4.0 AIR QUALITY IMPACTS

4.1 IMPACT ASSESSMENT BACKGROUND AND METHODOLOGY

4.1.1 Overview

As part of the CPCN application process, the Maryland Power Plant Research Program (PPRP), in conjunction with the Maryland Department of Environment Air and Radiation Management Administration (MDE-ARMA), evaluates potential impacts to air quality resulting from emissions of projects to be licensed in Maryland under COMAR 20.80. This evaluation includes emissions investigations and other studies, including air dispersion modeling assessments, to ensure that impacts to air quality from proposed projects are acceptable. PPRP and MDE-ARMA also conduct a complete air quality regulatory review for two purposes: 1) to assist in the impact assessment, because air quality regulatory standards and emissions limitations define levels to protect against adverse health, welfare, and environmental effects; and 2) to ensure that the proposed project will meet all applicable regulatory requirements.

To conduct the air quality evaluation of the proposed Calvert Cliffs Unit 3 project, PPRP and MDE-ARMA evaluated projected maximum potential air pollutant emissions to ensure that the project will meet applicable regulatory thresholds and limits. The proposed project was also evaluated to determine whether its emissions would have any significant impacts on the existing ambient air quality in the region. This was completed through air dispersion modeling that predicts the ambient air concentrations resulting from source emissions.

Note that Calvert Cliffs Unit 3 and its radionuclide emissions are not regulated by the State. We did not evaluate any impacts from radionuclide emissions from the reactor or any associated fuel or waste handling operations; this Environmental Review addresses only the non-NRC regulated emissions sources that are part of the Calvert Cliffs Unit 3 project.

4.1.2 Regulatory Considerations

The United States Environmental Protection Agency (EPA) has defined concentration-based National Ambient Air Quality Standards (NAAQS) for several pollutants, which are set at levels considered to be protective of the public health and welfare. Specifically, the NAAQS have been defined for six

"criteria" pollutants, including particulate matter (PM), sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone, and lead (Pb). Three forms of particulate matter are regulated: total suspended particulate (known as PM or TSP), particulate matter less than 10 microns (PM10), and particulate matter less than 2.5 microns (PM2.5). Air emissions limitations and pollution control requirements are generally more stringent for sources located in areas that do not currently attain a NAAQS for a particular pollutant (known as "nonattainment" areas).

The air quality in Calvert County in the vicinity of the proposed Calvert Cliffs Unit 3 project is in attainment for all pollutants with the exception of ozone. Because of the high levels of ozone historically found in Calvert County during the ozone season (May-October), the County is designated a "moderate" ozone nonattainment area. Emissions of the two pollutants that are the primary precursors to ozone—volatile organic compounds (VOCs) and nitrogen oxides (NO_x)—are regulated more stringently in ozone nonattainment areas such as Calvert County to ensure that air quality is not further degraded (i.e., the ambient air concentrations of ozone do not continue to increase as new sources of emissions are constructed).

Potential emissions from new and modified sources in nonattainment areas are evaluated through the Nonattainment Area New Source Review (NA-NSR) regulatory program (COMAR 26.11.17). The goal of the NA-NSR program is to allow construction of new emission sources and modifications to existing sources, while ensuring that progress is made towards attainment of the NAAQS. Triggering NA-NSR indicates that a project could adversely impact air quality, which means that impacts must be managed. NA-NSR requires that major sources of VOCs or NO_x limit emissions of pollutants through the implementation of the most stringent levels of pollution control, known as Lowest Achievable Emission Rate (LAER). In addition, NA-NSR requires pollutant "offsets" to be obtained for every ton of regulated pollutant emitted.

Potential emissions from new and modified sources in attainment areas are evaluated through the Prevention of Significant Deterioration (PSD) program. The goal of the PSD program is to ensure that emissions from major sources do not degrade air quality. Triggering PSD requires pollution control known as Best Available Control Technology (BACT) and additional impact assessments.

The proposed Calvert Cliffs Unit 3 Project has the potential to emit the criteria pollutants PM, PM10, PM2.5, CO, NO_2, SO_2, and Pb; ozone precursors (NO_x and VOCs); several hazardous air pollutants (HAPs); and several State-regulated toxic air pollutants (TAPs). Because the area in which Unit 3 will be located is nonattainment for ozone and attainment for the other pollutants, PPRP and MDE-ARMA assessed applicability with both NA-NSR and PSD

requirements to ensure no adverse impacts would be caused by the project. The results of these evaluations for the proposed project are discussed in Sections 4.3 (PSD program) and 4.4 (NA-NSR program).

Other federal and State air quality regulations may apply to the proposed Unit 3 project. These regulations apply either as a result of the types of emission sources that are to be constructed, or as a result of the pollutants to be emitted from the project. These regulations, discussed in Section 4.5, specify limits on pollutant emissions, and impose monitoring, recordkeeping, and reporting requirements.

4.2 PROPOSED PROJECT AIR EMISSIONS

UniStar's proposed new Unit 3 will produce 1,710 MW (nominal) of electricity. Regulated air emission sources associated with the installation and operation of Unit 3 include the following:

- One cooling tower for the circulating water system (CWS) with a maximum water circulation rate of 825,092 gallons per minute (gpm),
- Four smaller essential service water system (ESWS) cooling towers with a maximum water circulation rate of 20,029 gpm;
- Four 10,130-kilowatt (kWe) emergency diesel generators (EDGs),
- Two 5,000-kWe Station Blackout Generators (SBOs); and
- Six diesel fuel storage tanks, one for each emergency engine (UniStar does not have final design specifications at this time).

A more detailed description of the proposed project is found in Section 2.

UniStar presented emissions estimates for proposed new sources in its CPCN application, subsequent amendments, and in responses to DNR data requests. PPRP and MDE-ARMA reviewed UniStar's estimates and independently verified emissions to evaluate impacts from the proposed Unit 3 project. Backup information on emissions calculations is found in Appendix D.

4.2.1 Criteria Pollutants

4.2.1.1 Cooling Towers

UniStar proposes to install two major cooling systems: one hybrid cooling tower for the CWS and four smaller mechanical draft cooling towers for the ESWS. Emissions of particulate matter are generated from the drift that is discharged from the cooling towers. Drift is comprised of water droplets

created during the cooling process that are carried out in the exhaust stream. These water droplets have generally the same concentration of total dissolved solids (TDS) as the circulating water used in the cooling system. As the water droplets evaporate, particulate matter is generated in the atmosphere.

To determine PM emissions, EPA's "Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Fifth Edition" (AP-42) was used. PM emissions from the CWS cooling tower were based on a water circulation rate of 825,092 gpm, a density of 8.57 pounds per gallon, a drift loss of 0.0005 percent, and a total dissolved solids content of 17,500 ppm and two cycles of concentration. PM emissions for the ESWS cooling towers were based on a water circulation rate of 20,029 gpm, a density of 8.34 pounds per gallon, a drift loss of 0.005 percent, and a total dissolved solids content of 372 ppm and ten cycles of concentration.

PM10 and PM2.5 emissions are a fraction of total PM emissions. To determine the fractions of particle matter that are considered PM10 and PM2.5, the Reisman and Frisbie (2002) methodology and particle size distribution data provided by SPX (the manufacturer of the proposed cooling towers) were used. Emissions from the cooling towers are presented in Table 4-1. While UniStar expects that only two of the ESWS cooling towers will operate at any one time, to be conservative, annual emissions were based on operation of all four ESWS cooling towers.

Table 4-1 Emissions from the Cooling Towers (tons per year)

Source	PM	PM10	PM2.5
Circulating Water System (CWS) Cooling Tower (1)	325.2	251.4	42.2
Essential Service Water System (ESWS) Cooling Towers (2)	32.7	31.8	5.9

(1) Assumes 825,092 gallons per minutes (gpm), a density of 8.57 pounds per gallon, a total dissolved solids (TDS) concentration of 17,500 parts per million by weight (ppmw), two cycles of concentration, and a drift eliminator with 0.0005 percent drift loss.

(2) Assumes operation of 4 towers simultaneously each at 20,029 gpm, a density of 8.34 pounds per gallon, a TDS concentration of 372 ppmw, ten cycles of concentration, and a drift eliminator with 0.005 percent drift loss.

4.2.1.2 *Diesel Generators*

Potential emissions of criteria pollutants from the emergency generators (EDGs and SBOs) are shown in Table 4-2. The project will consist of the installation of four EDG units and two SBO units.

Emission factors for the EDGs were based on maximum allowable emission rates in federal New Source Performance Standard (NSPS) Subpart IIII (Standards for Stationary Compression Ignition Internal Combustion Engines) for PM, CO and NO_x; material balance calculations for SO_2; and EPA's emission factor guidance manual, AP-42 (Section 3.4), for VOCs. For emission calculation purposes, it was assumed that the EDGs will operate for no more than 600 hours per year (total for all four engines), will have a displacement of greater than 30 liters, and will use exclusively low sulfur diesel fuel with a maximum sulfur content of 0.05 percent by weight.

Emission factors for the SBOs were based on material balance calculations for SO_2 and maximum allowable emissions from NSPS Subpart IIII for PM, CO, and NO_x + THC (total hydrocarbons). To determine NO_x and VOC emissions from the NO_x + THC limit (11 grams per kilowatt hour, g/kW-hr), we conservatively assumed that 100% of emissions are NO_x and 10% are VOCs (thus double-counting to ensure emissions are conservative). For emission calculation purposes, it was assumed that the SBOs will operate no more than 200 hours per year (total for both units), have a displacement of between 10 and 30 liters, and will exclusively use ultra low sulfur diesel fuel with a maximum sulfur content of 0.0015 percent by weight.

Table 4-2 Emissions from the Emergency Engines (tons per year)

Source	PM	PM10	PM2.5	NO_x	CO	VOC	SO_2
Four EDGs(1)	1.0	1.0	1.0	10.7	23.4	2.6	1.3
Two SBOs(2)	0.6	0.6	0.5	12.1	5.5	1.2	0.0
Total Diesel Generators	1.6	1.6	1.5	22.8	28.9	3.8	1.3

(1) Assumes that the EDGs will not operate more than 600 hours per year (total all four engines), a displacement of greater than 30 liters, and the exclusive use of low-sulfur diesel fuel.

(2) Assumes that the SBOs will not operate more than 200 hours per year (total both engines), a displacement of between 10 and 30 liters, and the exclusive use of ultra low-sulfur diesel fuel.

4.2.1.3 *Fuel Oil Tanks*

Each of the six emergency engines (four EDGs and two SBOs) will have a dedicated fuel oil storage tank; however, UniStar does not have final design specifications for the tanks at this time and may have up to fifteen storage tanks in conjuction with this project. In its response to DNR Data Request No. 6-1, UniStar indicated the tanks for the EDGs will be sized to store sufficient fuel oil for the EDGs to operate for a period of seven days, or approximately 100,000 gallon capacity, and the tanks will be located within the EDG buildings. The SBOs and their storage tanks will be located in a separate building; the final design specifications and locations have not yet been determined.

4.2.1.4 *Summary of Criteria Pollutant Emissions*

A summary of short-term criteria pollutants emissions associated with the Calvert Cliffs Unit 3 project is provided in Table 4-3 and total (ton per year) emissions in Table 4-4. Emissions as presented by UniStar in the CPCN application are also provided in Table 4-4 for comparison purposes. The criteria pollutant emissions presented by UniStar were different from the PPRP and MDE-ARMA estimates for two reasons. The first is related to determination of the PM10 drift fraction using the Reisman/Frisbie methodology for both the CWS and ESWS cooling towers. In using the Reisman/Frisbie method, PPRP and MDE-ARMA interpolated when it was appropriate to determine the drift factors. For example, the State calculated a PM10 drift fraction of 0.773 based on a TDS concentration of 17,500 ppm and cycles of concentration ratio of 2, while UniStar estimated a PM10 drift fraction of 0.8 using the same parameters. PM10 emissions are a function of the PM emissions and the PM10 drift fraction. The State's calculated value of 251.4 tons of PM10 emissions for the CWS tower is approximately 8.8 tons lower than the value estimated by UniStar due to this difference in the PM10 drift fraction.

Second, PPRP and MDE-ARMA estimated emissions from the ESWS cooling towers based on four cooling towers operating simultaneously versus emissions from two cooling towers presented in the August 2008 CPCN amendments. There were several air dispersion modeling cases that had emissions from the ESWS cooling towers based on four units operating. Supporting documentation is provided in Appendix D.

Although there are differences between UniStar's and PPRP/MDE-ARMA's PM10 and PM2.5 fractions, these fractions are only constants (directly proportion to emissions) in the overall equation to determine PM10 and PM2.5 emissions (i.e., a slightly higher constant will result in a slightly higher overall

value whereas a slight lower constant will result in a slightly lower overall value). Variables in the equation include total dissolved solids (TDS) and flow, which UniStar is required to monitor and record. Therefore, although PPRP and MDE-ARMA does not agree with the fractions calculated by UniStar (and therefore the resulting short-term emission rate), they are agreeable to the slightly higher PM10 and PM2.5 short-term emission rates.

Table 4-3 Summary of Short-term Emissions from the Unit 3 Project

Emissions Unit	PM	PM10	PM2.5	NO_x	CO	VOC	SO_2	Lead	SAM
CWS Cooling Tower	0.0005 % drift loss 74.2 lb/hr 0.0001 gr/dscf 9.36 g/s	0.0005 % drift loss 57.4 lb/hr 0.0001 gr/dscf 7.24 g/s	0.0005 % drift loss 9.6 lb/hr 0.00002 gr/dscf 1.21 g/s	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
ESWS Cooling Towers (each)	0.005 % drift loss 1.9 lb/hr 0.0002 gr/dscf 0.24 g/s	0.005 % drift loss 1.8 lb/hr 0.0002 gr/dscf 0.23 g/s	0.005 % drift loss 0.3 lb/hr 0.00004 gr/dscf 0.04 g/s	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Emergency Diesel Generators (each)	0.15 g/kW-hr 3.3 lb/hr 0.037 lb/MMBTU 0.42 g/s	0.15 g/kW-hr 3.3 lb/hr 0.037 lb/MMBTU 0.42 g/s	0.15 g/kW-hr 3.2 lb/hr 0.036 lb/MMBTU 0.41 g/s	1.60 g/kW-hr 35.7 lb/hr 0.4 lb/MMBTU 4.50 g/s	3.5 g/kW-hr 78.1 lb/hr 0.87 lb/MMBTU 9.85 g/s	0.39 g/kW-hr 8.7 lb/hr 0.10 lb/MMBTU 1.10 g/s	0.20 g/kW-hr 4.5 lb/hr 0.05 lb/MMBTU 0.56 g/s	Not reported	Negligible
Station Black Out Generators (each)	0.50 g/kW-hr 5.5 lb/hr 0.12 lb/MMBTU 0.69 g/s	0.50 g/kW-hr 5.5 lb/hr 0.12 lb/MMBTU 0.69 g/s	0.49 g/kW-hr 5.3 lb/hr 0.11 lb/MMBTU 0.67 g/s	[1] 11.0 g/kW-hr 121.1 lb/hr 2.6 lb/MMBTU 15.28 g/s	5.0 g/kW-hr 55.1 lb/hr 1.2 lb/MMBTU 6.94 g/s	[1] 1.10 g/kW-hr 12.1 lb/hr 0.3 lb/MMBTU 1.53 g/s	0.0064 g/kW-hr 0.07 lb/hr 0.0015 lb/MMBTU 0.01 g/s	Not reported	Negligible

[1] NSPS Subpart IIII standard of total hydrocarbon (THC) + NO_X. For emission calculations, it was assumed 100 percent NO_x and 10 percent VOC.

Table 4-4 Summary of Emissions Associated with Calvert Cliffs Unit 3 (tons per year)

	PM	PM10	PM2.5	NO_x	CO	VOC	SO_2	SAM
CWS Cooling Tower	325.2	251.4	42.2	--	--	--	--	--
ESWS Cooling Towers (4)	32.7	31.8	5.9	--	--	--	--	--
Diesel Generators (6)	1.6	1.6	1.5	22.8	28.9	3.8	1.3	negligible
Total	**359.4**	**284.8**	**49.5**	**22.8**	**28.9**	**3.8**	**1.3**	negligible
UniStar Total	343.1	278.1 (1)	49.0	22.8	29.0	3.8	1.3	NP

NP – Not provided by the Applicant.

(1) Difference due to the calculation of the PM10 fraction and the operation of 4 towers versus 2 towers as presented by UniStar.

4.2.2 *Toxic and Hazardous Air Emissions*

Toxic air pollutants (TAPs) are those pollutants that are known or suspected to cause health problems. TAPs are regulated by Maryland under COMAR 26.11.15 and .16 and are divided into two categories—Class I and Class II. Class I TAPs are known, probable, or potential carcinogens specifically identified in COMAR 26.11.16.06. Class II TAPs include all other chemical compounds that have other potential acute or chronic health effects. Affected sources are subject to Best Available Control Technology for Toxics (T-BACT) requirements (COMAR 26.11.15.05) and an ambient impact demonstration requirement (COMAR 26.11.15.06).

The Maryland TAP regulations include provisions for exempting certain types of sources, including fuel burning equipment (such as the EDGs and SBOs). Therefore, the only sources associated with the proposed Calvert Cliffs Unit 3 project that may be subject to the Maryland TAP regulations are the cooling towers. The cooling towers require the use of chemical additives to prevent biological growth and scale build-up that would reduce heat transfer and cooling tower performance; release of these materials in cooling tower drift represent Class II TAP emissions (none is a Class I TAP).

UniStar's TAPs evaluation presented in the August 2008 application amendment was reviewed by PPRP and MDE-ARMA. The State verified UniStar's TAP emissions estimates for the CWS cooling tower. Table 4-5 presents these TAP emissions. The projected TAP emissions from the CWS are significantly lower than the most stringent applicable emission rates in

COMAR 26.11.16.02 and thus the TAP ambient impact assessment is satisfactorily demonstrated. Emissions from the ESWS are so significantly smaller than those from the CWS that only the CWS emissions were evaluated here.

The cooling towers will be equipped with high efficiency drift eliminators, which constitutes T-BACT for this source type.

Table 4-5 TAPs Emissions Associated with CWS Cooling Tower

Chemical	**NaOCl**	**NaOH**	**HEDP**	**Petroleum Distillate**
Annual Feed Rate (gal/yr)[1]	547,500	547,500	36,546	18,250
Density (lb/gal)	10.17	10.17	10.48	7.23
TAP Content (wt%)	20	5	20	100
TAP Emissions				
Hourly (lb/hr)	0.00064	0.00016	0.00044	0.00008
Annual (tpy)	0.002781	0.000695	0.000958	0.00033
TAP Screening Level ($\mu g/m^3$)	81.2 (8-hr)	20 (1-hr)	82 (8-hr)	170 (8-hr)
TAP Allowable Emission Rate (lb/hr)[2]	0.21	0.04	0.21	0.04

[1] Annual feed rate calculated based on data supplied in Table 6.4-2 of the CPCN Technical Report filed in August 2008.

[2] Represents most conservative allowable emission rate for the TAP in COMAR 26.11.16.02.

Hazardous air pollutants (HAPs) are a list of 187 specific pollutants included in Section 112 of the Clean Air Act (CAA). The source of HAPs from the Unit 3 project is burning fuel oil in the EDGs and SBOs. An estimate of total HAP emissions from the Unit 3 project is presented in Table 4-6. HAP emissions are based on the design rated heat input of each engine and AP-42 (Section 3.4) emission factors. A facility is considered a "major" source of HAPs if it has the potential to emit 10 tons per year (tpy) or more of any individual HAP, or 25 tpy or more of all HAPs combined. As depicted in Table 4-6, total HAPs from the project are estimated to be considerably less than 10 tpy; therefore, the project is not considered a major source of HAPs. Note that radionuclides are one of the listed HAPs; however, emissions of radionuclides from nuclear power plants are regulated by the NRC and were not reviewed here.

Table 4-6 HAPs Emissions Associated with Calvert Cliffs Unit 3

Pollutant	Emission Factor (lb/MMBtu)[1]	Emissions (tpy)
Benzene	7.76E-04	2.45E-02
Toluene	2.81E-04	8.86E-03
Xylenes	1.93E-04	6.09E-03
Formaldehyde	7.89E-05	2.49E-03
Acetaldehyde	2.52E-05	7.95E-04
Acrolein	7.88E-06	2.49E-04
Naphthalene[2]	1.30E-04	4.10E-03
POM[2]	8.15E-05	2.57E-03
Total		**4.96E-02**

[1] AP-42 Chapter 3.4, Tables 3.4-3 and 3.4-4.
[2] Naphthalene is listed as an individual HAP and is classified as a PAH. To avoid double counting, naphthalene has been subtracted from the total PAH value (<2.14E-04 lb/MMBtu) listed in AP-42 Table 3.4-4; POM = Polycyclic Organic Matter (listed as "Total PAH" in AP-42, Table 3.4-4).

4.2.3 *Greenhouse Gases – Carbon Dioxide*

The Regional Greenhouse Gas Initiative (RGGI) is a cooperative effort by Northeastern and Mid-Atlantic states to reduce carbon dioxide (CO_2) emissions – a greenhouse gas (GHG) contributing to global warming. Maryland joined RGGI as a component of the Healthy Air Act of 2006. The Maryland RGGI program will require action by affected units begining in 2009 and will address coal-fired, oil-fired, and natural gas-fired electric generating units that have a capacity of at least 25 MW, which means that Calvert Cliffs will not be subject to RGGI.

Nuclear power generating units do not burn fossil fuel and thus do not emit GHGs. However, the EDGs and the SBOs do burn nominal amounts of fossil fuels over the course of the year; therefore, for information purposes, PPRP and MDE-ARMA have estimated direct GHG emissions from the EDGs and SBOs. Emissions were estimated using the GHG Protocol Initiative's guidance tool developed by the World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI) for "direct emissions from stationary combustion" and are summarized in Table 4-7. Note that this

exercise does not account for the amount of GHGs that a nuclear power plant offsets compared to an equivalent amount of electricity generated in a fossil fuel plant (that is, the tons of GHGs that are not produced by generating 1,600 MW of electricity from nuclear rather than fossil fuel).

Table 4-7 GHG Emissions Associated with Calvert Cliffs Unit 3*

Pollutant	Emission Factor (kg/GJ)	Emissions (tpy)
CO_2	68.97	5,057
CH_4	0.002	0.1
N_2O	0.001	0.1

*Emission factors, emission data, density of fuel, higher heating value of fuel and oxidation factor (% conversion of carbon to CO_2) are provided by the GHG Protocol Guidance: Direct Emissions from Stationary Combustion; assumed No. 2 fuel oil parameters were equal to diesel; CO2 emission factor is based on 19 kg C available for emissions/MJ and a 99% oxidation factor.

4.2.4 *Construction Emissions*

Construction activities for the Calvert Cliffs Unit 3 project will generate emissions from essentially two types of activities: site preparation and the use of off-road fossil fuel-fired construction vehicles. According to the UniStar CPCN application, site preparation activities will include:

- Creation of construction access roads from MD 2/4 to Calvert Cliffs Unit 3 construction areas;
- Upgrading and extending heavy haul roads from barge landing to Calvert Cliffs Unit 3 construction areas;
- Establishing general plant area grade;
- Excavating building foundations; and
- Backfilling around foundations.

These site preparation activities will generate particulate matter emissions.

Off-road construction vehicles will be used for land clearing, road construction and grading, material transfer, and other various activities. These off-road construction vehicles will include: bulldozers; backhoes and loaders; cranes; dump trucks; and other support vehicles, trucks, and compressors. The

engines associated with these vehicles will generate emissions of criteria pollutants from the combustion of fuel.

Construction activities will vary over the anticipated construction schedule; therefore, the emissions associated with these activities will be temporary and will vary over time. According to the CPCN application, the contractor will employ the following practices during construction to mitigate emissions:

- Stabilizing construction roads, parking lots and laydown areas with gravel;
- Daily application of water to unpaved roads and other exposed areas;
- Use of a high efficiency baghouse for the concrete batch plant; and
- Operating EPA compliant diesel engines (Tier 2, Tier 3, and Tier 4).

Emissions from these sources were estimated using the proposed construction schedule provided by Bechtel (as presented by UniStar in the CPCN application), appropriate sections of AP-42, guidance documents from various regulatory agencies, and EPA's NONROADs model. Emissions were quantified for PM10, NO_x, CO, VOCs, and SO_2 from these various activities. The emissions of PM10, NO_x, CO, and SO_2 were used in an air dispersion modeling analysis to evaluate whether the emissions generate from construction activities would result in any exceedances of NAAQS (see Section 4.3.4.1). In general, the emissions compared favorably between the values estimated by MDE-ARMA and UniStar; however, there were a few differences for certain activities mainly due to difference in assumptions used in the calculations. For example, in the unpaved roads calculations, UniStar used a "weighted mean vehicle weight" in an attempt to simplify the calculation. Instead, PPRP and MDE-ARMA more accurately calculated emissions for each vehicle weight individually. As an example, for the wind erosion calculations, UniStar chose to use a conservative value of 13.3 mph, a value consistent with conditions in Nevada, whereas PPRP and MDE-ARMA used 5.5 mph, which is consistent with the on-site meteorological data. Nevertheless, the total construction emissions for each year present by UniStar were more conservative than the values estimated by PPRP and MDE-ARMA. A summary of PM10 emissions is presented in Table 4-8. Table 4-9 presents the emissions from construction-related combustion equipment. Detailed emission calculations from construction activities are in Appendix F.

Table 4-8 PM10 Emissions (tons per year) – PPRP and MDE-ARMA vs UniStar

	2010		2011		2012		2013		2014		2015	
	State	UniStar	State	UniStar	State	UniStar	State	UniStar	State	UniStar	State	UniStar
Paved Roads	0.07	0.07	0.27	0.27	0.53	0.53	0.80	0.80	0.27	0.27	0.02	0.02
Unpaved Roads	16.12	17.48	21.01	25.10	16.45	17.56	22.10	23.58	7.38	7.75	0.56	0.56
Material Transport	3.72	3.49	3.67	3.16	0.83	0.44	0.21	0.00	0.05	0.00	0.00	0.00
Site Preparation	49.67	50.40	50.59	52.79	21.34	24.28	6.44	9.38	1.84	2.58	0.00	0.37
Concrete Batch Plant	0.12	0.12	0.38	0.38	0.50	0.50	0.49	0.49	0.12	0.12	0.00	0.00
Wind Erosion	6.72	6.90	6.79	7.09	6.72	6.90	3.94	3.90	2.12	2.10	2.12	2.10
Combustion Equipment	1.49	1.49	2.08	2.08	1.95	1.95	1.50	1.50	0.98	0.98	0.38	0.38
Total	77.90	79.95	84.79	90.87	48.33	52.16	35.48	39.65	12.76	13.80	3.08	3.43

Table 4-9 Annual Criteria Emissions (tons per year) from Construction Vehicles During 2010-2015

Year	VOC	CO	NO_x	PM	SO_2
2010	4.36	23.31	60.92	1.49	2.45
2011	6.37	36.33	82.48	2.08	3.32
2012	7.18	44.67	72.61	1.95	2.91
2013	5.55	39.72	57.04	1.50	2.27
2014	4.40	34.56	39.03	0.98	1.54
2015	1.78	15.77	13.92	0.38	0.54

4.3 *PREVENTION OF SIGNIFICANT DETERIORATION (PSD)*

4.3.1 *Applicability*

Calvert Cliffs is an existing major stationary source for air permitting purposes, meaning that potential emissions of one or more regulated pollutants from existing Units 1 and 2 are above "major" source thresholds. Therefore, PSD applicability for this modification is based on whether there will be a "significant net emissions increase" of any regulated pollutants with the installation and operation of proposed Unit 3. As indicated in Table 4-10, potential emissions of PM, PM10, and PM2.5 exceed the significance thresholds and are subject to PSD review. Because there are pollutants that exceed the PSD significance thresholds, UniStar must:

- Demonstrate use of Best Available Control Technology (BACT) for pollutants with significant emissions (Section 4.3.2);
- Assess the ambient impact of emissions through the use of dispersion modeling; if the impact is significant, evaluate (through refined dispersion modeling) compliance with the NAAQS and consumption of air quality increments (Section 4.3.3); and
- Conduct additional impact assessments that analyze impairment to visibility, soils, and vegetation as a result of the modification, as well as impacts on Class I areas (Section 4.3.4).

VOCs (nonattainment pollutant) and NO_x emissions (both an attainment and nonattainment pollutant) are discussed further in Section 4.4.

Table 4-10 Potential Emissions from the Proposed Calvert Cliffs Unit 3 Project and PSD Significant Emission Rates

Pollutant	Potential Project Emissions (tpy)	PSD Significance Level (tpy)
NO_x/NO_2	22.8	40
CO	28.9	100
PM	**359.4**	25
PM10	**284.8**	15
PM2.5	**49.5**	10
Ozone	3.8(1)	Nonattainment
SO_2/SO_x	1.3	40
Sulfuric acid mist (SAM)	trace	7

[1]Ozone impacts are represented by VOC emissions.

4.3.2 *Best Available Control Technology (BACT)*

Based on projected potential emissions, BACT is required for PM, PM10 and PM2.5 emissions from all project emissions units (cooling towers and emergency generators). This section summarizes the BACT determination for these pollutants.

4.3.2.1 *BACT Analysis*

BACT for any source is defined in COMAR 26.11.17.01(B)(5) as:

a) …an emissions limitation, including a visible emissions standard, based on the maximum degree of reduction for each regulated NSR pollutant which would be emitted from any proposed major stationary source or major modification which the Department[1], on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for that source or modification through application of production processes or available methods, systems, and

[1] Department here means MDE-ARMA

techniques, including fuel cleaning or treatment or innovative fuel combination techniques for control of the pollutant.

b) Application of best available control technology may not result in emissions of any pollutant which would exceed the emissions allowed by an applicable standard under 40 CFR 60 and 61.

c) If the Department determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination of these, may be prescribed instead to satisfy the requirement for the application of best available control technology. This standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of the design, equipment, work practice, or operation, and shall provide for compliance by means which achieve equivalent results.

BACT analyses are conducted using EPA's "top-down" BACT approach, as described in EPA's *Draft New Source Review Workshop Manual* (USEPA 1990). The five basic steps of a top-down BACT analysis are listed below:

- Step 1: Identify potential control technologies
- Step 2: Eliminate technically infeasible options
- Step 3: Rank remaining control technologies by control effectiveness
- Step 4: Evaluate the most effective controls and document results
- Step 5: Select BACT

The first step is to identify potentially "available" control options for each emission unit triggering PSD, for each pollutant under review. Available options consist of a comprehensive list of those technologies with a potentially practical application to the emission unit in question. The list includes technologies used to satisfy BACT requirements, innovative technologies, and controls applied to similar source categories.

For this analysis, the following sources were investigated to identify potentially available control technologies:

- EPA's RACT/BACT/LAER Clearinghouse (RBLC) database,
- EPA's New Source Review website,
- Permits for like sources,
- In-house experts, and
- New Source Review Workshop Manual.

After identifying potential technologies, the second step is to eliminate technically infeasible options from further consideration. To be considered feasible for BACT, a technology must be both "available" and "applicable."

The third step is to rank the technologies not eliminated in Step 2 in order of descending control effectiveness for each pollutant of concern. If the highest ranked technology is proposed as BACT, it is not necessary to perform any further technical or economic evaluations. Potential adverse impacts, however, must still be identified and evaluated.

The fourth step entails an evaluation of energy, environmental, and economic impacts for determining a final level of control. The evaluation begins with the most stringent control option and continues until a technology under consideration cannot be eliminated based on adverse energy, environmental, or economic impacts. The economic or "cost-effectiveness" analysis is conducted in a manner consistent with EPA's *OAQPS Control Cost Manual, Fifth Edition* (USEPA 1996) and subsequent revisions.

The fifth and final step is to select as BACT the emission limit from application of the most effective of the remaining technologies under consideration for each pollutant of concern.

4.3.2.2 *UniStar BACT for the Proposed Units*

UniStar is proposing to control PM emissions (PM, PM10, and PM2.5) from the cooling towers by the installation and use of high efficiency drift eliminators (0.0005 percent drift loss for the CWS cooling tower and 0.005 percent drift loss for the ESWS cooling towers).

UniStar is proposing to control PM emissions (collectively PM, PM10, and PM2.5) from the emergency engines by the use of NSPS-compliant engines and the exclusive use of low sulfur diesel. Potential emissions from the engines are based on the reasonable worst-case estimate of operation for no more than 600 hours per year total for the EDGs and 200 hours per year total for the SBOs.

4.3.2.3 *BACT Determination*

PPRP and MDE-ARMA conducted an independent BACT determination for the sources associated with Calvert Cliffs Unit 3. Table 4-11 presents the PM/PM10/PM2.5 BACT emission limits for the emissions units associated with the Calvert Cliffs Unit 3 project.

Table 4-11 Proposed BACT Emission Limits for PM/PM10/PM2.5

Emission Source	Proposed BACT Limit	To be Achieved By
EDGs	0.15 g/hp-hr	Low sulfur diesel with maximum sulfur content of 0.05% by weight; reasonable worst case hours of operations are determined to be no more than 600 hr/yr total all EDGs combined
SBOs	0.50 g/hp-hr	Low sulfur diesel with maximum sulfur content of 0.0015% by weight; reasonable worst case hours of operation are determined to be no more than 200 hr/yr total all SBOs combined
CWS Cooling Tower	PM: 1,782 pounds/day PM10: 1,378 pounds/day PM2.5: 231 pounds/day	Drift eliminators designed to achieve a drift loss rate not to exceed 0.0005% of recirculating water flow
ESWS Cooling Towers	PM: 45 pounds/day PM10: 44 pounds/day PM2.5: 8 pounds/day	Drift eliminators designed to achieve a drift loss rate not to exceed 0.005% of recirculating water flow

CWS Cooling Tower

Actual drift loss rates from wet or wet/dry cooling systems, including those proposed by UniStar for this project, are affected by a variety of factors, including the type and design of the cooling system, capacity, velocity of air flow, density of the air in the cooling tower, and the TDS concentration in the circulating water. Commercially available techniques used to limit PM/PM10/PM2.5 drift from wet cooling towers include:

- **Application of drift eliminators**—Drift eliminators are incorporated into cooling tower systems to remove as many water droplets from the air leaving the system as possible. Types of drift eliminators include herringbone (blade-type), wave form, and cellular (or honeycomb) designs; system materials of construction may include ceramics, fiber

reinforced cement, fiberglass, metal, plastic, or wood. Designs may include other features, such as corrugations and water removal channels, to enhance the drift removal further. Drift eliminators are considered standard in the utility industry; the rate of drift as a percentage of circulating water flow rates varies with the specific project and can range from about 0.01 to 0.0005 percent of circulating water flow rates. Higher efficiency drift eliminators can achieve drift loss rates of 0.0005 percent of the circulating water flow rates.

- **Limiting TDS concentrations in the circulating water**—In general, water droplets released as drift from wet cooling towers contain TDS concentrations equivalent to the solids concentrations in the circulating water. Reducing the TDS concentrations in the water, including by managing the cycles of concentrations, minimizes drift. In any particular project, TDS concentrations are defined primarily by the water source and the concentration cycles.
- **Maintaining low air velocities**—Particulate entrainment rates are influenced by air velocities in the system, so maintaining low (or optimum design) air velocities can reduce the drift.

All of these options are technically feasible for the Calvert Cliffs Unit 3 CWS cooling tower system and UniStar is proposing to implement each of these features to some degree. UniStar is proposing to use a round, hybrid, evaporative mechanical draft cooling tower equipped with high-efficiency drift eliminators for the CWS cooling tower that will achieve a drift rate of no more than 0.0005 percent. They propose to manage cycles of concentration to limit TDS concentrations to a maximum of 35,000 ppm. Air velocities will be restricted to between approximately 14 feet per second (fps) with the wet section only in operation to 21 fps when both wet and dry sections are in operation to minimize entrainment.

A review of the RBLC and several other recently permitted cooling towers throughout the United States indicates that a drift rate of 0.0005 percent, or emissions limits resulting from use of such high efficiency drift eliminators, is consistent with what is being proposed as BACT. PPRP and MDE-ARMA concur that PM BACT for the CWS cooling tower is the operation of drift eliminators with a minimum drift loss of 0.0005 percent, to achieve the emission rates presented in Table 4-11. The PM emissions limits, in pounds per day, were determined as the maximum hourly emissions times 24 hours per day.

ESWS Cooling Towers

UniStar is proposing to use rectangular mechanical draft evaporative cooling towers for the ESWS system equipped with drift eliminators that will achieve a 0.005 percent drift rate. The ESWS towers are significantly smaller in capacity than the CWS system (each of the four ESWS towers is rated at about 20,029 gpm water flow rate versus 825,092 gpm flow rate for the CWS cooling tower system). The maximum TDS concentration in the circulating water for the ESWS towers is 3,720 ppm, based on desalination plant makeup water with TDS concentrations of a maximum of 372 ppm and ten cycles of concentration.

The techniques potentially available to limit PM/PM10/PM2.5 drift from the ESWS cooling towers are the same as identified above for the CWS system (drift eliminators, TDS concentration minimization, and air velocity management). All of these options are technically feasible for application to the ESWS, and UniStar is proposing to apply each of these techniques to some degree, including drift eliminators. As designed, UniStar is proposing installation of drift eliminators to achieve a maximum drift loss rate of 0.005 percent of circulating water flow (as opposed to a drift loss rate of 0.0005 percent for the CWS system). Because UniStar is proposing a drift rate less than the most efficient systems that may be feasible, we investigated the proposed ESWS systems further.

In its response to DNR Data Request No. 6-4, UniStar indicated that the drift eliminators for the ESWS towers must be manufactured of stainless steel for fire-proofing purposes to comply with NRC regulations. The system vendor, SPX, indicated that the stainless steel drift eliminators cannot be manufactured into a shape capable of achieving the higher 0.0005 percent efficiency with known manufacturing processes. Therefore, at least for this vendor, high efficiency drift eliminators of the type required by NRC regulation for this application do not appear to be technically feasible. Even if higher efficiency eliminators were technically feasible, an incremental cost effectiveness evaluation would demonstrate that additional reductions would not be cost effective, given that PM from each ESWS is projected to be about 8 tpy.

PPRP and MDE-ARMA concur that BACT for the ESWS cooling towers is the installation of drift eliminators with a drift loss of 0.005 percent with use of circulating water with a maximum TDS concentration of 3,720 ppm, to achieve the emission rates presented in Table 4-11.

Diesel Engines - EDGs

PM (and NO_x, VOC and CO) emission rates from diesel engines continue to improve as more stringent regulations drive advances in engine design and

fuels (e.g., development and distribution of ultra-low sulfur fuels). Emission controls, both combustion controls (such as fuel injection systems, air management system design, and combustion system design) and post-combustion controls (such as diesel oxidation catalysts and catalyzed diesel particulate filters, CDPFs), continue to advance. Feasibility and effectiveness of both types of controls are affected by engine size and rating; efficiencies of certain types of controls are greater with larger size engines.

The provisions of NSPS Subpart IIII to which the EDGs are subject are technology-forcing regulations; applicable emission limits decrease over time and later vintage engines will have more stringent emissions limits than earlier (older) units. For diesel engines with a displacement $\geq$30 liters per cylinder like the proposed EDGs, the standards require that PM emissions be reduced by at least 60 percent or PM emissions must be limited to 0.15 g/kWh (under 40 CFR 60.4205(d)). At present, UniStar has not identified the specific engines to be employed for the EDGs; however, the units will be subject to NSPS and will likely need to incorporate a combination of combustion and add-on controls to achieve the NSPS limits.

A review of the RBLC and other recently permitted, similarly sized emergency engines indicates that an emission rate of 0.15 g/kWh to be achieved through use of low sulfur fuels and based on the assumption that the units will operate for less than 600 hours per year, appears to represent BACT for these units.

Based on information available to date, BACT for the EDGs is a maximum PM emission rate of 0.15 g/kWh to be achieved through use of appropriate vintage engine and use of low sulfur diesel (maximum sulfur content of 0.05 percent by weight). Potential emissions from the units are based on the reasonable worst case assumption that the units will operate no more than 600 hours per year for all EDGs combined. Although emissions were based on this reasonable worst-case assumption, this is not a limitation for the units. Due to concerns about "emergencies", the NRC would prefer that there would NOT be any run time restrictions placed on the Emergency and Station Blackout diesel generators.

Diesel Engines - SBOs

PM BACT issues for the SBOs are similar to those for the EDGs. The SBOs (5,000-kWe) are smaller engines than the EDGs (10,130-kWe). The proposed PM emission rates for the SBOs (at 0.5 g/kWh), which are based on applicable NSPS Subpart IIII limits, are higher than the rates for the EDGs (0.15 g/kWh). Because the rates are higher and it may be technically feasible to apply catalyzed diesel particulate filter (CDPFs) to the SBO engines, we investigated further. UniStar, in response to DNR Data Request No. 6-5, suggests that use

of a combination of CDPFs and ultra-low sulfur fuel could reduce PM emissions by up to 90%; however, UniStar also indicates that such filters would not be cost-effective. Because UniStar has not yet selected engines that will serve as the SBOs, system specifications are not yet available; however, UniStar applied information from an EPA analysis (USEPA, 2007) that provided cost-effectiveness evaluations for diesel engines. The report indicates that application of CDPF with ultra-low sulfur fuel would cost on the order of $48,000 per ton of PM removed, assuming a unit operating nearly 400 hours per year (twice the amount of operations of the SBOs, which means that this application would cost even more on a per-ton-removed basis for the SBOs).

UniStar estimated the cost effectiveness of using CDPF on the SBO units on the basis of operating hours. For that analysis it was assumed that a single SBO unit was limited to operating less than 100 hours per year; therefore, UniStar stated that the cost effectiveness of using CDPF to control PM emissions was $163,000 per ton. MDE-ARMA does not agree with the calculated cost effectiveness value presented by UniStar because the cost should also be adjusted for factors other than hours of operations, such as size. The size of the engine evaluated in the EPA analysis was 100 hp versus the planned SBO engines each rated at 5,000 kW (6,705 hp). However, the EPA analysis does report that the cost effectiveness for CDPF for generator sets range between $20,800 and $51,300 per ton of PM removed. In addition, PPRP and MDE-ARMA contacted a vendor, Miratech, for a ballpark estimate of the installation of a CDPF on a emergency generator of this size. Miratech provided a capital cost of approximately $560,000 (operational costs would be in addition to that value).

On that basis, MDE-ARMA and PPRP determined that this control option is cost-prohibitive since the SBO units will operate less than 200 hours per year and the potential PM emissions are 0.6 ton per year. Any emissions reduction achieved through installation of add-on controls would provide, at best, a marginal environmental benefit. Therefore, based on information available to date, BACT for the SBOs is a maximum PM emission rate of 0.5 g/kWh to be achieved through use of appropriate vintage engine and use of ultra-low sulfur diesel (maximum sulfur content of 0.0015 percent by weight). Potential emissions from the units are based on the reasonable worst case assumption that the units will operation no more than 200 hours per year for all SBOs combined. Although emissions were based on this reasonable worst-case assumption, this is not a limitation for the units. Due to concerns about "emergencies", the NRC would prefer that there would NOT be any run time restrictions placed on the Emergency and Station Blackout diesel generators.

4.3.3 *NAAQS and PSD Increment Compliance Demonstration*

The NAAQS are concentrations in the ambient air that are established by EPA at levels intended to protect human health and welfare, with an adequate margin of safety. The air quality analysis required for sources subject to PSD includes an evaluation of the impact of the new source's emissions on NAAQS attainment, and also includes an evaluation of the impact of the new source's emissions on applicable PSD increments. PSD increments are established by EPA as allowable incremental increases in ambient air concentrations due to new sources in attainment areas, set at levels that are substantially less than the NAAQS. PSD increments cannot be exceeded even if the NAAQS evaluation would allow for impacts from new sources that are greater than the PSD increments.

An air quality modeling analysis was conducted to evaluate the air quality impact from the proposed Calvert Cliffs Unit 3 project. UniStar presented the results of its air quality modeling to demonstrate compliance with the NAAQS and PSD increments for each criteria pollutant with significant emissions from the proposed facility as part of the CPCN application. PPRP and MDE-ARMA have conducted an independent verification of UniStar's air quality modeling analysis as part of this environmental review. For reference, the NAAQS, PSD increments, Significant Impact Levels (SILs), and significant monitoring concentrations for the criteria pollutants NO_2, SO_2, CO, lead, PM10, PM2.5 and ozone defined by federal regulations (40 CFR 50), are shown in Table 4-12. On September 21, 2007, EPA proposed PSD increments, SILs, and significant monitoring concentration ranges for PM2.5; however, final action has not been taken on this proposal and further analysis of PM2.5 was not conducted.

The SILs have been established by EPA to serve as an initial test of air quality impacts. Predicted impacts less than the SILs are considered low enough that no threat to the NAAQS or PSD increments is present. Additional air quality modeling analyses relative to attainment of the NAAQS and PSD increments are not required or necessary for projects with predicted impacts less than the SILs. Impacts that are greater than the SILs need to be evaluated further to determine whether additional modeling is necessary to demonstrate NAAQS and increment attainment.

Ozone, another criteria pollutant for which NAAQS have been defined, is not emitted directly from the proposed UniStar facility sources. Ozone is formed by reactions of VOCs and NO_x emissions (called "ozone precursors") from point sources in the presence of sunlight and in the presence of precursors emitted by other sources. Ozone is considered to be a regional pollutant, in that the effects of individual sources are not ordinarily distinguishable from the effects of literally thousands of ozone precursor sources. For this reason,

modeling the impact of an individual source on ozone concentrations is not required and was not carried out for this project. For these pollutants, the emissions from the CCNCP project sources do not exceed the major modification threshold for NO_x and VOCs, therefore no further analysis is required.

PSD regulations require a source impact analysis (NAAQS and PSD increments) and an ambient air quality evaluation. The ambient air quality evaluation requires the analysis of monitored concentrations in the vicinity of the PSD source if the source impacts are greater than the monitoring *de minimis* values displayed in Table 4-12, and allows the regulatory agency to exempt a source from the analysis if impacts are less than the *de minimis* values.

Table 4-12 Ambient Air Quality Thresholds

Pollutant	Averaging Time	Primary NAAQS	Secondary NAAQS	PSD Increment	Monitoring *de minimis*	Significant Impact Level
NO_2	Annual	100 (0.053 ppm)	100 (0.053 ppm)	25	14	1.0
SO_2	Annual	80 (0.03 ppm)	—	20	—	1.0
	24-hr	365 (0.14 ppm)	—	19	13	5.0
	3-hr		1300 (0.5 ppm)	512	—	25.0
CO	8-hr	10,000 (9 ppm)	—	—	575	500
	1-hr	40,000 (35 ppm)	—	—	—	2000
PM10	Annual	50	50	17	--	1.0
	24-hr	150	150	30	10	5.0
PM2.5	Annual	15	15	—	—	—
	24-hr	35	35	—	—	—
Lead	Rolling 3-month avg.	0.15	0.15	—	—	—
	Quarterly avg.	1.5	1.5	—	—	—
Ozone	1-hr	235 (0.12 ppm)	235 (0.12 ppm)	—	100 tpy VOC	—
	8-hr	156 (0.08 ppm)	156 (0.08 ppm)	—	—	—

ppm = parts per million

Source: 40 CFR 50; all values are shown in $\mu g/m^3$ except as noted.

4.3.3.1 *UniStar Air Quality Modeling Analysis*

To initiate the compliance demonstration for the NAAQS and PSD increments, the applicant modeled project related emissions of all PSD pollutants that will increase as a result of the project. The purpose of this initial modeling analysis was to determine maximum project impacts relative to the SILs and monitoring *de minimis* concentrations. This modeling indicated that the

proposed Calvert Cliffs Unit 3 project PM10 and SO_2 emissions exceed the PSD significance thresholds for the 24-hr and 3-hr (SO_2 only) averaging periods.

UniStar Modeling Methodology

UniStar submitted an air quality modeling protocol to PPRP and MDE-ARMA for review. The protocol proposed the use of the most recent version of the EPA regulatory refined dispersion model AERMOD (version 07026) in the modeling analysis. After comment, PPRP and MDE-ARMA approved the final protocol in March 2008. The following paragraphs summarize the major elements of the UniStar dispersion modeling analysis.

Meteorological Data

Five years (2001-2005) of site-specific surface meteorological data were used in the modeling analysis. The site specific meteorological data were collected at a multi-level meteorological tower located on the Calvert Cliffs Unit 3 property. The surface data was supplemented with cloud cover data from Reagan National Airport (DCA), and upper air observations from Sterling, VA. The most recent version of the AERMOD meteorological processor, AERMET (version 06341) was used to process the surface and upper air meteorological data for input into AERMOD.

AERMET also requires that the land use surrounding the meteorological data collection site be characterized and input into the model. Land use is characterized by identifying the surface roughness, Bowen ratio, and albedo of the surrounding land cover. These micrometeorological parameters are used by AERMET, along with the standard surface meteorological data, to determine the stability state of the boundary layer of the atmosphere. UniStar used the EPA approved land use processing program AERSURFACE (version 08009) to develop the land use characteristics surrounding the Calvert Cliffs meteorological tower. UniStar used three separate wind direction sectors and seasonal micrometeorological variables in AERSURFACE. PPRP and MDE-ARMA reviewed UniStar's AERSURFACE methodology and approved its use in the modeling protocol.

Source Characterization

The following project related emissions sources were characterized and included in the air quality modeling analysis: one CWS cooling tower, four ESWS cooling towers, four EDGs, and two SBOs.

UniStar identified six potential short term operating scenarios that were used to assess emissions impacts compared to the short-term ambient thresholds. The six short term operating scenarios are as follows:

- Normal Operations Case 1: CWS cooling tower and two ESWS in operation for 24 hours.

- Normal Operations Case 2: CWS cooling tower and two ESWS in operation for 24 hours, plus one EDG operating at full load for 24 hours.

- Normal Operations Case 3: CWS cooling tower and two ESWS in operation for 24 hours, plus one SBO operating for 24 hours.

- Normal Operations Case 1: CWS cooling tower and four ESWS in operation for 24 hours.

- Backup Power Operations Case 1: Four ESWS cooling towers and four EDGs operating at 100% load for four hours, and two EDGs operating at 100% load and two ESWS cooling towers for an additional 20 hours.

- Backup Power Operations Case 2: Two ESWS cooling towers and two SBOs operating for 8 hours.

For the scenarios that had limited hours of operation for certain units, UniStar used the "Hour of Day" feature of AERMOD to toggle the emissions on/off for certain hours. UniStar identified hours where worst-case dispersion characteristics would be present, and used these hours as "on" hours in the model. The worst case periods used were:

- Worst Case 12 hour period: Hours 1 through 12

- Worst Case 8 hour period: Hours 1 through 8

- Worst Case Hour: Hour 5

UniStar developed an annual operations scenario for comparison to annual ambient thresholds. This scenario assumed constant operation of the CWS cooling tower and each ESWS cooling tower. This assumption is conservative, since normal operations of the ESWS would only involve running two units at a time. For the annual scenario, furthermore, the four EDGs were assumed to operate for a combined 600 hours per year, split evenly among the four units. Similarly, the SBOs were assumed to operate at a combined 200 hours per year, split evenly between the two units.

The annual and short term emission rates used for each emissions unit are shown in Table 4-13 and 4-14. PM2.5 emissions were not modeled, but the emissions are included in these tables for the sake of completeness. The physical stack characteristics for each emissions unit is shown in Table 4-15.

Table 4-13 – Project Related Short Term Emission Rates

Pollutant	Scenario		EDG 1	EDG 1&2	EDG 3&4	SBO 1	SBO 1&2	CWS	1x ESWS	2x ESWS
Units			gm/sec	gm/sec	gm/sec	gm/sec	gm/sec	gm/sec	g/s/m2	g/s/m2
SO_2	Normal Operations Case 2	1 EDG at 100% Load for 24 hrs	0.560	-	-	-	-	-	-	-
	Normal Operations Case 3	1 SBO for 24 hrs	-	-	-	0.009		-	-	-
	Backup Power Operations Case 1	4 EDG at 100% Load for 4 hrs (find worst 4 hrs) & 2 EDGs at 100% Load for 20 hrs	-	1.119	1.119	-	-	-	-	-
	Backup Power Operations Case 2	2 SBOs for 8 hrs (find worst 8 hrs a day)	-	-	-	-	0.018	-	-	-
CO	Normal Operations Case 2	1 EDG at 100% Load for 24 hrs	9.85	-	-	-	-	-	-	-
	Normal Operations Case 3	1 SBO for 24 hrs	-	-	-	6.94	-	-	-	-
	Backup Power Operations Case 1	4 EDG at 100% Load for 4 hr (find worst 4 hrs) & 2 EDGs at 100% Load for 20 hrs		19.70	19.70	-	-	-	-	-
	Backup Power Operations Case 2	2 SBOs for 8 hrs (find worst 8 hrs a day)		-	-	-	13.89	-	-	-
PM10	Normal Operations Case 1	CWS + 2 ESWS	-	-	-	-	-	7.48	8.39E-05	
	Normal Operations Case 2	CWS + 2 ESWS+1 EDG at 100% Load for 24 hrs	0.422	-	-	-	-	7.48	8.39E-05	
	Normal Operations Case 3	CWS + 2 ESWS+1 SBO for 24 hrs	-	-	-	0.694	-	7.48	8.39E-05	
	Normal Operations Case 4	CWS + 4 ESWS	-	-	-	-	-	7.48	8.39E-05	1.68E-04
	Backup Power Operations Case 1	4 ESWS+4 EDG at 100% Load for 4 hr (find worst 4 hrs) & 2 ESWS+2 EDGs at 100% Load for 20 hrs	-	0.844	0.844	-	-	-	8.39E-05	1.68E-04
	Backup Power Operations Case 2	2 ESWS+2 SBOs for 8 hrs (find worst 8 hrs a day)	-	-	-	-	1.39	-	8.39E-05	
PM25	Normal Operations Case 1	CWS + 2 ESWS	-	-	-	-	-	1.216	2.68E-05	
	Normal Operations Case 2	CWS + 2 ESWS+1 EDG at 100% Load for 24 hrs	0.410	-	-	-	-	1.216	2.68E-05	
	Normal Operations Case 3	CWS + 2 ESWS+1 SBO for 24 hrs	-	-	-	0.674	-	1.216	2.68E-05	
	Normal Operations Case 4	CWS + 4 ESWS	-	-	-	-	-	1.216	2.68E-05	5.36E-05
	Backup Power Operations Case 1	4 ESWS+4 EDG at 100% Load for 4 hr (find worst 4 hrs) & 2 ESWS+2 EDGs at 100% Load for 20 hrs	-	0.819	0.819	-	-	-	2.68E-05	5.36E-05
	Backup Power Operations Case 2	2 ESWS+2 SBOs for 8 hrs (find worst 8 hrs a day)	-	-	-	-	1.348	-	2.68E-05	

Table 4-14 – Project Related Long Term Emission Rates

Pollutant	Scenario	EDG 1	EDG 1&2	EDG 3&4	SBO 1	SBO 1&2	CWS	1x ESWS	2x ESWS
Units		gm/sec	gm/sec	gm/sec	gm/sec	gm/sec	gm/sec	g/s/m2	g/s/m2
NO_x	4 EDGs & 2 SBOs	-	0.154	0.154	-	0.349	-	-	-
SO_2	4 EDGs & 2 SBOs	-	0.0192	0.0192	-	0.0002	-	-	-
PM10	CWS & 2 ESWS & 4 EDGs & 2 SBOs	-	0.0145	0.0145	-	0.0159	7.48	8.39E-05	-
PM2.5	CWS & 2 ESWS & 4 EDGs & 2 SBOs	-	0.0140	0.0140	-	0.0154	1.22	2.6775E-05	-

Table 4-15 – Physical Source Characteristics

Pollutant	Units	EDG 1	EDG 1&2	EDG 3&4	SBO 1	SBO 1&2	CWS	1x ESWS	2x ESWS
UTM-X (Zone 18)	m	374,491	374,491	374,380	374,422	374,422	374,614	area	-
UTM-Y (Zone 18)	m	4,254,011	4,254,011	4,254,129	4,254,002	4,254,002	4,253,336	area	-
Stack Height	m	23.8	23.8	23.8	23.8	23.8	50	32.3	-
Base Elevation	m	25	25	25	25.9	25.9	30	24.4	-
Temperature[1]	K	767.6	767.6	767.6	767.6	767.6	-3	-	-
Velocity[1]	m/s	58.7	58.7	58.7	56.8	56.8	4.34 (3.62)*	-	-
Diameter	m	0.89	0.89	0.89	0.64	0.64	105	-	-
Area	m^2	-	-	-	-	-	-	2800	-

* 4.34 m/s is the exit velocity from the wet and dry sections. 3.63 m/s is from wet section only.

[1] EDGs at 100% Load

Downwash

Aerodynamic downwash caused by buildings and structures in the vicinity of exhaust stacks can lead to an increase in ground level concentrations. Downwash effects are modeled within AERMOD by using algorithms derived from the ISCPRIME model. AERMOD requires information about buildings and structures to be input in a prescribed format. UniStar used EPA's Building Profile Input Program (BPIP, version 04274) for this purpose. The BPIP program generates information on the location and size of buildings and structures relative to each stack, and AERMOD uses this information to calculate downwash effects.

BPIP also calculates the good engineering practice (GEP) stack height for a given stack location. GEP is the height at which downwash effects are considered to be insignificant. BPIP determined the GEP height for the all project related stacks as well in excess of the actual planned stack heights. Therefore, the direction specific downwash information created by BPIP for each source was used in the air quality modeling analysis.

Receptor Grid Development

A receptor grid was developed by UniStar that extended to approximately 7 km from the Calvert Cliffs Unit 3 project site in each direction. Receptor spacing was set to 100 m along the site boundary; 100 m spacing from the site boundary to 1 km; 300 m spacing from 1 km to 3 km; and 500 m spacing from 3 km to 7 km.

A total of 4,946 receptors were analyzed in the model. Terrain elevations were assigned to each receptor, and a hill scale was calculated with the AERMAP (version 06341) terrain processor. AERMAP is a companion program to

AERMOD that utilizes digitized USGS digital elevation model (DEM) data files to assign elevations and hill scales to receptors. The hill scale assigned to each receptor is used by AERMOD to determine the appropriate terrain algorithm to use for the receptor. AERMOD calculates a critical dividing streamline height, based on the hill scale that divides the approach flow towards the hill into two parts: one that rises over the terrain obstacle, and one that passes around the side of the obstacle. Based on the plume height relative to the terrain and relative to the receptor, AERMOD calculates concentration contributions from different parts of the plume following the different flow regimes.

UniStar Air Quality Modeling Results and Discussion

PPRP and MDE-ARMA evaluated the modeling methodology including the model used, the development and application of the meteorological database, the use and application of BPIP to determine downwash effects, the design of the receptor grid, and the actual model application. PPRP and MDE-ARMA's conclusion based on this evaluation is that the methodology is adequate to determine PSD significance and other subsequent air quality model evaluations for this project.

Table 4-16 summarizes the PSD significance modeling results for the Calvert Cliffs Unit 3 project. The maximum overall concentrations predicted by AERMOD are intended to be compared to the SILs and monitoring *de minimis* values that are also shown in Table 4-16. The modeling results as presented in the CPCN application, and confirmed by PPRP and MDE-ARMA, are shown. As shown in these tables, the 24-hr PM10 SIL, the 3-hr SO_2 SIL and 24-hr SO_2 SIL are exceeded. Therefore, a cumulative air quality modeling analysis is required to be performed for the 24-hr PM10, and 3-hr and 24-hr SO_2 NAAQS and PSD increment evaluations.

UniStar identified a "significant impact distance" (SID) of 1.6 km from the proposed site for PM10, and 1.8 km for SO_2. The significance of the SID is that multi-source modeling must be conducted to determine the total impact on PSD increments and NAAQS at receptors within a circle with a radius equal to the SID. The area within this circle is referred to as the significant impact area (SIA). The inventory of sources to be evaluated for possible inclusion in the multi-source modeling should include all sources within a distance of 50 km of the outer edge of the SIA. The development of multi-source inventories for PM10 and SO_2 is described in Section 4.3.3.2, and the multi-source modeling for PM10 and SO_2 is described in Section 4.3.3.3. The issue of preconstruction monitoring is discussed further in Section 4.3.3.4.

Table 4-16 PSD Significance Modeling Results

Pollutant	Averaging Period	Operating Scenario	Modeled Sources	2001-2005 Max Modeled Concentration (μg/m³)	Class II SIL	PSD Class II Increment	Significant Monitoring Concentration	NAAQS
					(μg/m³)	(μg/m³)	(μg/m³)	(μg/m³)
CO	1-hr	Normal Operations Case 2	EDG at 100% Load	267.8	2,000	-	-	40,000
	1-hr	Normal Operations Case 3	SBO for 24 hrs	311.6	2,000	-	-	40,000
	1-hr	Backup Power Operations Case 1	4xEDGs at 100% Load for 4 hr; 2xEDGs at 100% Load for 20 hrs	860.8	2,000	-	-	40,000
	1-hr	Backup Power Operations Case 2	2xSBOs for 8 hrs	574.5	2,000	-	-	40,000
	8-hr	Normal Operations Case 2	EDG at 100% Load	112.8	500	-	575	10,000
	8-hr	Normal Operations Case 3	SBO for 24 hrs	114.3	500	-	575	10,000
	8-hr	Backup Power Operations Case 1	4xEDGs at 100% Load for 4 hr; 2xEDGs at 100% Load for 20 hrs	248.5	500	-	575	10,000
	8-hr	Backup Power Operations Case 2	2xSBOs for 8 hrs	228.5	500	-	575	10,000
SO_2	3-hr	Normal Operations Case 2	EDG at 100% Load	9.84	25	512	-	1,300
	3-hr	Normal Operations Case 3	SBO for 24 hrs	0.19	25	512	-	1,300
	3-hr	Backup Power Operations Case 1	4xEDGs at 100% Load for 4 hr; 2xEDGs at 100% Load for 20 hrs	**30.04**	25	512	-	1,300
	3-hr	Backup Power Operations Case 2	2xSBOs for 8 hrs	0.37	25	512	-	1,300
	24-hr	Normal Operations Case 2	EDG at 100% Load	3.38	5	19	13	365
	24-hr	Normal Operations Case 3	SBO for 24 hrs	0.07	5	19	13	365
	24-hr	Backup Power Operations Case 1	4xEDGs at 100% Load for 4 hr; 2xEDGs at 100% Load for 20 hrs	**6.23**	5	19	13	365

Pollutant	Averaging Period	Operating Scenario	Modeled Sources	2001-2005 Max Modeled Concentration (µg/m³)	Class II SIL	PSD Class II Increment	Significant Monitoring Concentration	NAAQS
					(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)
	24-hr	Backup Power Operations Case 2	2xSBOs for 8 hrs	0.10	5	19	13	365
	Annual	Annual hours of operation	4xEDGs & 2xSBOs	0.03	1	20	-	80
NO_X	Annual	Annual hours of operation	4xEDGs & 2xSBOs	0.60	1	25	14	100
PM10	24-hr	Normal Operations Case 1	CWS (1) & 2xESWS	3.30	5	30	10	150
	24-hr	Normal Operations Case 2	CWS (1) & 2xESWS & EDG at 100% Load	**5.30**	5	30	10	150
	24-hr	Normal Operations Case 3	CWS (1) & 2xESWS & SBO for 24 hrs	**7.90**	5	30	10	150
	24-hr	Normal Operations Case 4	CWS (1,2) & 4xESWS	**7.40**	5	30	10	150
	24-hr	Backup Power Operations Case 1	4xESWS & 4xEDGs at 100% Load for 4 hr; 2xESWS & 2xEDGs at 100% Load for 20 hrs	**7.50**	5	30	10	150
	24-hr	Backup Power Operations Case 2	2xESWS & 2xSBOs for 8 hrs	**8.40**	5	30	10	150
	Annual	Annual hours of operation	CWS (1) & 2xESWS & 4xEDGs & 2xSBOs	0.60	1	17	-	50

4.3.3.2 *Multi-Source Inventory Development for PM10 and SO_2*

The process of developing an appropriate inventory to conduct multi-source modeling involves several steps, and is aided by developing information from different sources for the sake of intercomparison. This intercomparison of information from different sources allows for choices to be made that help ensure that conservative estimates of background source impacts are made.

UniStar acquired a background modeling inventory, including source-specific PM10 and SO_2 emissions and stack parameters from the Virginia Department of Environmental Quality (VDEQ). The file provided by VDEQ contained information on PM10 and SO_2 emissions from the District of Columbia, Maryland and Virginia. UniStar considered all the background sources within the SIA plus 50 km as candidates for the cumulative modeling.

PPRP and MDE-ARMA have reviewed the development of UniStar's multi-source inventories. The results of this review are discussed in two parts: first, for the selection of sources to model, and second, for the development of modeling inputs including stack parameters and emission rates.

Source Selection

For the purpose of the PSD increment evaluation, increment-consuming emissions for facilities in operation should represent actual emissions. For the purpose of the NAAQS evaluation, emissions should represent the potential to emit, defined in EPA's GAQM as the product of an allowable emission limit (in lb/MMBtu) and an operating level (in MMBtu/hr), and assumed to occur continuously (i.e., 8,760 hrs/yr).

The first step in developing a multi-source inventory is to identify sources within 50 km of the SIA. UniStar took the step of identifying PM10 and SO_2 sources out to a distance of 50 km from Calvert Cliffs Unit 3 project.

The ultimate goal of a NAAQS and PSD increment consumption analysis is to demonstrate compliance with these standards within a source's SIA. The selection of which sources to model in addition to the source requesting a permit is intended to accomplish this goal. The basic selection criterion, according to the EPA GAQM, is to model all sources with a significant concentration gradient within the SIA. A significant concentration gradient would suggest that the source's impacts may not be captured in the ambient monitoring and that modeling is necessary to define whether the source's impacts, in conjunction with impacts from the new source, are within ambient standards.

A source that is within the SIA is almost certain to have a significant concentration gradient in the SIA, and most sources within the SIA should be modeled. For sources outside of the SIA, however, the definition of significant concentration gradient is not well defined, and source selection relies on more qualitative judgments.

UniStar applied a screening technique to select background sources for modeling. The screening technique compares the annual emissions of a source (in tpy) to 0.3 times the distance of the source from the SIA. If the ratio of these values (tpy/0.3D) is greater than 1, UniStar included the source in the cumulative modeling analysis. UniStar applied the conservative factor of 0.3 as opposed to the commonly used factor of 20 used in the "20D" screening technique. The so-called 20D technique is frequently used for screening sources to model, but has not been approved generically either by PPRP, MDE-ARMA or EPA. It does, however, provide a first cut at limiting the number of sources that can serve as a useful starting point. The information retrieval resulted in data for approximately six sources. The facilities that were selected by UniStar, using this technique are shown in Table 4-17 and Table 4-18.

PPRP and MDE-ARMA have reviewed the selections made by UniStar and conclude that the facilities selected for PM10 and SO_2 modeling as displayed in Tables 4-17 and 4-18, in addition to the existing Calvert Cliffs Units 1 and 2 are appropriate for determining attainment of the PM10 and SO_2 NAAQS and PSD increments in the SIAs defined for the UniStar Unit 3 project.

Table 4-17 Off-Site Sources Modeled for the PM10 Increment and NAAQS Analyses

StateFIPs+Facility ID	Point ID	UTM Easting (m)	UTM Northing (m)	Base Elevation (m)	Short-term PM10 Emissions (g/sec)	Stack Height (m)	Temperature (K)	Velocity (m/s)	Diameter (m)
24009-009-0021	26	376800	4249400	30	0.29	8.23	314.82	30.48	1.22
24009-009-0021	38	376800	4249400	30	0.06	13.11	422.04	14.33	2.44
24009-009-0021	36	376800	4249400	30	0.07	13.11	422.04	14.33	2.44
24017-017-0014	8	327100	4247200	0	0.22	14.63	727.59	24.38	6.78
24017-017-0014	7	327100	4247200	0	0.23	14.63	727.59	24.38	6.78
24017-017-0014	12	327100	4247200	0	0.61	14.63	727.59	24.38	6.78
24017-017-0014	10	327100	4247200	0	0.62	14.63	727.59	24.38	6.78
24017-017-0014	9	327100	4247200	0	0.69	14.63	727.59	24.38	6.78
24017-017-0014	11	327100	4247200	0	0.73	14.63	727.59	24.38	6.78
24017-017-0014	6	327100	4247200	0	0.04	56.69	408.15	20.42	1.52
24017-017-0014	5	327100	4247200	0	0.04	56.69	408.15	20.42	1.52
24017-017-0014	15	327100	4247200	0	35.52	213.36	405.37	30.48	5.89
24017-017-0014	14	327100	4247200	0	48.06	213.36	405.37	30.48	5.89

StateFIPs+Facility ID	Point ID	UTM Easting (m)	UTM Northing (m)	Base Elevation (m)	Short-term PM10 Emissions (g/sec)	Stack Height (m)	Temperature (K)	Velocity (m/s)	Diameter (m)
24019-019-0029	22	418400	4267700	6	0.00	7.01	505.37	12.19	0.46
24019-019-0029	21	418400	4267700	6	0.02	7.01	505.37	12.19	0.46
24019-019-0029	19	418400	4267700	6	0.03	7.32	519.26	3.05	1.37
24019-019-0029	35	418400	4267700	6	0.09	9.14	422.04	9.14	0.63
24019-019-0029	34	418400	4267700	6	0.42	9.14	422.04	9.14	0.63
24033-033-0014	6	353100	4267300	0	0.31	9.14	755.37	27.43	3.14
24033-033-0014	9	353100	4267300	0	0.26	12.19	755.37	17.37	4.57
24033-033-0014	14	353100	4267300	0	0.13	64.92	813.15	32.31	5.64
24033-033-0014	15	353100	4267300	0	0.13	64.92	813.15	32.31	5.64
24033-033-0014	16	353100	4267300	0	0.20	64.92	814.82	34.44	5.61
24033-033-0014	17	353100	4267300	0	0.22	64.92	814.82	34.44	5.61
24033-033-0014	13	353100	4267300	0	0.01	67.06	588.71	9.45	2.13
24033-033-0014	8	353100	4267300	0	6.47	213.36	644.26	9.14	5.09
24033-033-0014	1	353100	4267300	0	2.11	216.10	415.93	17.07	9.60
24033-033-0014	2	353100	4267300	0	2.19	216.10	415.93	17.07	9.60
24033-033-0014	7	353100	4267300	0	12.24	217.02	395.93	19.20	7.62
24037-037-0017	48	373200	4237600	17.66	0.01	1.22	294.26	15.24	0.97
24037-037-0017	153	373200	4237600	17.66	0.02	3.66	294.26	19.51	0.25
24037-037-0017	205	373200	4237600	17.66	0.01	4.57	505.37	19.51	0.25
24037-037-0017	194	373200	4237600	17.66	0.01	6.10	477.59	15.24	0.30
24037-037-0017	196	373200	4237600	17.66	0.01	6.10	477.59	15.24	0.30
24037-037-0017	195	373200	4237600	17.66	0.04	6.10	477.59	15.24	0.30
24037-037-0017	88	373200	4237600	17.66	0.01	10.97	463.71	10.97	0.51
24037-037-0017	89	373200	4237600	17.66	0.01	10.97	463.71	10.97	0.51
24037-037-0017	198	373200	4237600	17.66	0.12	10.97	519.26	15.54	0.56
24037-037-0017	199	373200	4237600	17.66	0.02	21.34	533.15	4.27	1.47
24041-041-0069	11	407100	4294200	9	0.09	12.19	765.37	30.48	0.41
24041-041-0069	12	407100	4294200	9	0.09	12.19	765.37	30.48	0.41
24041-041-0069	9	407100	4294200	9	0.06	21.34	705.37	30.48	0.89
24041-041-0069	8	407100	4294200	9	0.38	21.34	634.26	24.38	0.99
24041-041-0069	7	407100	4294200	9	0.40	21.34	634.26	30.48	0.99
24041-041-0069	10	407100	4294200	9	1.10	21.34	705.37	30.48	0.89

Table 4-18 Off-Site Sources Modeled for the SO_2 Increment and NAAQS Analyses

StateFIPs+Facility ID	Point ID	UTM Easting (m)	UTM Northing (m)	Base Elevation (m)	Short-term SO_2 Emissions (g/sec)	Stack Height (m)	Temperature (K)	Velocity (m/s)	Diameter (m)
24009_009_0021	26_1	376552.45	4250099.84	30	0.0105	8.20	314.80	30.50	1.20
24009_009_0021	38_1	376552.45	4250099.84	30	0.0306	13.10	422.00	14.30	2.40

StateFIPs+Facility ID	Point ID	UTM Easting (m)	UTM Northing (m)	Base Elevation (m)	Short-term SO_2 Emissions (g/sec)	Stack Height (m)	Temperature (K)	Velocity (m/s)	Diameter (m)
24009_009_0021	36_1	376552.45	4250099.84	30	0.0367	13.10	422.00	14.30	2.40
24017_017_0014	8_2	327340.77	4247375.9	0	0.399	14.60	727.60	24.40	6.80
24017_017_0014	7_2	327340.77	4247375.9	0	0.436	14.60	727.60	24.40	6.80
24017_017_0014	12_2	327340.77	4247375.9	0	1.17	14.60	727.60	24.40	6.80
24017_017_0014	10_2	327340.77	4247375.9	0	1.17	14.60	727.60	24.40	6.80
24017_017_0014	9_2	327340.77	4247375.9	0	1.37	14.60	727.60	24.40	6.80
24017_017_0014	11_2	327340.77	4247375.9	0	1.38	14.60	727.60	24.40	6.80
24017_017_0014	6_2	327340.77	4247375.9	0	0.184	56.70	408.20	20.40	1.50
24017_017_0014	5_2	327340.77	4247375.9	0	0.441	56.70	408.20	20.40	1.50
24017_017_0014	15_2	327340.77	4247375.9	0	1070	213.40	405.40	30.50	5.90
24017_017_0014	14_2	327340.77	4247375.9	0	1130	213.40	405.40	30.50	5.90
24033_033_0014	6_3	353061.16	4267369.58	0	0.544	9.10	755.40	27.40	3.10
24033_033_0014	9_3	353061.16	4267369.58	0	0.481	12.20	755.40	17.40	4.60
24033_033_0014	16_3	353061.16	4267369.58	0	0.0313	64.90	814.80	34.40	5.60
24033_033_0014	17_3	353061.16	4267369.58	0	0.683	64.90	814.80	34.40	5.60
24033_033_0014	15_3	353061.16	4267369.58	0	0.78	64.90	813.20	32.30	5.60
24033_033_0014	14_3	353061.16	4267369.58	0	0.8	64.90	813.20	32.30	5.60
24033_033_0014	12_3	353061.16	4267369.58	0	0.0113	67.10	588.70	9.40	2.10
24033_033_0014	11_3	353061.16	4267369.58	0	0.015	67.10	588.70	9.40	2.10
24033_033_0014	13_3	353061.16	4267369.58	0	0.0318	67.10	588.70	9.40	2.10
24033_033_0014	8_3	353061.16	4267369.58	0	131	213.40	644.30	9.10	5.10
24033_033_0014	1_3	353061.16	4267369.58	0	710	216.10	415.90	17.10	9.60
24033_033_0014	2_3	353061.16	4267369.58	0	741	216.10	415.90	17.10	9.60
24033_033_0014	7_3	353061.16	4267369.58	0	148	217.00	395.90	19.20	7.60
24033_033_2200	1_4	337600	4281400	61	0.703	50.30	377.00	19.20	4.60
24033_033_2200	2_4	337600	4281400	61	0.709	50.30	377.00	19.20	4.60
24037_037_0001	18_5	365900	4222800	0	0.367	4.90	533.20	6.70	0.80
24037_037_0001	19_5	365900	4222800	0	0.381	4.90	533.20	6.70	0.80
24037_037_0001	15_5	365900	4222800	0	1.71	9.10	672.00	3.00	0.80
24037_037_0001	16_5	365900	4222800	0	2.32	9.10	672.00	3.00	0.80
24037_037_0001	17_5	365900	4222800	0	2.49	9.10	699.80	9.40	0.80
24037_037_0001	13_5	365900	4222800	0	1.32	12.20	574.80	3.00	0.80
24037_037_0001	14_5	365900	4222800	0	1.72	12.20	574.80	3.00	0.80
24041_041_0069	11_6	407100	4294200	9	0.0157	12.20	765.40	30.50	0.40
24041_041_0069	12_6	407100	4294200	9	0.0157	12.20	765.40	30.50	0.40
24041_041_0069	9_6	407100	4294200	9	0.745	21.30	705.40	30.50	0.90
24041_041_0069	8_6	407100	4294200	9	0.866	21.30	634.30	24.40	1.00
24041_041_0069	10_6	407100	4294200	9	0.898	21.30	705.40	30.50	0.90
24041_041_0069	7_6	407100	4294200	9	0.903	21.30	634.30	30.50	1.00

4.3.3.3 *NAAQS and PSD Increment Modeling Results*

To demonstrate compliance with the PSD increments and the NAAQS for PM10 and SO_2, an air quality modeling analysis was conducted using the same methodology as with the project source only analysis. For the increment and NAAQS analyses, model runs were conducted using five years of meteorology but only at receptors located in the PM10 and SO_2 SIAs. The worst-case operating scenario was modeled, along with the appropriate multi-source inventories. The Backup Power Operations Case 2 scenario corresponded to the scenario that resulted in the highest project source impacts for PM10, while the The Backup Power Operations Case 1 scenario corresponded to the scenario that resulted in the highest project source impacts for SO_2.

UniStar included a background PM10 concentration in the NAAQS analysis. This background concentration was obtained from a PM10 monitor located in Fairfax County, Mount Vernon, VA (Monitor ID #510590018). The average second highest 24-hr monitor value from 2005-2007 was used and added to the cumulative modeling concentration. For SO_2, background concentrations were obtained for the 3-hr and 24-hr averaging periods from a monitor located in Fairfax County, Cub Lee Run, VA (Monitor ID #510590015). As with PM10, the average second highest monitor value from 2005-2007 was used and added to the cumulative modeling concentration for both 3-hr and 24-hr averages.

The UniStar PSD increment and NAAQS modeling results are summarized in Tables 4-19 through 4-22. These multi-source modeling results demonstrate compliance with the PM10 and SO_2 NAAQS and PSD increments.

Table 4-19 Calvert Cliffs Unit 3 Project PM10 NAAQS Analysis

Pollutant	Averaging Period	Unit 3 Operating Scenario	Modeled Sources	H2H 2001-2005 Modeled Concentration	Ambient Monitoring Background	Total	NAAQS
				(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)
PM10	24-hr	Normal Operations Case 2	Unit 1 & 2 &3 NAAQS & Major Sources	85.3	38	123.3	150
	24-hr	Normal Operations Case 3	Unit 1 & 2 &3 NAAQS & Major Sources	85.8	38	123.8	150
	24-hr	Normal Operations Case 4	Unit 1 & 2 &3 NAAQS & Major Sources	85.2	38	123.2	150
	24-hr	Backup Power Operations Case 1	Unit 1 & 2 &3 NAAQS & Major Sources	85.3	38	123.3	150
	24-hr	Backup Power Operations Case 2	Unit 1 & 2 &3 NAAQS & Major Sources	85.2	38	123.2	150

Table 4-20 Calvert Cliffs Unit 3 Project PM10 PSD Modeling Results

Pollutant	Averaging Period	Unit 3 Operating Scenario	Modeled Sources	H2H 2001-2005 Modeled Concentration	PSD Class II
				(μg/m³)	(μg/m³)
PM10	24-hr	Normal Operations Case 2	Unit 1 & 2 & 3 PSD & Major Sources	26.4	30
	24-hr	Normal Operations Case 3	Unit 1 & 2 & 3 PSD & Major Sources	26.5	30
	24-hr	Normal Operations Case 4	Unit 1 & 2 & 3 PSD & Major Sources	26.4	30
	24-hr	Backup Power Operations Case 1	Unit 1 & 2 & 3 PSD & Major Sources	26.5	30
	24-hr	Backup Power Operations Case 2	Unit 1 & 2 & 3 PSD & Major Sources	26.4	30

Table 4-21 Calvert Cliffs Unit 3 Project SO_2 NAAQS Analysis

Pollutant	Averaging Period	Unit 3 Operating Scenario	Modeled Sources	H2H 2001-2005 Modeled Concentration	Ambient Monitoring Background	Total	NAAQS
				(μg/m³)	(μg/m³)	(μg/m³)	(μg/m³)
SO_2	3-hr	Backup Power Operations Case 1	Unit 1 & 2 & 3 NAAQS & Major Sources	155.8	55.9	211.7	1,300
	24-hr	Backup Power Operations Case 1	Unit 1 & 2 & 3 NAAQS & Major Sources	58.6	26.2	84.8	365

Table 4-22 Calvert Cliffs Unit 3 Project SO_2 PSD Modeling Results

Pollutant	Averaging Period	Unit 3 Operating Scenario	Modeled Sources	H2H 2001-2005 Modeled Concentration	PSD Class II
				(μg/m³)	(μg/m³)
SO_2	3-hr	Backup Power Operations Case 1	Unit 1 & 2 & 3 PSD & Major Sources	80.1	512
	24-hr	Backup Power Operations Case 1	Unit 1 & 2 & 3 PSD & Major Sources	20.2	91

4.3.3.4 *Preconstruction Monitoring*

The air quality modeling analyses described in Section 4.3.3.3, which address attainment of the NAAQS and PSD increments, are intended to fulfill the requirements contained in the PSD regulations at 40 CFR Part 52.21(k), "source impact analysis." Additional requirements at 40 CFR Part 52.21(m) require an analysis of air quality in the vicinity of the PSD source, including preconstruction monitoring. If the ambient impacts of a new source or modification are less than the monitoring *de minimis* levels specified in Part 52.21(i)(8), an exemption may be granted from the air quality analysis. Since the impacts of the Calvert Cliffs Unit 3 project do not exceed the monitoring *de minimis* levels for CO, NO_2, PM10 and SO_2 (see Table 4-12), an exemption can be granted for these pollutants. PPRP and MDE-ARMA conclude, therefore, that the air quality analysis requirements of 52.21(m) have been satisfied for the Unistar Calvert Cliffs Unit 3 project.

4.3.3.5 *Comparison of Modeled Results to Monitoring Data*

Ambient monitored concentrations recorded at State-run monitoring stations near the Calvert Cliffs Unit 3 project site have been identified and are summarized in Table 4-23. The data summarized in this table represent maximum recorded values for the time period 2003-2007. Maximum predicted impacts from the Calvert Cliffs Unit 3 project sources occur in areas close to the site that are relatively isolated from large concentrations of urban sources. The available monitoring stations were sited generally to determine the attainment status of broad areas, and are likely to represent air quality that is more heavily polluted than the area surrounding the Calvert Cliffs Unit 3 project site. Table 4-23 displays data from monitoring stations with urban and suburban designations in each of these categories. Including data from different stations provides a broader range of existing conditions than selecting a single station. Maximum model-predicted values over five years for the UniStar Calvert Cliffs Unit 3 project, along with the SIL and NAAQS, are repeated in this table for comparison.

Table 4-23 Maximum Predicted and Monitored Concentration Comparisons

Pollutant:					NO_2	SO_2	SO_2	SO_2	CO	CO	PM10	PM10
Units:					µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³
Averaging Time:					Annual	Annual	24-hr	3-hr	8-hr	1-hr	Annual	24-hr
SIL:					1	1	5	25	500	2000	1	5
NAAQS:					100	80	365	1300	10,000	40,000	50	150
Maximum Modeled Concentration :					0.60	0.03	6.23	30.04	248.5	860.8	0.6	8.4
Maximum Monitored Concentration: Location			County	(l)								
Takoma Sc. Piney Branch Rd & Dahlia St N	DC	Urban And Center City	Washington city	77.45	0.025	-	-	-	-	-	-	-
Verizon Phone Co. L St. Bet 20th & 21st	DC	Urban And Center City	Washington city	73.18		-	-	-	3.7	10.9	-	-
34th. And Dix Streets, N.E.	DC	Urban And Center City	Washington city	67.22	0.023	0.008	0.043	0.048	4.5	8.6	36	84
2500 1st Street, N.W.	DC	Urban And Center City	Washington city	72.34	0.023	-	-	-	-	-	-	-
7409 Balto And Annapolis Blvd	MD	Suburban	Anne Arundel	81.73	-	-	-	-	-	-	22	53
600 Dorsey Avenue, Essex	MD	Suburban	Baltimore	95.31	0.018	0.005	0.023	0.092	3.3	3.9	24	64
S E Police Station 5600 Eastern Ave	MD	Suburban	Baltimore city	93.28	-	-	-	-	-	-	27	78
Fmc Corp. 1701 E Patapsco Avenue	MD	Urban And Center City	Baltimore city	87.74	-	-	-	-	-	-	29	91
Old Town Fire Station, 1100 Hillen Stree	MD	Urban And Center City	Baltimore city	95.03	0.026	-	-	-	4	9.3	-	-
S 18th And Hayes St	VA	Urban And Center City	Arlington	70.59	0.026	-	-	-	3.1	4.1	-	-
Sta. 46-B9, Lee Park, Telegraph Road	VA	Suburban	Fairfax	60.24	-	-	-	-	1.9	2.6	-	-
6507 Columbia Pike	VA	Suburban	Fairfax	76.18	0.018	0.006	0.025	0.055	1.8	2.4	-	-
Lewinsville 1437 Balls Hill Rd	VA	Suburban	Fairfax	84.76	0.023	0.006	0.023	0.042	2.8	3.7	-	-
517 N Saint Asaph St, Alexandria Health	VA	Urban And Center City	Alexandria city	66.44	0.024	0.006	0.036	0.113	3	3.6	-	-
Mt.Vernon 2675 Sherwood Hall Lane	VA	Suburban	Fairfax	64.5	-	-	-	-	-	-	21	64
Roof Of West Point Elem School	VA	Suburban	King William	99.34	-	-	-	-	-	-	23	63
Hugh Mercer Elem. School 2100 Cowan Blvd	VA	Unknown	Fredericksburg city	90.82	-	-	-	-	-	-	20	55

NOTE (1) Approximate distance in kilometers from Calvert Cliffs Unit 3 project site to monitor site.

Source of monitored concentrations: EPA AIRS web site

4.3.3.6 *Summary and Conclusions*

Based on the information provided in UniStar Calvert Cliffs Unit 3 CPCN application, supplemented with independent analyses, PPRP and MDE-ARMA conclude that criteria pollutant impacts for the UniStar Calvert Cliffs Unit 3 project will not adversely affect the NAAQS or PSD increments for PM10.

4.3.3.7 *PPRP/MDE-ARMA AERMOD Analysis – Adjustments to UniStar Analysis*

PPRP and MDE-ARMA reran the air quality modeling analysis provided by UniStar to uncover any sensitivity to input assumptions assumed by UniStar in the modeling analysis. Since the Calvert Cliffs Unit 3 project used on-site meteorological data, the uncertainties associated with this modeling analysis is somewhat limited. However, some assumptions in the AERMET processing for the onsite meteorological data were identified by PPRP and MDE-ARMA as possibly having an effect on modeled concentrations.

Meteorological Processing Changes

PPRP and MDE-ARMA changed the wind speed threshold from 0.5 m/s to 0.1 m/s in AERMET. This threshold change allows for the use of the lowest wind speeds recorded by the on-site meteorological monitoring system. The higher threshold may unnecessarily treat lower wind speeds as calms, when the on-site monitoring system is still able to report wind speeds accurately in this range. AERMOD does not predict concentrations for calm hours.

The UniStar modeling used cloud cover data from Reagan National Airport (DCA) as an input into AERMET, to calculate boundary layer parameters for both stable and unstable hours. For unstable hours, AERMET has the ability to use on-site measurements of solar radiation to perform the necessary calculations; however, solar radiation is not a recorded parameter at the Calvert Cliffs meteorological monitoring site. Therefore, DCA cloud cover is required for unstable hours. AERMET also has the ability to use two measurements of temperature, taken at different elevations, to perform the so-called Bulk Richardson Number (Bulk Rn) approximation scheme. The use of the Bulk Rn scheme does not require off-site cloud cover data. The Bulk Rn scheme has not gained wide acceptance for use in AERMOD as standard cloud cover data; however, PPRP and MDE-ARMA reran AERMET using the Bulk Rn scheme to uncover any sensitivity in modeled concentrations.

Receptor Grid Changes

PPRP and MDE-ARMA also developed a separate receptor grid to use in the State's analyses. The PPRP and MDE-ARMA receptor grid used 150 m spacing, along the facility property boundary, 150 m spacing out to 3 km in all direction from the facility, and 400 m spacing from 3 km to 5 km from the facility. The total number of receptors modeled is reduced to 1,302.

Cumulative Modeling Inventory Changes

PPRP and MDE-ARMA conducted a review of the stack parameters and emission rates used in the cumulative modeling analysis. UniStar's methodology and results for developing the inventory were reviewed in conjunction with the recent environmental reviews for power plant facilities in Morgantown, MD (Facility ID – 24017-0014) and Chalk Point, MD (Facility ID – 24033-0014) and as well as from the 2002 National Emissions Inventory (NEI) from EPA. This review uncovered significant discrepancies in the PM10 emissions and the stack locations for the above mentioned facilities. Subsequently, PPRP and MDE-ARMA conducted a revision of the cumulative modeling analysis including the appropriate stack locations and PM10 and SO_2 emissions for these facilities as shown in Tables 4-24 and 4-25.

The results of the AERMOD analyses, with the changes made by PPRP and MDE-ARMA described above, are shown in Tables 4-26 through 4-30. No significant deviations in the modeled concentrations from the analyses conducted by UniStar were found. PPRP and MDE-ARMA conclude that no uncertainties exist that would significantly alter the findings of the air quality modeling analysis for this project.

Table 4-24 Off-Site Sources Modeled for the PM10 Increment and NAAQS Analyses – PPRP and MDE-ARMA Revisions

StateFIPs+Facility ID	Point ID	UTM Easting (m)	UTM Northing (m)	Base Elevation (m)	Short-term PM10 Emissions (g/sec)	Stack Height (m)	Temperature (K)	Velocity (m/s)	Diameter (m)
24009-009-0021	26	376552.45	4250099.8	30	0.29	8.23	314.82	30.48	1.22
24009-009-0021	38	376552.45	4250099.8	30	0.06	13.11	422.04	14.33	2.44
24009-009-0021	36	376552.45	4250099.8	30	0.07	13.11	422.04	14.33	2.44
24017-017-0014	8	327340.77	4247375.9	0	0.22	14.63	727.59	24.38	6.78
24017-017-0014	7	327340.77	4247375.9	0	0.23	14.63	727.59	24.38	6.78
24017-017-0014	12	327340.77	4247375.9	0	0.61	14.63	727.59	24.38	6.78
24017-017-0014	10	327340.77	4247375.9	0	0.62	14.63	727.59	24.38	6.78
24017-017-0014	9	327340.77	4247375.9	0	0.69	14.63	727.59	24.38	6.78

StateFIPs+Facility ID	Point ID	UTM Easting (m)	UTM Northing (m)	Base Elevation (m)	Short-term PM10 Emissions (g/sec)	Stack Height (m)	Temperature (K)	Velocity (m/s)	Diameter (m)
24017-017-0014	11	327340.77	4247375.9	0	0.73	14.63	727.59	24.38	6.78
24017-017-0014	6	327340.77	4247375.9	0	0.04	56.69	408.15	20.42	1.52
24017-017-0014	5	327340.77	4247375.9	0	0.04	56.69	408.15	20.42	1.52
24017-017-0014	15	327340.77	4247375.9	0	49.41	213.36	405.37	30.48	5.89
24017-017-0014	14	327340.77	4247375.9	0	49.41	213.36	405.37	30.48	5.89
24019-019-0029	22	418400	4267700	6	0.00	7.01	505.37	12.19	0.46
24019-019-0029	21	418400	4267700	6	0.02	7.01	505.37	12.19	0.46
24019-019-0029	19	418400	4267700	6	0.03	7.32	519.26	3.05	1.37
24019-019-0029	35	418400	4267700	6	0.09	9.14	422.04	9.14	0.63
24019-019-0029	34	418400	4267700	6	0.42	9.14	422.04	9.14	0.63
24033-033-0014	6	353061.16	4267369.6	0	0.31	9.14	755.37	27.43	3.14
24033-033-0014	9	353061.16	4267369.6	0	0.26	12.19	755.37	17.37	4.57
24033-033-0014	14	353061.16	4267369.6	0	0.13	64.92	813.15	32.31	5.64
24033-033-0014	15	353061.16	4267369.6	0	0.13	64.92	813.15	32.31	5.64
24033-033-0014	16	353061.16	4267369.6	0	0.20	64.92	814.82	34.44	5.61
24033-033-0014	17	353061.16	4267369.6	0	0.22	64.92	814.82	34.44	5.61
24033-033-0014	13	353061.16	4267369.6	0	0.01	67.06	588.71	9.45	2.13
24033-033-0014	8	353061.16	4267369.6	0	4.25	213.36	644.26	9.14	5.09
24033-033-0014	1	353061.16	4267369.6	0	62.45	216.10	415.93	17.07	9.60
24033-033-0014	2	353061.16	4267369.6	0	66.56	216.10	415.93	17.07	9.60
24033-033-0014	7	353061.16	4267369.6	0	5.02	217.02	395.93	19.20	7.62
24037-037-0017	48	373200	4237600	17.66	0.01	1.22	294.26	15.24	0.97
24037-037-0017	153	373200	4237600	17.66	0.02	3.66	294.26	19.51	0.25
24037-037-0017	205	373200	4237600	17.66	0.01	4.57	505.37	19.51	0.25
24037-037-0017	194	373200	4237600	17.66	0.01	6.10	477.59	15.24	0.30
24037-037-0017	196	373200	4237600	17.66	0.01	6.10	477.59	15.24	0.30
24037-037-0017	195	373200	4237600	17.66	0.04	6.10	477.59	15.24	0.30
24037-037-0017	88	373200	4237600	17.66	0.01	10.97	463.71	10.97	0.51
24037-037-0017	89	373200	4237600	17.66	0.01	10.97	463.71	10.97	0.51
24037-037-0017	198	373200	4237600	17.66	0.12	10.97	519.26	15.54	0.56
24037-037-0017	199	373200	4237600	17.66	0.02	21.34	533.15	4.27	1.47
24041-041-0069	11	407100	4294200	9	0.09	12.19	765.37	30.48	0.41
24041-041-0069	12	407100	4294200	9	0.09	12.19	765.37	30.48	0.41
24041-041-0069	9	407100	4294200	9	0.06	21.34	705.37	30.48	0.89
24041-041-0069	8	407100	4294200	9	0.38	21.34	634.26	24.38	0.99
24041-041-0069	7	407100	4294200	9	0.40	21.34	634.26	30.48	0.99
24041-041-0069	10	407100	4294200	9	1.10	21.34	705.37	30.48	0.89

Table 4-25 Off-Site Sources Modeled for the SO_2 Increment and NAAQS Analyses – PPRP and MDE-ARMA Revisions

StateFIPs+Facility ID	Point ID	UTM Easting (m)	UTM Northing (m)	Base Elevation (m)	Short-term SO_2 Emissions (g/sec)	Stack Height (m)	Temperature (K)	Velocity (m/s)	Diameter (m)
24009_009_0021	26_1	376552.45	4250099.84	30	0.0105	8.20	314.80	30.50	1.20
24009_009_0021	38_1	376552.45	4250099.84	30	0.0306	13.10	422.00	14.30	2.40
24009_009_0021	36_1	376552.45	4250099.84	30	0.0367	13.10	422.00	14.30	2.40
24017_017_0014	8_2	327340.77	4247375.9	0	0.399	14.60	727.60	24.40	6.80
24017_017_0014	7_2	327340.77	4247375.9	0	0.436	14.60	727.60	24.40	6.80
24017_017_0014	12_2	327340.77	4247375.9	0	1.17	14.60	727.60	24.40	6.80
24017_017_0014	10_2	327340.77	4247375.9	0	1.17	14.60	727.60	24.40	6.80
24017_017_0014	9_2	327340.77	4247375.9	0	1.37	14.60	727.60	24.40	6.80
24017_017_0014	11_2	327340.77	4247375.9	0	1.38	14.60	727.60	24.40	6.80
24017_017_0014	6_2	327340.77	4247375.9	0	0.184	56.70	408.20	20.40	1.50
24017_017_0014	5_2	327340.77	4247375.9	0	0.441	56.70	408.20	20.40	1.50
24017_017_0014	15_2	327340.77	4247375.9	0	1193.66	213.40	405.40	30.50	5.90
24017_017_0014	14_2	327340.77	4247375.9	0	1193.66	213.40	405.40	30.50	5.90
24033_033_0014	6_3	353061.16	4267369.58	0	0.544	9.10	755.40	27.40	3.10
24033_033_0014	9_3	353061.16	4267369.58	0	0.481	12.20	755.40	17.40	4.60
24033_033_0014	16_3	353061.16	4267369.58	0	0.0313	64.90	814.80	34.40	5.60
24033_033_0014	17_3	353061.16	4267369.58	0	0.683	64.90	814.80	34.40	5.60
24033_033_0014	15_3	353061.16	4267369.58	0	0.78	64.90	813.20	32.30	5.60
24033_033_0014	14_3	353061.16	4267369.58	0	0.8	64.90	813.20	32.30	5.60
24033_033_0014	12_3	353061.16	4267369.58	0	0.0113	67.10	588.70	9.40	2.10
24033_033_0014	11_3	353061.16	4267369.58	0	0.015	67.10	588.70	9.40	2.10
24033_033_0014	13_3	353061.16	4267369.58	0	0.0318	67.10	588.70	9.40	2.10
24033_033_0014	8_3	353061.16	4267369.58	0	131	213.40	644.30	9.10	5.10
24033_033_0014	1_3	353061.16	4267369.58	0	710	216.10	415.90	17.10	9.60
24033_033_0014	2_3	353061.16	4267369.58	0	741	216.10	415.90	17.10	9.60
24033_033_0014	7_3	353061.16	4267369.58	0	148	217.00	395.90	19.20	7.60
24033_033_2200	1_4	337600	4281400	61	0.703	50.30	377.00	19.20	4.60
24033_033_2200	2_4	337600	4281400	61	0.709	50.30	377.00	19.20	4.60
24037_037_0001	18_5	365900	4222800	0	0.367	4.90	533.20	6.70	0.80
24037_037_0001	19_5	365900	4222800	0	0.381	4.90	533.20	6.70	0.80
24037_037_0001	15_5	365900	4222800	0	1.71	9.10	672.00	3.00	0.80
24037_037_0001	16_5	365900	4222800	0	2.32	9.10	672.00	3.00	0.80
24037_037_0001	17_5	365900	4222800	0	2.49	9.10	699.80	9.40	0.80
24037_037_0001	13_5	365900	4222800	0	1.32	12.20	574.80	3.00	0.80
24037_037_0001	14_5	365900	4222800	0	1.72	12.20	574.80	3.00	0.80
24041_041_0069	11_6	407100	4294200	9	0.0157	12.20	765.40	30.50	0.40
24041_041_0069	12_6	407100	4294200	9	0.0157	12.20	765.40	30.50	0.40
24041_041_0069	9_6	407100	4294200	9	0.745	21.30	705.40	30.50	0.90
24041_041_0069	8_6	407100	4294200	9	0.866	21.30	634.30	24.40	1.00

StateFIPs+Facility ID	Point ID	UTM Easting (m)	UTM Northing (m)	Base Elevation (m)	Short-term SO_2 Emissions (g/sec)	Stack Height (m)	Temperature (K)	Velocity (m/s)	Diameter (m)
24041_041_0069	10_6	407100	4294200	9	0.898	21.30	705.40	30.50	0.90
24041_041_0069	7_6	407100	4294200	9	0.903	21.30	634.30	30.50	1.00

Table 4-26 PPRP and MDE-ARMA SILs Analysis

Pollutant	Averaging Period	Operating Scenario	Modeled Sources	2001-2005 Max Modeled Concentration (μg/m³)						Class II SIL	PSD Class II Increment	NAAQS
				2001	2002	2003	2004	2005	Max	(μg/m³)	(μg/m³)	(μg/m³)
CO	1-hr	Normal Operations Case 2	EDG at 100% Load	421.1	252.0	387.2	447.4	382.0	447.4	2,000	-	40,000
	1-hr	Normal Operations Case 3	SBO for 24 hrs	460.6	386.2	536.0	511.7	439.4	536.0	2,000	-	40,000
	1-hr	Backup Power Operations Case 1	4xEDGs at 100% Load for 4 hr; 2xEDGs at 100% Load for 20 hrs	1212.1	743.6	1396.8	1293.5	1106.5	1396.8	2,000	-	40,000
	1-hr	Backup Power Operations Case 2	2xSBOs for 8 hrs	921.2	772.5	1071.9	1023.3	718.3	1071.9	2,000	-	40,000
	8-hr	Normal Operations Case 2	EDG at 100% Load	114.9	91.7	96.7	94.3	97.6	114.9	500	-	10,000
	8-hr	Normal Operations Case 3	SBO for 24 hrs	90.3	94.2	98.7	111.2	117.7	117.7	500	-	10,000
	8-hr	Backup Power Operations Case 1	4xEDGs at 100% Load for 4 hr; 2xEDGs at 100% Load for 20 hrs	329.2	180.9	363.0	194.1	248.9	363.0	500	-	10,000
	8-hr	Backup Power Operations Case 2	2xSBOs for 8 hrs	180.6	188.3	197.5	222.3	235.3	235.3	500	-	10,000
SO_2	3-hr	Normal Operations Case 2	EDG at 100% Load	13.29	8.09	8.70	8.48	10.01	13.29	25	512	1,300
	3-hr	Normal Operations Case 3	SBO for 24 hrs	0.23	0.19	0.28	0.29	0.20	0.29	25	512	1,300
	3-hr	Backup Power Operations Case 1	4xEDGs at 100% Load for 4 hr; 2xEDGs at 100% Load for 20 hrs	36.54	20.60	32.85	24.51	24.77	**36.54**	25	512	1,300
	3-hr	Backup Power Operations Case 2	2xSBOs for 8 hrs	0.45	0.33	0.56	0.58	0.41	0.58	25	512	1,300
	24-hr	Normal Operations Case 2	EDG at 100% Load	3.19	3.29	2.80	2.76	3.21	3.29	5	19	365
	24-hr	Normal Operations Case 3	SBO for 24 hrs	0.069	0.066	0.068	0.065	0.071	0.07	5	19	365
	24-hr	Backup Power Operations Case 1	4xEDGs at 100% Load for 4 hr; 2xEDGs at 100% Load for 20 hrs	6.27	5.04	8.59	4.72	5.64	**8.59**	5	19	365

Pollutant	Averaging Period	Operating Scenario	Modeled Sources	2001-2005 Max Modeled Concentration (μg/m³)						Class II SIL	PSD Class II Increment	NAAQS
				2001	2002	2003	2004	2005	Max	(μg/m³)	(μg/m³)	(μg/m³)
	24-hr	Backup Power Operations Case 2	2xSBOs for 8 hrs	0.077	0.080	0.098	0.094	0.100	0.10	5	19	365
	Annual	Annual hours of operation	4xEDGs & 2xSBOs	0.027	0.026	0.020	0.023	0.020	0.03	1	20	80
NO_X	Annual	Annual hours of operation	4xEDGs & 2xSBOs	0.61	0.60	0.47	0.53	0.46	0.61	1	25	100
PM10	24-hr	Normal Operations Case 1	CWS (1) & 2xESWS	2.92	2.64	3.27	4.13	3.38	4.13	5	30	150
	24-hr	Normal Operations Case 2	CWS (1) & 2xESWS & EDG at 100% Load	4.76	4.62	4.80	5.03	4.42	**5.03**	5	30	150
	24-hr	Normal Operations Case 3	CWS (1) & 2xESWS & SBO for 24 hrs	7.90	7.55	7.11	7.69	8.09	**8.09**	5	30	150
	24-hr	Normal Operations Case 4	CWS (1,2) & 4xESWS	5.89	5.31	6.65	8.46	6.77	**8.46**	5	30	150
	24-hr	Backup Power Operations Case 1	4xESWS & 4xEDGs at 100% Load for 4 hr; 2xESWS & 2xEDGs at 100% Load for 20 hrs	6.51	6.71	6.56	6.53	6.43	**6.71**	5	30	150
	24-hr	Backup Power Operations Case 2	2xESWS & 2xSBOs for 8 hrs	7.46	7.18	8.05	8.22	8.55	**8.55**	5	30	150
	Annual	Annual hours of operation	CWS (1) & 2xESWS & 4xEDGs & 2xSBOs	0.53	0.53	0.47	0.57	0.43	0.57	1	17	50

Table 4-27 PPRP and MDE-ARMA PM10 NAAQS Analysis

Pollutant	Averaging Period	Unit 3 Operating Scenario	Modeled Sources	H2H 2001-2005 Modeled Concentration						Ambient Monitoring Background	Total	NAAQS
				2001	2002	2003	2004	2005	(mg/m³)	(µg/m³)	(µg/m³)	(µg/m³)
PM10	24-hr	Normal Operations Case 2	Unit 1 & 2 &3 NAAQS & Major Sources	83.9	76.7	88.4	84.0	91.3	91.3	38	129.3	150
	24-hr	Normal Operations Case 3	Unit 1 & 2 &3 NAAQS & Major Sources	84.5	77.1	88.5	84.7	91.4	91.4	38	129.4	150
	24-hr	Normal Operations Case 4	Unit 1 & 2 &3 NAAQS & Major Sources	83.8	76.9	88.6	83.8	91.4	91.4	38	129.4	150
	24-hr	Backup Power Operations Case 1	Unit 1 & 2 &3 NAAQS & Major Sources	84.0	77.5	88.5	84.2	91.9	91.9	38	144.3	150
	24-hr	Backup Power Operations Case 2	Unit 1 & 2 &3 NAAQS & Major Sources	83.8	77.7	88.4	83.8	91.4	91.4	38	129.4	150

Table 4-28 PPRP and MDE-ARMA PM10 PSD Increment Analysis

Pollutant	Averaging Period	Unit 3 Operating Scenario	Modeled Sources	H2H 2001-2005 Modeled Concentration						PSD Class II
				2001	2002	2003	2004	2005	(µg/m³)	(µg/m³)
PM10	24-hr	Normal Operations Case 2	Unit 1 & 2 & 3 PSD & Major Sources	20.4	19.1	22.9	23.2	22.2	23.2	30
	24-hr	Normal Operations Case 3	Unit 1 & 2 & 3 PSD & Major Sources	20.4	19.1	23.0	24.0	22.3	24.0	30
	24-hr	Normal Operations Case 4	Unit 1 & 2 & 3 PSD & Major Sources	20.5	19.9	23.0	23.0	22.3	23.0	30
	24-hr	Backup Power Operations Case 1	Unit 1 & 2 & 3 PSD & Major Sources	20.4	19.6	23.0	23.4	22.2	23.4	30
	24-hr	Backup Power Operations Case 2	Unit 1 & 2 & 3 PSD & Major Sources	20.4	19.0	22.9	23.0	22.3	23.0	30

Table 4-29 PPRP and MDE-ARMA SO_2 NAAQS Analysis

Pollutant	Averaging Period	Unit 3 Operating Scenario	Modeled Sources	H2H 2001-2005 Modeled Concentration						Ambient Monitoring Background	Total	NAAQS
				2001	2002	2003	2004	2005	(mg/m³)	(µg/m³)	(µg/m³)	(µg/m³)
SO_2	3-hr	Backup Power Operations Case 1	Unit 1 & 2 & 3 NAAQS & Major Sources	156.2	148.0	250.6	162.7	216.8	250.6	55.9	306.5	1,300
	24-hr	Backup Power Operations Case 1	Unit 1 & 2 & 3 NAAQS & Major Sources	52.5	51.5	56.5	52.6	59.1	59.1	26.2	85.3	365

Table 4-30 PPRP and MDE-ARMA SO_2 PSD Increment Analysis

Pollutant	Averaging Period	Unit 3 Operating Scenario	Modeled Sources	H2H 2001-2005 Modeled Concentration						PSD Class II
				2001	2002	2003	2004	2005	(µg/m³)	(µg/m³)
SO_2	3-hr	Backup Power Operations Case 1	Unit 1 & 2 & 3 PSD & Major Sources	55.2	60.0	91.9	70.0	86.4	91.9	512
	24-hr	Backup Power Operations Case 1	Unit 1 & 2 & 3 PSD & Major Sources	17.0	15.4	19.8	20.9	18.4	20.9	91

4.3.4 Additional Impact Analyses

The PSD regulations require additional analyses beyond the NAAQS and PSD increment assessment described in the previous section. In particular, the regulations require an assessment of any impairment to visibility, soils, and vegetation that would occur as a result of the new source, and of general commercial, residential, industrial, and other growth associated with the new source. Furthermore, impacts on Class I areas must be analyzed to determine compliance with Class I increments and to assess the impacts of new emissions on air quality related values (AQRVs). The following sections contain a review of UniStar's analyses, and a discussion of further analyses conducted by PPRP and MDE-ARMA.

4.3.4.1 *Air Quality Impacts from Construction Activities*

UniStar conducted an additional air quality modeling analysis that focused exclusively on air quality impacts due to construction related emissions of PM10, SO_2, NO_x, and CO. UniStar used the same modeling methodology that was used for the Unit 3 significance, NAAQS and PSD modeling analyses in the construction modeling analysis. The results of the UniStar construction modeling analysis are shown in Table 4-31.

Table 4-31 UniStar Construction Related Air Quality Modeling Analysis

Pollutant	Averaging Period	Unit 3 Construction Year	2001-2005 Modeled Concentration						Ambient Monitoring Background	Total	NAAQS
			2001	2002	2003	2004	2005	(μg/m³)	(μg/m³)	(μg/m³)	(μg/m³)
PM10	24-hr	2010	63.7	50.7	70.6	60.2	45.3	70.6	38	108.6	150
	24-hr	2011	82.2	57.0	88.4	62.7	56.1	88.4	38	126.4	150
	24-hr	2012	53.8	30.7	56.3	35.2	36.8	56.3	38	94.3	150
	24-hr	2013	52.2	35.9	48.9	40.3	41.8	52.2	38	90.2	150
	24-hr	2014	19.9	14.1	20.7	15.2	16.8	20.7	38	58.7	150
	24-hr	2015	7.8	6.8	10.0	7.9	9.3	10.0	38	48.0	150
	24-hr	2016	7.7	6.6	9.9	7.7	9.2	9.9	38	47.9	150
	Annual	2010	4.8	4.5	4.4	4.7	4.4	4.8	21	25.5	50
	Annual	2011	6.4	5.9	5.9	6.3	6.1	6.4	21	27.1	50
	Annual	2012	4.8	4.4	4.6	4.9	5.0	5.0	21	25.7	50
	Annual	2013	5.3	4.2	5.2	5.4	5.3	5.4	21	26.1	50
	Annual	2014	2.4	2.2	2.3	2.5	2.6	2.6	21	23.3	50
	Annual	2015	1.2	1.1	1.2	1.3	1.3	1.3	21	22.0	50
	Annual	2016	1.2	1.1	1.2	1.3	1.3	1.3	21	22.0	50
NO_x	Annual	2011	12.4	11.4	12.0	12.4	12.9	12.9	16.3	29.2	100
CO	1-hour	2011	606.4	450.1	691.9	550.6	662.1	691.9	1,725.0	2,416.9	40,000
	8-hour	2011	137.7	80.4	135.1	75.5	105.2	137.7	1,533.3	1,671.0	10,000
SO_2	3-hour	2011	18.9	11.9	17.5	14.3	14.6	18.9	55.9	74.8	1300
	24-hr	2011	3.9	3.4	3.9	3.6	3.3	3.9	26.2	30.1	365
	Annual	2011	0.5	0.5	0.5	0.5	0.5	0.5	7.9	8.4	80

PPRP and MDE-ARMA have expanded on the construction modeling analysis conducted by UniStar, by including existing Calvert Cliffs Unit 3 project PM10 and NO_x sources in the construction modeling runs. Since the SILs for PM10 and NO_x were exceeded by the construction related emissions alone, the PM10 NAAQS and NO_2 NAAQS and increment demonstration for the construction

phase of the project should include existing sources at Calvert Cliffs Unit 3. It should be noted that the federal PSD rules specifically state that PM10 emissions due to construction related activities do not consume increment, so no PM10 increment analysis was conducted. The results of the expanded PM10 and NO_x construction modeling analyses are shown in Tables 4-32 and 4-33.

Table 4-32 PPRP and MDE-ARMA Construction NAAQS Modeling Analysis

Pollutant	Averaging Period	Unit 3 Construction Year	2001-2005 Modeled Concentration (µg/m³)						Ambient Monitoring Background	Total	NAAQS
			2001	2002	2003	2004	2005	Max	(µg/m³)	(µg/m³)	(µg/m³)
PM10	24-hr	2011	98.40	82.66	91.76	89.86	88.77	98.40	38	136.4	150
PM10	Annual	2011	6.46	6.01	6.01	6.35	6.20	6.46	21	27.5	50
NO_x	Annual	2011	32.83	29.29	29.46	31.32	30.29	32.83	16.3	49.1	100

Table 4-33 PPRP and MDE-ARMA Construction PSD Increment Modeling Analysis

Pollutant	Averaging Period	Unit 3 Construction Year	2001-2005 Modeled Concentration (µg/m³)						PSD Increment
			2001	2002	2003	2004	2005	Max	(µg/m³)
NO_x	Annual	2011	14.08	12.99	12.82	14.07	13.58	14.08	25

4.3.4.2 Air Toxics Analysis

UniStar conducted an air toxics modeling analysis for the emissions of certain TAPs from the proposed CWS cooling tower. The results of the air toxics modeling analysis were compared to MDE screening values for each pollutant. PPRP and MDE-ARMA reviewed the UniStar analysis and verified the modeling results, presented in Table 4-34. The modeled concentration of each TAP is well below its respective MDE screening value.

Table 4-34 PPRP and MDE-ARMA Air Toxics Modeling Analysis

Pollutant	Averaging Period	Emission Rate (lb/hr)	2001-2005 Modeled Concentration (μg/m³)						MDE Screening Value
			2001	2002	2003	2004	2005	Maximum	(μg/m³)
Sodium Hypochlorite	8-hour	0.000651	0.000019	0.000013	0.000027	0.000008	0.000018	0.0000273	81.2
Sodium Hydroxide	1-hour	0.0001627	0.000020	0.000019	0.000026	0.000008	0.000018	0.0000258	20
HEDP	8-hour	0.0002186	0.000006	0.000004	0.000009	0.000003	0.000006	0.0000092	82
Petroleum Distillate	8-hour	6.917E-05	0.000002	0.000001	0.000003	0.000001	0.000002	0.0000029	170

4.3.4.3 *Impacts on Soils, Vegetation and Wildlife; Impacts of Growth*

UniStar conducted analyses of the effects of growth (e.g., emissions associated with construction of the facility and new development in the area as a result of the facility) associated with the Calvert Cliffs Unit 3 project, and of the impact of project emissions on soils, vegetation, wildlife, and visibility in the vicinity of the facility. These analyses consist of mostly qualitative assessments of these impacts, due to the temporary nature of the construction activities and the low ambient impacts of all pollutants. PPRP and MDE-ARMA have reviewed these assessments and agree with the conclusion that emissions from the Calvert Cliffs Unit 3 project during operation will have minimal effects on soils, vegetation, wildlife, and local visibility. PPRP and MDE-ARMA also agree with the conclusion that growth associated with the facility will not have a significant effect on air quality.

4.3.4.4 *Cooling Tower Salt Deposition*

Deposition is a term that is used to describe the result of the interaction of pollutants with the ground surface, where some of the pollutant mass is deposited on the ground or is absorbed by vegetation. Deposition occurs through physical and biological processes, and is generally thought of as a secondary pollution problem (i.e., pollutants that are directly emitted by combustion sources must undergo chemical transformation in the atmosphere before deposition becomes a significant factor). PPRP and MDE-ARMA conducted a modeling analysis, based on information provided by UniStar, to determine the impact of salt deposition that may result from the Calvert Cliffs Unit 3 project's cooling system.

AERMOD was used to model the proposed facility's salt deposition impacts at the vicinity of the plant. Table 4-35 summarizes the results of the salt deposition on nearby flora and fauna.

To quantify the effect of salt deposition on the nearby flora and fauna, the salt deposition on flowering dogwood (*Cornus florida*) is taken as a measure of impact. The flowering dogwood is the most sensitive native plant in the vicinity of Calvert Cliffs which could experience acute injury at salt deposition rates exceeding approximately 4.6 lb/acre (5.2 kg/hectare) per month. This threshold level is based on observational data from forest vegetation affected by salt drift from cooling towers at the Chalk Point power plant. However, the predicted values due to the cooling tower are lower than threshold deposition rates needed to have an adverse impact on the nearby flora and fauna.

Table 4-35 Maximum Annual Salt Deposition

2001-2005 Maximum Annual Salt Deposition				
Year	**($g/m^2/yr$)**	**($g/m^2/month$)**	**kg/ha/month**	**lb/acre/month**
2001	0.12459	0.010	0.10	0.09
2002	0.20486	0.017	0.17	0.15
2003	0.27566	0.023	0.23	0.21
2004	0.16002	0.013	0.13	0.12
2005	0.12484	0.010	0.10	0.09

4.3.4.5 Impacts on Class I Areas

PSD Class I areas are those that are designated as requiring special protection from the effects of pollutants emitted by PSD sources due to the pristine quality of their natural resources. The Class I areas located within 300 km of the proposed facility are the Shenandoah National Park and James River Face Wilderness in Virginia, Brigantine National Wildlife Refuge in New Jersey, and the Dolly Sods and Otter Creek Wilderness Areas in West Virginia. The Class I area that is closest to the proposed facility is the Shenandoah National Park located approximately 160 km to the Northwest of the site at its closet point. The distances from the Calvert Cliffs Unit 3 project to Dolly Sods NWA, Otter Creek NWA, James River Face Wilderness and Brigantine National Wildlife Refuge in New Jersey are approximately 253, 284, 277 and 210 km, respectively.

Applicants are required to show that new emissions will not have an adverse impact on the Air Quality Related Values (AQRVs) of the Class I areas under consideration. The PSD regulations do not contain a definition of AQRVs, and in fact, the assessment of impacts on AQRVs has historically been less prescriptive than the assessment of impacts on PSD increments. The Federal Land Manager (FLM) of the Class I area under consideration has an

affirmative responsibility, under the PSD regulations, to ensure that AQRVs are not adversely affected. A working definition of AQRVs can be found in a report prepared by representatives of the U.S. Forest Service, the NPS, and the U.S. Fish and Wildlife Service – the Federal Land Managers' *Air Quality Related Values Workgroup (FLAG) Phase I Report*, December 2000 (NPS, 2000). The FLAG report's definition of an AQRV is, "A resource, as identified by the FLM for one or more Federal areas, that may be adversely affected by a change in air quality. The resource may include visibility or a specific scenic, cultural, physical, biological, ecological, or recreational resource identified by the FLM for a particular area. The FLAG report identifies three types of AQRV impacts that are common to all Class I areas: visibility, ozone, and deposition. These types of impacts are influenced by the concentrations in the Class I area of PM10, SO_2, NO_x, and VOCs due to PSD sources.

UniStar inquired with FLM representatives to determine if a Class I area analysis was required for this project. Correspondence from the FLMs indicated that no Class I area analysis for AQRVs was required to be submitted as part of the permit application process. However, PPRP and MDE-ARMA did conduct an analysis of PM10 emissions from the new CWS cooling tower to determine Class I area visibility impacts due to the project, in order to provide perspective of these impacts to on-going analyses conducted by PPRP and MDE-ARMA to evaluate effects on Class I areas of Maryland power plant emissions. The PM10 emissions from the CWS cooling tower will be largely composed of sea salt, which is hygroscopic (i.e., absorbs humidity from the atmosphere) and can cause visibility degradation. In this analysis, PPRP and MDE-ARMA considered impacts in the Shenandoah National Park and Brigantine National Wildlife Refuge only.

PPRP and MDE-ARMA modeled the PM10 from the CWS cooling tower as primary sulfate emissions in CALPUFF. Sulfate is also a hygroscopic particle, and the CALPOST post-processor is set up to apply relative humidity factors to modeled sulfate concentrations in the algorithm to calculate the modeled light extinction. To customize the treatment of sulfate to reflect the properties of sea salt in the model, the extinction coefficient associated with sulfate was changed from 3.0 to 1.7. Also, the emissions of PM10 were scaled down (divided by a factor of 1.38) to account for the scaling of sulfate emissions that is automatically done in CALPOST. CALPOST assumes that a transformation of primary sulfate to ammonium sulfate takes place, and in this customized application of CALPOST, no such mass increase is needed.

PPRP and MDE-ARMA used the meteorological data prepared by the Visibility Improvement State and Tribal Association of the Southeast (VISTAS) for the years 2001-2003. These meteorological data were originally provided by VISTAS for use in visibility analyses as part of the Best Available Retrofit

Technology (BART) exemption process. VISTAS used the most recent EPA-approved version of CALMET (Version 5.8) to conduct these simulations. VISTAS developed several different CALMET domains covering the southeastern US. PPRP and MDE-ARMA used the VISTAS domain 5 which covers all the above mentioned Class I areas for this analysis.

The following sections describe additional analyses conducted by PPRP and MDE-ARMA to examine the visibility impacts on the above mentioned Class I areas.

Class I Impacts: Visibility Modeling Results

CALPUFF/CALPOST visibility impacts were calculated and the results are summarized in Table 4-36. This value represents the maximum daily visibility impact for receptors in the Shenandoah National Park and Brigantine National Wildlife Refuge. Visibility impairment (in terms of the extinction coefficient and the percent change due to the proposed sources) was calculated for each day of the input meteorological data set, based on concentrations predicted at all Class I receptors. Results in Table 4-36 represent the worst case year (2003) of meteorology. The daily maximum visibility change was 4.17 percent, less than the FLAG criterion of 5 percent.

Table 4-36 Maximum 24-hr Visibility Impact

Pollutant	**Modeled Extinction due to** Calvert Cliffs Unit 3 **Sources (Mm^{-1})**	**Modeled Extinction – Background (Mm^{-1})**	**Percent Change**
PM10 (Modeled as sulfate)	0.886	-	-
Total	0.886	23.278	3.81

4.3.4.5 *Conclusions Regarding Class I Impacts*

PPRP and MDE-ARMA believe that it can be reasonably concluded that the Calvert Cliffs Unit 3 project's impacts on visibility in the surrounding Class I areas are likely to be minimal. The relatively low impacts are due to the considerable distance between the Calvert Cliffs Unit 3 project and the surrounding Class I areas, as well as the relatively low emissions of NO_x, SO_2, and PM10 from the proposed project. The visibility analysis conducted by PPRP and MDE-ARMA provides a quantitative evaluation of this small effect.

4.4 NONATTAINMENT NEW SOURCE REVIEW (NA-NSR)

Calvert Cliffs is located in Calvert County, which is designated as moderate nonattainment area for ozone. Because chemicals such as NO_x and VOCs react to form ozone in the atmosphere, if emissions of these pollutants from the project are greater than 25 tpy, the project will trigger the requirements of NA-NSR.

As indicated in Table 4-4, projected maximum potential NO_x emissions (at 22.8 tpy) and VOCs emissions (at 3.8 tpy) from the proposed Unit 3 project do not exceed major source threshold for NA-NSR for these pollutants of 25 tpy each; therefore, no NA-NSR requirements are triggered by this project.

4.5 APPLICABLE REQUIREMENTS REVIEW

Based on source types and projected emissions, this section outlines the federal, State, and local air quality requirements, beyond the PSD requirements reviewed in Section 4.3, that are applicable to the Calvert Cliffs Unit 3 project. A summary of key regulatory programs that were considered follows.

4.5.1 Federal Regulations

4.5.1.1 *National Emissions Standard for Hazardous Air Pollutants (NESHAPs)*

NESHAPs are federal HAP requirements in 40 CFR 63 that apply generally to "major" sources of HAPs, defined as facilities with the potential to emit 10 tpy or more of any one HAP, or 25 tpy or more of two or more HAPs. HAP standards, known as Maximum Achievable Control Technology (MACT) standards, for major HAP sources are established for classes or categories of sources. For example, there are NESHAP for Stationary Reciprocating Internal Combustion Engines (40 CFR 63, Part ZZZZ) and Industrial Process Cooling Towers (40 CFR 63, Part Q).

The total potential HAP emissions associated with Calvert Cliffs Unit 3 are projected to be considerably less than 10 tpy (see Table 4-6); therefore the project is not considered a major HAP source and the MACT standards do not apply.

4.5.1.2 *New Source Performance Standards (NSPS)*

Section 111 of the Clean Air Act requires EPA to establish emission standards for source categories that cause or contribute significantly to air pollution, referred to as new source performance standards (NSPS). The proposed Calvert Cliffs Unit 3 emergency generators (EDGs and SBOs) are subject to one of these NSPS—40 CFR 60, Subpart IIII, "Standards of Performance for Stationary Compression Ignition Internal Combustion Engines"—and the associated fuel, monitoring, compliance, testing, notification, reporting, and recordkeeping requirements (40 CFR §60.4200 *et seq*.) and related applicable provisions of 40 CFR §60.7 and §60.8. UniStar is subject to NSPS Subpart IIII and will meet the applicable requirements.

The fuel oil storage tanks, depending on final design specifications, may be subject to 40 CFR 60, Subpart Kb "Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984." Based on UniStar's response to DNR Data Request No. 6-1, the tanks for the EDGs maybe greater than 100,000 gallons in capacity; no specific design information is available for the SBO tanks. Should any of the tanks be subject to NSPS Subpart Kb, UniStar will need to design the tanks to meet NSPS specifications, keep required records, and make required notifications.

4.5.2 *State Regulations*

The project will be subject to several State air quality regulations including, but not limited to, those summarized in Table 4-37, which lists current Maryland air quality regulations in COMAR 26.11 and indicates whether each regulation will be applicable to the project.

Table 4-37 COMAR Applicability Determination

Chpt	Sub. Sec	Title	CWS Cooling Tower	ESWS Cooling Towers (4)	EDGs (4)	Black Out Diesel Generators (SBOs) (2)	Facility-Wide	Notes
01	**-**	**General Administrative Provisions**						
	04	A. Compliance Testing, B. Requirements for Monitoring, C. Emissions Test Methods					Yes	
	05	Records and Information					Yes	
	05-1	Emissions Statements (Calvert Co. - Source Exceeding 25 TPY NOx or VOCs)					Yes	
	06	Circumvention					Yes	
	07	Malfunctions & Temporary Increses of Emissions (Reporting Excess Emissions)					Yes	
	08	Determination of Ground Level Concentrations (Acceptable Techniques)					Yes	
	09	Vapor Pressure of Gasoline					No	
	10	Continuous Emissions Monitoring					No	
	11	Additional CEM Installation Requirements					No	
02	**-**	**Permits, Approvals, and Registration**					Yes/No	Some exemptions for EGUs
03	**-**	**Permits, Approvals, and Registration -- Title V Permits**					Yes	
04		**Ambient Air Quality Standards**					No	
05		**Air Pollution Episode System**						
06		**General Emission Standards, Prohibitions, and Restrictions**						
	02	Visible Emissions	<20% opacity under (C)(1)	<20% opacity under (C)(1)	No	No	No	
	03	Particulate Matter	<0.05 gr/dscf under (B)(1)(a)	<0.05 gr/dscf under (B)(1)(a)	No	No	No	
	04	Carbon Monoxide In Areas III And IV	No	No	No	No	No	
	05	Sulfur Compounds From Other Than Fuel Burning Equipment	No	No	No	No	No	
	06	Volatile Organic Compounds	No	No	No	No	No	
	07	Control Of Sources Of Fluoride Emissions	No	No	No	No	No	
	08	Nuisance	Yes	Yes	Yes	Yes	Yes	
	09	Odors	Yes	Yes	Yes	Yes	Yes	
	12	Control of NSPS Sources	No	No	Yes	Yes	Yes	
	14	Control of PSD Sources	Yes	Yes	Yes	Yes	Yes	
07		**Open Fires**					No	
08		**Control of Incinerators**					No	
09		**Control of Fuel-Burning Equipment, Stationary Internal Combustion Engines, and Certain Fuel Burning Installations**						
	03	General Conditions for Fuel Burning Equipment	No	No	No	No	No	
	04	Prohibition Of Certain New Fuel-Burning Equipment	No	No	No	No	No	
	05	Visible Emissions	No	No	<20% under (A)(1)	<20% under (A)(1)	No	
	06	Control of Particulate Matter	No	No	No	No	No	No solid or residual oil fuel
	07	Control of Sulfur Oxides From Fuel Burning Equipment	No	No	S <0.3% under (A)(1)(c)	S <0.3% under (A)(1)(c)	No	
	08	Control of NO_x Emissions for Major Stationary Sources	No	No	Yes	Yes	No	
10		**Control of Iron and Steel Production Installations**	No	No	No	No	No	
11		**Control of Petroleum Products Installations, Including Asphalt Paving and Asphalt Concrete Plants**	No	No	No	No	No	
12		**Control of Batch Type Hot-Dip Galvanizing Installations**	No	No	No	No	No	
13		**Control of Gasoline and Volatile Organic Compound Storage and Handling**	No	No	No	No	No	
14		**Control of Emissions from Kraft Pulp Mills**	No	No	No	No	No	
15		**Toxic Air Pollutants**	Yes	Yes	No	No	No	
16		**Procedures Related to Requirements for Toxic Air Pollutants**	No	No	No	No	No	
17		**Requirements for Major New Sources and Modifications**	No	No	No	No	No	
18		**Control of Agriculturally Related Installations**	No	No	No	No	No	
19		**Volatile Organic Compounds from Specific Processes**	No	No	No	No	No	
20		**Mobile Sources**	No	No	No	No	No	
21		**Control of Asbestos**	No	No	No	No	No	
22		**Vehicle Emissions Inspection**	No	No	No	No	No	
23		**Asbestos Accreditation of Individuals, and Approval of Training Courses**	No	No	No	No	No	
24		**Stage II Vapor Recovery at Gasoline Dispensing Facilities**	No	No	No	No	No	
25		**Control of Glass Melting Furnaces**	No	No	No	No	No	
26		**Conformity**	No	No	No	No	No	
27		**Emission Limitations For Power Plants**	No	No	No	No	No	
28		**Clean Air Interstate Rule**	No	No	No	No	No	
29		**NO(x) Reduction and Trading Program**	No	No	No	No	No	
30		**Maryland's NO(x) Reduction and Trading Program**	No	No	No	No	No	
31		**Small Business Pollution Compliance Program**	No	No	No	No	No	
32		**Control of Emissions of VOCs from Consumer Products**	No	No	No	No	No	

4.4.3 Other Air Requirements

Calvert County does not have any additional air quality regulations that will be applicable to the Calvert Cliffs Unit 3 Project.