Operational)
(Page 1 of 1)

Characteristics	Requirements*	Specifications
Wind Speed Sensor		
Accuracy	±0.2 m/s (±0.45 mph) OR ±5% of observed wind speed	±1%
Resolution	0.1 m/s (0.1 mph)	0.1 m/s (0.1 mph)
Wind Direction Sensor		
Accuracy	±5 degrees	±1.5 degrees
Resolution	1.0 degree	1.0 degree
Temperature Sensors		
Accuracy (ambient)	±0.5°C (±0.9°F)	±0.05°C (±0.09°F)
Resolution (ambient)	0.1°C (0.1°F)	0.1°C (0.1°F)
Accuracy (vertical temperature difference)	±0.1°C (±0.18°F)	±0.05°C (±0.09°F)
Resolution (vertical temperature difference)	0.01°C (0.01°F)	0.01°C (0.01°F)
Precipitation Sensor		
Accuracy	±10% for a volume equivalent to 2.54 mm (0.1 in) of precipitation at a rate < 50 mm/hr (< 2 in/hr)	±1%
Resolution	0.25 mm (0.01 in)	0.25 mm (0.01 in)
Time		
Accuracy	± 5 min	± 5 min
Resolution	1 min	1 min

- Accuracy and resolution criteria from Regulatory Guide 1.23, Revision 1

Table 6.4-2 Distances from Meteorology Tower to Nearby Obstructions to Air Flow (Page 1 of 1)

Downwind Sector*	Approximate Distance miles (meters)
N	0.25 (402)
NNE	0.33 (531)
NE	N/A**
ENE	N/A**
E	N/A**
ESE	1 (1609)
SE	0.1 (161)
SSE	0.1 (161)
S	0.1 (161)
SSW	0.25 (402)
SW	0.33 (531)
WSW	0.1 (161)
W	0.25 (402)
WNW	0.33 (531)
NW	0.25 (402)
NNW	0.25 (402)

* With respect to True North

** Lower than tower base elevation and therefore no possible obstructions

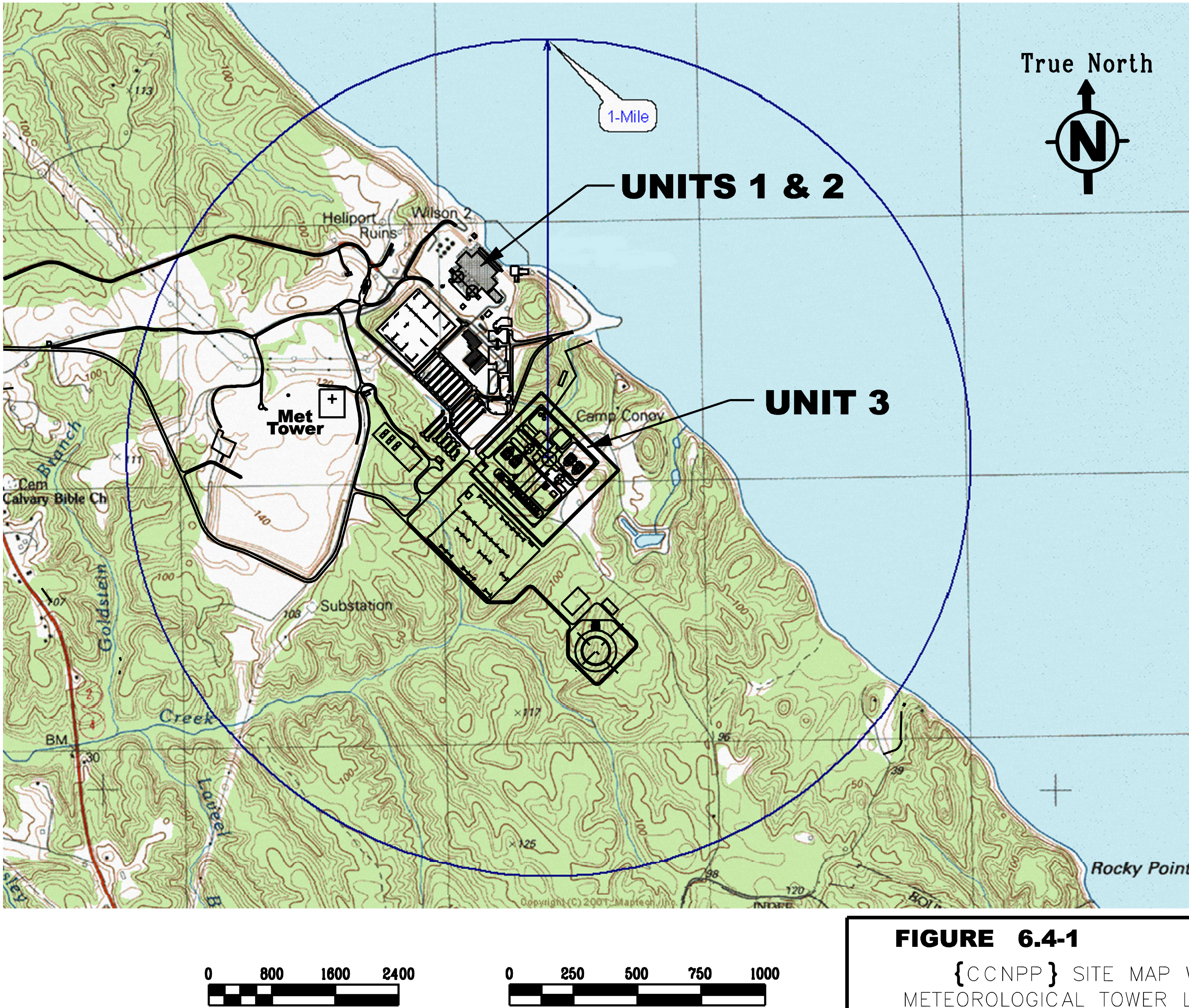

FIGURE 6.4-1 **Rev. 2**

{CCNPP} SITE MAP WITH METEOROLOGICAL TOWER LOCATION

CCNPP UNIT 3 ER