Attachment F

City of Alexandria, Virginia
Department of
Transportation and Environmental Services
P. O. Box 178 - City Hall
Alexandria, Virginia 22313

April 19, 2007

Mr. David Paylor, Director
Mr. Michael Kiss, Air Quality Modeling Coordinator
Virginia Department of Environmental Quality
629 East Main Street
PO Box 10009
Richmond, Virginia 23240-0009

Re: City of Alexandria Comments on Protocols for Air Modeling to Determine Emission Limitation for Potomac River Generating Station

Dear Messrs. Paylor and Kiss:

The Potomac River Generating Station is a major source that is undergoing, for the first time in its history, a comprehensive ambient air quality analysis for the purposes of establishing permit emissions limitations. The reliability and security issues stemming from the operational emergency pre-empted this process in 2005 and 2006. Now, with the completion of significant transmission infrastructure upgrades only months away, this comprehensive analysis can proceed without the overarching need to evaluate this source under less stringent criteria. These comments and recommendations for the facility's modeling protocol are rooted in the presumption that the same rigor and adherence to state regulations and federal guidelines to which any other source obtaining a permit would be subject, should also apply to this Mirant application. We learned in our meeting with you and VDEQ staff on March 12th that your agency also shares this interest, by your statement that this analysis should conform to Appendix W procedures (Guideline on Air Quality Models) for this analysis.[1]

Historical perspective is important here. To quickly summarize, the facility's existing state Permit to Operate was issued in 2000 to constrain the facility's NOx, emissions, starting in 2003, to levels that would not contribute significantly to nonattainment of the primary ambient air quality standard for ozone.[2] While the facility owners submitted a Title V permit application in 1998,[3] the issuance of that permit was derailed

[1] "Revis ion to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions," 40 CFR Part 51, Nov. 9, 2005, and "Ap pendix W to Part 51 – Guideline on Air Quality Models," July 1, 2003.
[2] Stationary Source Permit to Operate, September 18, 2000.
[3] "PEPC O Potomac River Title V Air Operating Permit Application," J. Potts, Potomac Electric Power Company to A. Laubscher, Virginia Department of Environmental Quality, January 9, 1998.

by the lack of the facility's compliance plan with the level of NO_2 emissions that were stipulated in the 2000 permit. [4] The 2000 permit, currently the only permit in place, includes no enforceable emission limitations for the purpose of constraining operations to ensure that the facility will not contribute significantly to nonattainment for any criteria pollutants other than ozone The lack of a final Title V permit for the facility also held at abeyance the implementation of the clause within every Title V and comprehensive permit issued in Virginia,[5] that "the permittee shall, upon request of the DEQ, reduce the level of operation or shut down a facility, as necessary to avoid violating any primary ambient air quality standard and shall not return to normal operation until such time as the ambient air quality standard will not be violated." It was not until the violation of the 2000 Permit to Operate that an Order by Consent was reached in 2004 requiring the facility to evaluate its compliance with national ambient air quality standards (NAAQS).

The result of this prolonged delay in this facility's comprehensive permitting has been essentially unfettered operations and emissions for most pollutants. The state's emissions limitations for sulfur dioxide (SO_2), particulate matter under 10 microns (PM_{10}) and carbon monoxide (CO) that apply to any solid fuel burning facility have never represented any significant constraint on this facility's operation. Therefore, for virtually its full lifespan, this facility's boilers were able to run to their maximum heat input levels, and the plant was able to annually consume as much coal as operationally possible. Even the 20% opacity limitation for these boilers, which represented the only measure, albeit limited, of compliance with PM_{10} and $PM_{2.5}$ emissions, would likely not have been violated even if the plant had decided to run in an energy- and cost-saving mode by reducing the number of operational electrostatic precipitator fields. We know that these unrestrained emissions of criteria pollutants and their precursors came at the expense of those living around the plant (the exceedance of February 23rd occurred at approximately half the emission levels of pre-2005 operations) and the region.

With air quality modeling tools readily available for decades now, this facility could have implemented an air quality compliance plan long ago. The time when Mirant was working with VDEQ to develop a compliance plan for its NO_x emissions would have been a propitious time to do so, approximately six to eight years ago. At that time, several current existing regulatory criteria were not in place, namely the promulgation of the $PM_{2.5}$ NAAQS. Therefore, at that time, full NAAQS compliance might have required curtailment in operations and installation of control technology, all possible but not overwhelming. Now, the region is designated nonattainment not only for ozone, but for $PM_{2.5}$ as well. Further, the $PM_{2.5}$ NAAQS has recently been tightened.

These recent developments represent significant tightening of permitting constraints for this facility. The PJM upgrades to transmission capability will soon satisfy the region' s need for reliability and allow the importation of energy into the capitol area from other electrical generating units, many of which likely generate power more efficiently and more cleanly. The City asks that VDEQ treat this permit application as it would that of any other un-permitted source that is requesting to annually emit thousands of tons of SO_2, NO_x, CO and acid gases, and hundreds of tons of fine PM, in an ozone and $PM_{2.5}$ nonattainment area.

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[4] As described in conversation J. McKie of VDEQ.

[5] 9 VAC 5-20-180 I. In discussions with VDEQ staff, it was confirmed that this is a condition within each facility's Title V permit.

1. Protocol should be Revised to Include Evaluation of Existing and Proposed Configurations

The Administrative Consent Order (ACO)[6] which currently governs the facility's operation expires on June 1, 2007. Mirant has proposed the construction of a stack merge project at the facility, to commence approximately in the fall of 2007 and complete possibly as late as the spring of 2008. The City supports the stack merge project if it means a reduction in airborne exposures for local and regional residents. The City of Alexandria has provided the regulatory basis to the US EPA, however, for why this plant' s emission limitations cannot be developed while accounting for the dispersion enhancement that the stack merge project represents.[7] Dispersion credits cannot be allowed within the Clean Air Act, and should not be granted in this circumstance.

Therefore, until such time that the stack merge occurs, operations must be governed by emission limitations that are determined through an air quality compliance assessment for the existing five stack configuration.[8] Therefore, Mirant's protocol[9] should be revised to include the operational scenarios of the plant's existing five stack configuration. Examples of these scenarios are likely already included within the ACO's Table 1.

Then, upon completion of the analysis to determine non-varying emission limits for these five-stack operational scenarios (without the unorthodox day-by-day load-increasing predictive modeling procedure in place), Mirant can proceed with the post-merge modeling cases (numbers 1 through 11) shown in Mirant's protocol (see page 3-1), constrained to the same emission limitations that are defined for the five-stack configuration. Both tables and plots of maximum impacts of both the existing and merged stack configuration should then be presented. With the non-varying emission limitations remaining equal for each respective pollutant and time period between the existing five-stack and merged-stack scenarios, the stated benefits of the stack merge project will be clearly displayed. Alternately, plots can be developed that show the percentage differential in air quality impacts between the existing five-stack and proposed stack merge configuration.

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[6] US EPA, Administrative Compliance Order by Consent, June, 2006.

[7] J. Britton, Schnader, Harrison, Segal and Lewis, LLP, and I. Pessoa, City of Alexandria to D. Welsh, US EPA Regional Administrator and J. Katz, US EPA Region III, Director, Air Protection Division, April 11, 2007.

[8] The purpose of prohibiting such a dispersion technique is obvious. A plant' e missions limitations derive from a level of compliance equal to the NAAQS (a concentration level of pollutants) as the required outcome. Therefore, " control" techniques that derive simply from an increase in dispersion indirectly allow a facility to *increase* its daily, hourly and annual emission levels to the level of the NAAQS.

[9] "P rotocol for Modeling Ambient Pollutant Concentrations form the Proposed Stack Merge Project at the Potomac River Power Plant," February, 2007.

2. Mirant' s Protocol should Include Evaluation of $PM_{2.5}$, CO and NO_2 Impacts

(a) $PM_{2.5}$ Emissions Must be Modeled

Since inception of public awareness of the detriment of the facility's impacts on public areas, the pollutant of primary interest and focus for the citizens of Alexandria has been fine particulate matter ($PM_{2.5}$). More than a full year prior to the analyses[10] that determined the serious extent of criteria pollutant impacts on immediately adjacent local areas, City residents were informed of the significant extent of the plant's impacts on regional and local levels of $PM_{2.5}$.[11]

This region, joining nine adjacent counties, is designated as a nonattainment area by US EPA for $PM_{2.5}$ based on historical measurements showing widespread and recurring monitored levels equal to or exceeding the initially promulgated National Ambient Air Quality Standards (NAAQS).[12] Since the initial establishment of the $PM_{2.5}$ NAAQS, evidence of unprecedented scale linking increased mortality, hospitalization and cardiac and respiratory events, at levels lower than the NAAQS, prompted the Clean Air Scientific Advisory Council to recommend a reduction in the $PM_{2.5}$ NAAQS. Effective December, 2006, US EPA promulgated a reduction in the 24-hour standard for $PM_{2.5}$ from 65 to 35 $\mu g/m^3$. [13] A time series of all monitored values from the seven $PM_{2.5}$ regional monitors that VDEQ operates (see Figure 1) shows the degree to which daily values exceeded this short-term NAAQS in the region in 2006.[14] Each of these recorded exceedances occurred during the ozone season of May through September, the season when this plant's output has been, and thereby may continue to be, at its highest levels.

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[10] In addition to the downwash analysis by Mirant, the City of Alexandria prepared its own ambient air quality analysis (see "A mbient Air Quality Analysis – Potomac River Generating Station – Alexandria, Virginia," AERO Engineering Services, August, 2005.

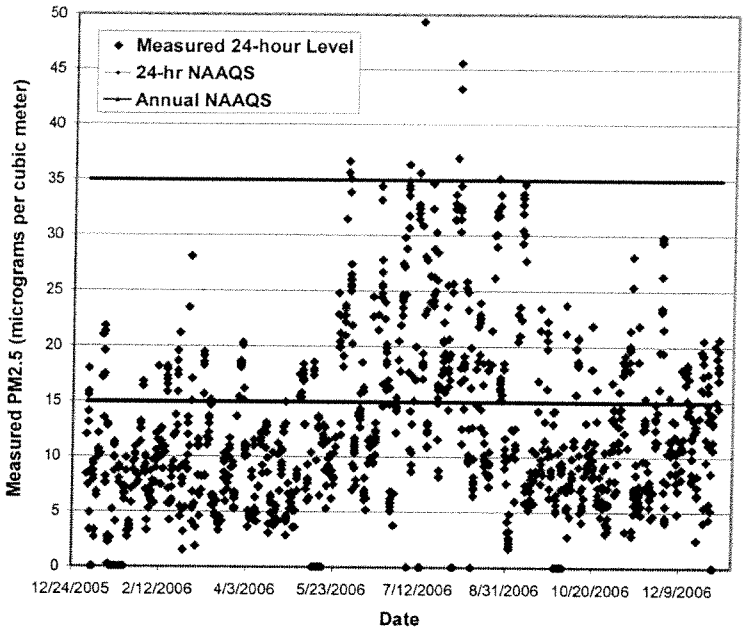
[11] "An alysis of Particulate Matter Impacts for the City of Alexandria, Virginia," J. Levy, Harvard School of Public Health, April, 2004.

[12] http://www.epa.gov/pmdesignations/documents/final/finaltable.htm. Counties included in the Washington DC/MD/VA nonattainment area are Alexandria, Arlington, Fairfax, Loudon, Prince William, Falls Church, Manassas, Manassas Park, Fairfax City.

[13] "National Ambient Air Quality Standards for Particulate Matter," Federal Register, October 17, 2006.

[14] Note: Daily $PM_{2.5}$ averages from all Northern Virginia (from Arlington, Fairfax, Loudon and Annandale Counties) regional monitors for the year 2006. Includes results using Federal Reference and continuous methods.

Figure 1. All Nothern Virginia Measurements in 2006 - PM2.5 24-hour Averages (ug/m3)



The Commonwealth of Virginia defines primary ambient air quality standards in 9 VAC 5-30-65 (including $PM_{2.5}$) as the "levels of air quality which, allowing an adequate margin of safety, are necessary to protect the public health." VDEQ's enforcement authority in protecting the NAAQS prompted the agency to declare, in August, 2005, that this "facility shall not be returned to operation until it and the associated air pollution control equipment are able to operate without violation of any ambient air quality standard."[15] The US EPA Region III Director declared federal support for VDEQ's enforcement action, stating that "for the health and safety of local residents near the plant ... the USEPA will not support any continued full or partial operation of the Potomac River without verification from EPA experts that there will not be any modeled exceedances of the NAAQS caused by emissions from the plant" (Donald S. Welsh, US EPA Region III, to James P. Moran, Congressman, October 21, 2005).[16]

Since that time at which VDEQ requested that the plant "immediately undertake such action as is necessary to ensure protection of human health and the environment," VDEQ has publicly stated its intention in "drafting a State Operating Permit that addresses the facility's impacts on all National Ambient Air Quality Standards" (J. Steers, to J. Britton, I. Pessoa, July 26, 2006). As a signatory to the US EPA's Administrative Consent Order,[17] Mirant obligated itself to the development of emission limitations that are protective of all NAAQS. See Section E. Permitting Requirements of the ACO, stating that "within the [following] 12 months ... Mirant must cooperate with VDEQ in the development of operating permit emissions limits protective of all NAAQS."

[15] Director Burnley, VDEQ, to L. Johnson, Mirant, August 19, 2005.
[16] Exhibit C, Motion for Leave to File Consolidated Answer and Consolidated Answer of Robert G. Burnley, Director of the Commonwealth of Virginia, Department of Environmental Quality, Docket no. EL05-145-000, November 10, 2005.
[17] Adminstrative Compliance Order by Consent, United States Environmental Protection Agency, Region III, Docket no. CAA-03-2006-0163DA, June, 2006.

$PM_{2.5}$ is a pollutant for which primary ambient air quality standards are defined. In summary, not only is there solid regulatory basis for an air quality analysis that includes the determination of this plant' s $PM_{2.5}$ emission limits that demonstrate compliance with the NAAQS, there is also extremely heightened public interest in ensuring that this pollutant be included in the facility's NAAQS compliance demonstration.

Using Only the SIP Process for this Permit Proceeding will Lead to Severe Local Exceedances of the PM2.5 NAAQS

We believe that this modeling analysis is governed by VDEQ' s statutory requirement that prohibits the granting of a permit unless the facility is "des igned, built and equipped to operate without preventing or interfering with the attainment or maintenance of any applicable ambient air quality standard (AAQS) and without causing or exacerbating a violation of any applicable air quality standard." See 9 VAC 5-80-1180.A.3. Through issuance of Permits to Operate governed by this regulation, the State determines *source-specific* enforceable limitations to ensure that a source's impacts do not contribute to localized exceedances of the AAQS.

On the other hand, through development of the State Implementation Plan (SIP), VDEQ will develop categories of pollutant control for sources which *currently hold* a state Permit to operate for the purpose of achieving attainment on a broad *regional* level, as measured by levels of criteria pollutants at *regional* monitors. These regional monitors' locations meet strict federally-recommended siting criteria designed to assure collection of representative ambient, background levels of pollutants, at locations that are selected to avoid impacts from distinct major sources. Once the Virginia SIP process unfolds,[18] the process of implementing that plan' s elements, including category-specific (rather than source specific) pollutant controls, will likely unfold over the course of several years.

This source's compliance with the NAAQS must be demonstrated on both regional and local scales. Using the SIP process as the sole review mechanism for this facility will not only practically ensure that this facility contributes significantly to *localized* exceedances of the NAAQS, but will also exacerbate and confound the goals of the SIP by allowing greater emissions of $PM_{2.5}$ and its precursors that, at greater distance and time scales, contribute to the nonattainment status of the region.

Gaussian Dispersion Methods to Evaluate Localized $PM_{2.5}$ Impacts are Technically Sound

As US EPA stated, " direct $PM_{2.5}$ emissions can be evaluated with current models."[19] For local assessment of PM_{10} impacts, AERMOD is a recommended Appendix W model, and application of AERMOD to assess the plant's contribution to local levels of $PM_{2.5}$

[18] The Virginia SIP has not yet been developed; it is due by April 15.

[19] US EPA states in its proposed rule to implement the fine particle NAAQS that "the lack of modeling techniques to project ambient impacts is among the previous difficulties that have been resolved in most respects," and that the technical aspects of calculating "direct" (i.e., primary) $PM_{2.5}$ impacts using existing models are well-defined. See Proposed Rule to Implement the Fine Particulate National Ambient Air Quality Standards, Federal Register, November 1, 2005. US EPA proceeds with just such an assessment as proposed here; see US EPA' s posting of the local-scale assessment of $PM_{2.5}$ impacts using AERMOD on the SCRAM site, labeled "Interi m Regulatory Impact Analysis," which describes the application of AERMOD to calculate local scale impacts of the direct component of $PM_{2.5}$.

by its direct $PM_{2.5}$ components is an equivalent approach. VDEQ has stated its intention to use Appendix W to govern how the ambient air quality compliance demonstration of this major source is to proceed.[20] Text within Appendix W only supports the assessment of $PM_{2.5}$ impacts, rather than discouraging that process. Section 7.0 includes a discussion of general modeling considerations for establishing a source's design concentrations for $PM_{2.5}$ (see Section 7.2.1.2). Section 5.2.2.1 (under Section 5.2.2 "Models for Particulate Matter"), states that modeling to estimate the impact of individual sources for $PM_{2.5}$ should proceed on a case-by-case basis. Therefore, the current lack of comprehensive VDEQ guidance specific to $PM_{2.5}$ impact assessments neither obviates the need for protection of the standard nor precludes the use of existing, technically-sound means of calculating $PM_{2.5}$ impacts in a local-scale assessment.

Impacts of direct $PM_{2.5}$ can be calculated through application of AERMOD just as PM_{10} impacts are assessed using AERMOD. Mirant's protocol should therefore, be amended to propose $PM_{2.5}$ emission rates for each stack. The recent stack tests of direct $PM_{2.5}$ (filterable plus condensable components), reported in February, 2007, facilitate this analysis by providing a basis for emission rates. The City recommends however, that emission levels used in the compliance demonstration be increased from stack tests to account for the frequent variations and expected increases in $PM_{2.5}$ emissions that occur due to soot-blowing, ESP rapping, and boiler start-up and shutdown. These $PM_{2.5}$ emission rates should also be based on the assumption that a continuous means of compliance will be in place on each stack (such as particulate matter continuous emission monitors, or PM CEMs, see below). Within the revised protocol, Mirant must expand the analysis to propose $PM_{2.5}$ rates for each of its existing operational scenarios and future proposed modeling cases in Section 3.0. Compliance with the NAAQS must be determined by the addition of the modeled 24-hour average impacts (on a 98th percentile basis) to similarly determined background concentration levels.

The table below shows the most recent three-year average of the 98th percentile measured 24-hour values for $PM_{2.5}$ at all Northern Virginia (NOVA) monitoring locations. These results show these levels either exceed the $PM_{2.5}$ NAAQS or leave less than 2 $\mu g/m^3$ for available margin. The degree of uniformity within these monitoring results for NOVA is remarkable; certainly it cannot be reasonably expected that background results for Alexandria will be significantly different. If this trend continues even when the three-year average levels are re-evaluated with inclusion of 2006 measurements, the City recommends that this facility's impacts be evaluated against significant impact levels (SILs). In any comprehensive ambient air quality impact analysis, if a source' s impact for a pollutant falls below the respective SIL, then that source is considered to *not* contribute to a violation of the respective ambient air quality standard.[21]

2003-2005 24-Hour Averages - 98th Percentile Values ($\mu g/m^3$)				
Site	**2003**	**2004**	**2005**	**3-Yr Avg.**
Loudon	35.3	34.2	37.7	35.7
Franconia, Fairfax Co.	32.6	35.3	34.5	34.1

[20] Meeting in Alexandria, Virginia, March 12, 2007.

[21] 40 CFR Part 51, Section 165 Permit Requirements defines the term significantly, stating that "a major source or major modification will be considered to cause or contribute to a violation of a national ambient air quality standard when such source or modification would, at a minimum, exceed the following significance levels at any locality that does not or would not meet the applicable national standard."

Arlington	39.2	35.7	34.2	36.4
McLean, Fairfax Co.	32.9	33.7	34.6	33.7
Annandale, Fairfax Co.	36.7	34.0	35.1	35.3

Source:
"Virginia Ambient Air Monitoring 2005 Data Report,"
http://www.deq.virginia.gov/airmon/documents/AnnualReport05_002.pdf

VDEQ policy does not currently define significant impact levels (SILs) for $PM_{2.5}$. However, other air use management authorities have already moved forward in recommending SILs for $PM_{2.5}$. As recommended by both the Northeast States for Coordinated Air Use Management (NESCAUM)[22] and National Association of Clean Air Agencies (previously STAPPA-ALAPCO, of which both the City of Alexandria and VDEQ are members), the SIL should be established either by the ratio-of-NAAQS method, or 4% method, both of which have been used previously by US EPA to develop SILs.[23] Both methods, based on the higher, older 24-hour $PM_{2.5}$ NAAQS, lead to similar values, equal to 2.0 and 0.3 $\mu g/m^3$ on a 24-hour and annual basis, respectively. Therefore, given the revision of the 24-hour $PM_{2.5}$ NAAQS, methods used previously by US EPA and air regulatory agencies suggest that the final 24-hour $PM_{2.5}$ SIL should fall below 2.0 $\mu g/m^3$. [24]

Note that Mirant's protocol currently suggests that the operational scenarios described in Tables 1 and 2 will be simulated for the purposes of determining complying SO_2 emission rates. $PM_{2.5}$ impacts may be significantly more constraining, likely requiring that the lowest operational SO_2 limit that the plant can continuously meet be pre-determined. The scenarios proposed then for both the existing five-stack configuration and the proposed stack merge configuration should then be simulated, with the expectation that daily hours of operation or output may need to be reduced to show compliance with the $PM_{2.5}$ daily standard.

Permit Must also Prescribe $PM_{2.5}$ and Precursor Emission Limits that Ensure the Facility's Em issions do not Contribute Significantly to Regional Levels of $PM_{2.5}$

Just as NO_x emissions of this facility are constrained in order to ensure that the facility does not contribute significantly to the ozone nonattainment status of the region,[25] so must the facility's $PM_{2.5}$ direct and precursor emissions of NO_x and SO_2 be constrained (to ensure that their emissions do not contribute significantly to the $PM_{2.5}$ nonattainment status of the region). CALPUFF is an Appendix W model recommended for the assessment of regional $PM_{2.5}$ impacts, allowing calculations of this plant's contribution to regional $PM_{2.5}$ impacts from its direct and precursor pollutant emissions. For this assessment, compliance criteria should be the selected $PM_{2.5}$ SILs.

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[22] "NES CAUM Technical Guidance on Significant Impact Levels (SILs) for PM2.5, NESCAUM Permit Modeling Committee, Dec. 8, 2006.

[23] "At tachment to STAPPA and ALAPCO Comments on Proposed PM2.5 Implementation Rule," www.4cleanair.org/comments_attachment-FINAL.pdf.

[24] Recent regulatory proceedings and rulings support the procedures to require that a source demonstrate an insignificant impact in a $PM_{2.5}$ nonattainment area as a condition for a permit. See for example, the repowering of the East River Generating Station, Consolidated Edison Company of New York, Inc, in US EPA's Region II.

[25] Through the existing state Permit to Operate, September, 2000 and the proposed Amended NOx Consent Decree, last revised in early 2007.

Preliminary results using CALPUFF indicate that the facility contributes significantly to short-term regional levels of fine particulate matter. As expected, the future proposed scenario contributes even greater contributions to regional degradation.[26] Mirant should amend the current protocol to define a modeling approach using CALPUFF that will determine the facility's contribution to $PM_{2.5}$ regional levels, for each of the existing and merged stack scenarios.

(b) Carbon Monoxide Emissions Must be Modeled

Mirant's protocol currently includes no proposal to evaluate the facility's impacts of CO for the purposes of determining compliance with that pollutant's 1-hour and 8-hour NAAQS. Preliminary modeling by the City of Alexandria shows violations of the CO 1-hour NAAQS at Alexandria House.[27] The table below shows that reported values of the facility's emissions of CO vary significantly. For example, the recent test results exceed the value assumed within Mirant's 2005 downwash analysis significantly, indicating a generalized increase in CO emissions since 2004 (the reference period cited within the 2005 Downwash Analysis). Recent installations of Separated Overfire Air technology and Low-NO_x Burners are expected to increase CO emissions due to those technologies' reliance on a reduction in combustion temperature and excess air to reduce the conversion of atmospheric nitrogen to nitrous oxides.

Continuous emission monitor records of CO emissions should be relayed by Mirant to VDEQ for the purposes of determining the maximum 1-hour and 8-hour emission rates for each of these boilers. These rates should then be used within the AAQS demonstration.

Reference	CO Rate	Maximum Short-term Rate
Consolidated Plant Emissions Report (2004)	Plant total reported as 252 tons per year.	--
2005 Downwash Analysis	As high as 3,000 tons/boiler	681 ppm per boiler.
2007 $PM_{2.5}$ Test Results[a]	As high as 6,000 tons/boiler	1,490 ppm per boiler.

Notes:
a. Recent test results (February, 2007) show short-term values for one boiler that vary significantly from minimum to maximum values during testing. The values presented here are the maximum levels reported for the 90-minute test period.

(c) Annual Impacts of NO_x, SO_2, $PM_{2.5}$ and PM_{10}

Currently, Mirant' s protocol describes only SO_2 3-hour and 24-hour impacts as the means by which complying levels will be determined. The protocol should be revised to propose a means by which long-term operation under the proposed scenarios will comply with annual NAAQS for NO_x, $PM_{2.5}$, PM_{10} and SO_2.

(d) Startup and Shutdown Emissions Must be Modeled

Given the variability in the operating scenarios for the five boilers, especially during the past 18 months, boiler startup and shutdown is a routine occurrence at the facility. As discussed during the March 12, 2007 meeting, Mirant' s modeling protocol should be

[26] Preliminary results for one year of analysis simulating Scenario 7a within the posted Appendix I of VDEQ's proposed Consent Order for the facility for the current five-stack configuration. Results for the merged stack scenario derive from estimated emissions equal to twice the short-term levels of Scenario 7a; Sullivan Environmental Consulting, April, 2007.

[27] Five year results using AERMOD-EBD with maximum reported CO emissions level in February, 2007 test.

revised to include calculations of emissions of all pollutants during startup and shutdown for each boiler. Since these emissions are non-continuous, the revised protocol should also explain how they will be modeled. The emissions should then be included in the modeling analysis.

3. Use of Equivalent Building Dimensions in the Analysis should be Limited

The City of Alexandria has expressed a wide range of concerns regarding the Wind Tunnel Study[28] that developed equivalent building dimensions for the facility. Since that time, US EPA has approved the use of EBDs within the AERMOD model. The City of Alexandria maintains its concerns, which stem from areas where the Wind Tunnel Study's procedures fell short in scope from the broad investigation required when alternatives to default procedures are proposed. These areas of concern are primarily the limited simulation of load conditions, limited measurement for all stacks and wind directions, lack of concentration evaluation in the buildings' cavity zones, and improper characterization of surface roughness.

The table below shows that the change in stack flue gas parameters between minimum and maximum load affects results significantly. From this example, which may not even represent the full range of exit velocities for each stack, the difference in impacts between maximum and minimum loads for any stack at a unit emission rate is as much as 50 to 70%. Episodes of low loads and high wind speeds may result in overall worst case impacts by allowing stack exhaust plumes' to be captured in the building cavity, thereby substantially increasing concentrations in regions where public lands fall close to the building. The location where measured impacts exceeded the ambient air quality standard on February 23rd is such an example. The objective of the wind tunnel study was to develop EBDs that are applicable to worst-case downwash conditions. Yet the Wind Tunnel Study failed to estimate downwash dimensions for the full range of load conditions, undermining the presumption that the Wind Tunnel Study produced conservative downwash dimensions.

[28] "Final Report – Wind Tunnel Modeling Evaluation for the Mirant Potomac River Generating Station," Mirant Potomac River, LLC, August, 2006.

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Effect of Load on Impacts (year 2003, using EBDs)

Unit Emission Rate Assumed

	Max Load, mps	Min. Load, mps	1-hour Impact (µg/m³)			3-hour Impact (µg/m³)			24-hour Impact (µg/m³)		
			Max.	Min.	Delta, %	Max.	Min.	Delta, %	Max.	Min.	Delta, %
All boilers	--		98.9	115	16.3%	48	73.9	54.0%	17	25.2	48.2%
		Location	AH	AH		MT2	MT1	chg.	MT1	MT1	
Blr. 1	32	21.0	19	22.5	18.4%	10.1	12.7	25.7%	3.2	4.1	28.1%
		Location	AH	AH		MT2	MT2		MT1	MT2	chg.
Blr. 2	35	22.0	18.2	22.1	21.4%	8.1	12.7	56.8%	2.8	4.3	53.6%
		Location	AH	AH		MT2	MT1	chg.	MT1	MT2	chg.
Blr. 3	33	19.0	20.6	23.9	16.0%	10.3	16.2	57.3%	3.6	5.4	50.0%
		Location	AH	AH		MT1	MT1		MT1	MT1	
Blr. 4	35	21.0	19.7	22.8	15.7%	9.3	15.7	68.8%	3.4	5.5	61.8%
		Location	AH	AH		MT1	MT1		MT1	MT1	
Blr. 5	28	17.0	21.3	24.5	15.0%	10.9	17.1	56.9%	4.1	6.2	51.2%
			AH	MT1	change	MT1	MT1		MT1	MT1	

Max. Delta, % ***21.4%*** ***Max. Delta, %*** ***68.8%*** ***Max. Delta, %*** ***61.8%***

Notes:

1. AH equals Alexandria House located at -180, -920 meters, 65 meter height.
2. MT 1 equals Marina Towers rooftop (-20, 130, 40 m), southern corner of southeast tier's end.
3. MT 2 equals Marina Towers rooftop (-30, 120, 40 m) , northern corner of southeast tier's end.

Due to the need to evaluate the plant' s compliance scenario within a five stack configuration and the Wind Tunnel Study's focus on the merged stack configuration, the Wind Tunnel Study derived EBDs are not complete. No simulation and calculation of downwash dimensions occurred for Stacks 2, 3 and 5 for wind directions from the northeast to southeast. Also, for winds from the western side, only directions at 40 degree increments were evaluated. The Wind Tunnel Study reported that dimensions for Stacks 2, 3 and 5 for missing wind directions were presumed equivalent to dimensions for those directions for Stacks 1 and 4; however, no evidence to support that hypothesis was ever provided. In fact, for this multi-tiered structure adjacent to another large, complexly-shaped tier of equivalent height, it does not seem possible for this hypothesis to be proven without performing the direction-by-direction wind tunnel analysis for each stack.

Concerns remain regarding the improper characterization of surface roughness conditions for key trajectories toward Marina Towers. Surface roughness is clearly much larger than the 15 centimeter value assumed in the Wind Tunnel Study for flows over 160 to 180 wind directions. This adversely affects the representativeness of the results (there is a kilometer or more of overland flow through Alexandria along these fetches).

Review of limited modeling results and observations show that this culmination of concerns that undermines the confidence in the accuracy of the Wind Tunnel Study' s EBDs is well founded; for several periods through December 4 through March 13, 2007, AERMOD-EBD under-predicted observed SO_2 concentrations, in some cases by almost 60% (see the table below). In fact, reliance on AERMOD-EBD on February 23rd would

have missed the exceedance of the NAAQS while under-predicting actual impacts by almost 30%.

Limited SO_2 Observations in Dec. 06 to Mar. 07 Period	AERMOD-EBD 3-hour	Observed 3-hour	AERMOD-EBD 24-hour	Observed 24-hour
Dec. 4	440	470		
Dec. 7	482	568	187	239
Feb. 22	465	805	--	--
Feb. 23	638	677	317	408
Mar. 5	330	453	112	134

Notes:
a. D. Shea, ENSR to M. Kiss, VDEQ, Mar. 28, 2007 by email. Full analysis of AERMOD-EBD predictions must be conducted, beyond those that are limited to when AERMOD-Default predicted exceedances.

Evidence indicates that AERMOD can under-predict impacts in adjacent areas when the proposed EBDs are used. Attachment 4 of Mirant's protocol[29] shows that the magnitude of AERMOD-EBD predictions are lower, by more than a factor of two and approaching a factor of three, than wind tunnel observations. This differential between AERMOD-EBD and wind tunnel observations is far greater than that reported in CPP, Inc's published analysis of another facility in an urban setting with downwash (see the Wind Tunnel Study report, Appendix C).[30] In that analysis, agreement between AERMOD using EBDs for that facility, and wind tunnel observations, was much closer, at levels that are described as expected and inherent when impacts predicted using a 1-hour model are compared against 10 to 15-minute observations of the highly controlled environment of the wind tunnel. This indicates either that the EBDs for this facility err on the side of being too low, or that other site and source-specific conditions are not being input correctly in AERMOD. Either or both of these situations warrant correction. For example, CPP, Inc.'s published study discusses the importance of using a low exit velocity to improve AERMOD's prediction capability when using EBDs; however, Mirant has not proposed this improvement to performance capability. We recommend that until VDEQ or Mirant evaluates and explains this larger-than-expected discrepancy between AERMOD-EBD and the wind tunnel study observations and recommends a means to correct it, that EBDs not be used in this modeling analysis.

Placement of monitors connected to in-plant alarms accomplishes the protection of ambient air quality standards at only the particular location at which the monitor is placed. Therefore, there is no assurance that the impacts measured by the few monitors in place are capable of sufficiently representing all of the high impacts that occur around this plant's perimeter under the wide variation in loads, number of operating boilers and wind directions that occur. Note that although the southwest and southeast fence lines were stipulated as preferred and alternate locations for monitor placement within the Administrative Consent Order, no monitors are placed there (the current "southeast" monitor is actually located almost directly to the east of the PRGS,

[29] "Protocol for Modeling Ambient Pollutant Concentrations from the Proposed Stack Merge Project at the Potomac River Power Plant," ENSR Corporation, February, 2007.
[30] "Evaluation of AERMOD/PRIME for Two Sites with Unusual Structures," R. Petersen, J. Carter, Paper Number 262, A&WMA 99th Annual Conference, June 20-23, 2006.

and does not satisfy the distance requirements stipulated in the ACO for southeastern alternate locations). Due to the poor prediction capability[31] of the unorthodox system to allow day-by-day load increases over guideline-developed emission limits, many high impacts likely occur at these and other expected areas of high impacts, such as the northwest fenceline, without any feedback indicators.

It is a precept embodied in Appendix W that in the absence of evidence that scientifically supports the use of refinements to an ambient air quality analysis, that inputs conservatively protective of human health be adhered to. Mirant is not only requesting use of EBDs in their determination of this facility's non-varying permit limits, it is requesting their use for the purpose of determining unorthodox day-by-day load-increases. There is no supportable rationale for the use of alternatives to the recommended, default prediction tools, when there is direct evidence that use of those alternatives would allow impacts in excess of ambient air quality standards.

Considering EPA' s acceptance of the Wind Tunnel Study, and VDEQ's position that it will rely on these results, it is important that the allowed use of the EBDS be delineated and exclusions explicitly identified. The use of EBDs should be limited to only the following model simulations:

a) mid-range loads,
b) neutral stability,
c) moderate to strong wind speeds (e.g., 5 to 10 meter per second),
d) receptors beyond the cavity zone of the building.

Mirant's protocol should be revised to detail the use of BPIP-PRIME default downwash dimensions for all other conditions.

4. PM Compliance Monitoring

In-stack monitors currently measure rates of SO_2, CO and NO_x. These existing monitors can be used to demonstrate compliance with the short-term and annual emission rates that the proposed air quality compliance analysis establishes. Currently, several utility generators in the U.S. successfully apply particulate matter continuous emission monitors (CEMs). Federal performance specifications for PM CEMs were promulgated in January, 2004. The use of these monitors is becoming more widespread, in part due to the promulgation of the federal performance specification, and also due to stated interest by federal authorities in facilitating Compliance Assurance Monitoring requirements at major sources, especially in $PM_{2.5}$ nonattainment areas where accurate emissions data are important for attainment efforts. [32] In reference to use of PM CEMs,

[31] Analysis of predictions versus observations since the day-to-day load increasing system was put in place shows an extremely poor correlation (D. Sullivan of Sullivan Environmental Consulting, Inc., April 10, 2007).

[32] US EPA recently recommended the use of PM CEMs on a waste coal-fired project in Pennsylvania, stating that "[t]he proposed plan approval requires annual stack testing to assure compliance with the particulate matter emission limits from the [circulating fluidized bed] and its associated fabric-filter baghouse. In light of the evolution of CEMS systems for particulate matter, EPA is strongly urging the requirement to install and operate a particulate matter CEMS at the proposed facility. Currently, there are several facilities that operate PM CEMS and have demonstrated that the systems are reliable and accurate. These are Tampa Electric power plant (Florida), Eli Lilly Corporation (Indiana), and the U.S. Department of Energy (Tennessee). EPA has also secured commitments from up to 30 existing coal-fired utility installations to install PM

US EPA states that "bas ed on our analysis of available data, there is no technical reason that PM CEMs cannot be installed and operate reliably on electric utility steam generating units." [33] In fact, installation of PM CEMs on each of the five stacks prior to merging may be an important opportunity to establish each boiler/ESP system' s emission rates prior to operation in a configuration which will not easily allow the ability to uniquely identify each source's contri bution.

The table below shows examples of applications of PM CEMS on electrical generating units that fire coal. Note that several of these coal-fired boilers are located in Virginia.

Applications	Boiler and PM Controls	Correlation Status
Dominion Electric, Chesterfield, Virginia[b]	Coal-fired w. ESP	Passed all criteria.
Dominion Electric, Mt Storm, Virginia[b]	Coal-fired w. ESP	Passed all criteria.
Louisville Gas & Elect., Mill Creek Station, Kentucky.[b]	Coal-fired w. ESP	Passed all criteria.
Tampa Electric, Big Bend Station, FL	Coal-fired	Described as "reliable and easy to maintain."[a]

Notes:
a. Per correspondence with David Lloyd, US EPA, Region 4, March 26, 2007.
b. Dan Bivins, US EPA, OAQPS, relayed March 27, 2007.

The use of PM CEMS is particularly apt for this application where apparent recent increases in opacity exceedances due to trona use[34] underscore the need to accurately estimate emissions during the frequent upsets and particulate emission variations that may occur during startup and shutdown, ESP rapping and soot blowing operations.[35] Due to the expected variation in emissions with events that are not always anticipated or predictable, installation of a CEM on each stack is warranted. Therefore, Mirant should propose each stack's 24-hour averaged PM emission rate with which the facility can continuously comply and which the results of the modeling analysis show as necessary for a demonstration of NAAQS compliance.

CEMS over the next couple of years. It is fair to assume that the state of technology for PM CEMS will be even further evolved by the time the proposed Robinson Power facility begins operation. Further, the facility will be required to establish a compliance assurance monitoring plan (CAM) as part of its title V operating permit and the federal CAM regulations strongly encourage reliance on continuous monitoring systems as a means for assuring compliance. Also, the upcoming re-designation of the area to nonattainment for $PM_{2.5}$ suggests that more timely and accurate data regarding PM emissions from the proposed facility would be important information." See "C ontinuous Emissions Monitors" on http://www.ejnet.org/toxics/cems.html.

[33] From 70 Fed. Reg. No. 38, February 28, 2005 as cited in "PM CEMS Installation, Certifications, and Operations," As relayed by D. Bivins, Office of Air Quality Planning and Standards, US EPA, March, 2007.

[34] Review of the number of opacity exceedances since trona use versus prior to trona use s a very sharp increase in the number of exceedances of the 20% limit.

[35] Recent tests of $PM_{2.5}$ emissions from coal-fired boilers indicate that $PM_{2.5}$ emissions can increase by up to 100% during periods of ESP-rapping. See " Characteristics of Inhalable Particulate Matter Concentrations and Size Distribution from Power Plants in China," H. Yi, J. Hao, L. Duan, X. li and X. Guo, J. Air & Waste Manage. Assoc., V. 56, pp. 1243-1251, Sept., 2006.

While the local scale assessment using AERMOD for this project should use direct $PM_{2.5}$ emissions, which include the condensable and filterable $PM_{2.5}$ components, the use of PM CEMs can likely assure continuous compliance with only the filterable component. Based on review of the recent $PM_{2.5}$ test results, VDEQ should establish a reasonable limit for filterable PM that it feels can serve as a satisfactory measure of compliance with total $PM_{2.5}$ emissions.

Additionally, acid gas emissions are expected to vary considerably due to the variability in trona use. Mirant should review potential applications of in-stack monitors for acid gases, and consider their use at this facility.

5. Boiler Flue Gas Parameters

A comprehensive ambient air quality analysis for a source with an extended operational history should not proceed without review of actual, historical flue gas parameters for each boiler for each of minimum, mid and maximum load. Load histories for each of boilers 1, 2 and 5 for portions of the 2nd quarter of 2006 show that flue gas exit velocities are lower than the values Mirant proposes using for minimum load.[36] Review of Table 2 in Mirant' s protocol proposes simulation using minimum flue gas velocities that appear higher than actual stack velocity histories. For example:

1) Modeling Case no. 5 for minimum loads shows a velocity of 19.0 mps for Boiler no. 1 alone, while time series of flue gas velocity histories for Boiler no. 1 show extended periods where velocity equals 16 mps;
2) Several modeling cases in Table 2 propose simulating a minimum flue gas velocity for Boiler no. 2 alone equal to 18.7, while time series of flue gas velocities show recurring extended periods where flue gas velocity for Boiler no. 2 equals 12 mps, and;
3) Proposed minimum flue gas velocities for Boiler no. 5 in Modeling Case nos. 7c, 8c, 8f, and 9c in Table 2 appear to be greater than pre-stack merge conditions shown in the actual velocity history for Boiler no. 5, even though the post-stack merge diameter for Boiler no. 5 increases significantly (to 3.05 meters versus 2.6 meters). Instead, Table 2 should show a flue gas velocity that is slower, by approximately 30%, compared to historical records.

Additionally, the reference to support the temperature values proposed in Tables 1 and 2 is not cited. Historical flow rate and temperature records for the full annual period of 2006 should be reviewed by VDEQ for the purposes of establishing these important parameters.

The protocol in its current form includes no comprehensive presentation of flue gas parameters and emissions for minimum and maximum load for the existing five-stack configuration. VDEQ should request in-stack continuous monitor records of CO emissions, flue gas flowrates and temperatures to determine the worst-case short-term values for these parameters.

6. Boiler Maximum Heat Input Rates

[36] Flowrates posted on www.epa.gov/airmarket, converted to actual flowrate from standard conditions, and using actual stack diameters including Venturi insert.

Table 3 of Mirant's protocol shows heat input rates that are significantly higher than initially proposed by Mirant in its downwash analysis (see Table 2-1, "Protoc ol for Modeling the Effects of Downwash from Mirant's Potomac River Power Plant," ENSR Corporation, March, 2005), and significantly higher than their original design capacity. Mirant monitors the heat input rates via continuous monitors as required by the Clean Air Act.[37] In the meeting with VDEQ on March 12, 2007 to discuss modeling approaches, Mirant reported that this difference between the higher monitored heat input rate and the original design rating is due to heat rate differences between design coal and current lower heat rate coal with higher moisture content. Mirant mentioned that the design coal had a rating of 14,000 Btu/lb versus 12,800 Btu/lb for the current coal However, it is not immediately apparent why the use of coal with lower heat input would result in higher, rather than lower, recorded heat input rates. Additionally, it is not clear then why this difference in design versus current coal would affect each boiler differently (the differences between current reported maximum heat input rates and each boiler' s design rating varies between 6.0 and 15.3%).

VDEQ should request heat input continuous monitoring records for the year 2006 to establish actual maximum values of heat input. Additional records relating to this discrepancy between design heat input and current heat input ratings should also be provided by Mirant and fully analyzed by VDEQ.

7. Fugitive Emissions

All coal and ash yard process calculations for both the existing and future configurations should be revised to include $PM_{2.5}$ emission totals.

Currently, Mirant's protocol presents fugitive emissions that are equivalent to the emissions in the 2005 analysis for each process, except for differences in control levels for the processes of ash silo releases, coal pile wind erosion, and railcar dumper. The basis for revisions to control assumptions within Appendix A Environmental Controls of the proposed Amended NOx Consent Decree is clear (for example, control of emissions from the ash silos is now assumed equal to 100% due to the routing of silo baghouse emissions to ESP1; coal pile wind erosion is controlled by 60% due to surfactant application, and 50% control from water spraying at the railcar dumping). However, it seems that while there is currently no permit mechanism to enforce the conditions within Appendix A Supplemental Controls, Mirant's analysis assumes the installation of these controls in the expectation that they become enforceable by permit.

In the current protocol the number of tons of ash and coal processed are exactly equal to those of the 2005 analysis. Correspondence between Oak Ridge National Laboratory and Mirant[38] indicates that Mirant's rationale for this approach is that while ash

[37] Air Operating Permit Application, PEPCO to Commonwealth of Virginia, January 6, 1998. Citation 40 CFR 75.10c (Acid Rain Provisions) require measurement of heat input rate.

[38] E-mail correspondence from D. Cramer, Mirant, to L. McCold, ORNL, October 13, 2006, as shown Mirant must release records documenting its ash handling and coal use totals since operations with trona began. For both current existing and future proposed scenarios emissions for each fugitive process (see pages B-1 through B-7 of Attachment 8) should be re-calculated using the maximum daily and annual coal and ash totals. It is likely that the future scenario's coal and ash yard process emissions will be approximately twice that of the current existing scenario, due to the request for annual emission increases that are approximately twice that of operations in 2006.

handling will increase, overall production under the existing configuration is less. This cannot be a reliable approximation for the purpose of determining fugitive emissions because not only are fugitive emission calculations non-linear, there is no basis presented to support the assumption that the reduction in the coal and ash due to the drop in plant production is enough to offset increased emissions from increased ash loading and hauling due to trona use. The table below indicates approximately how much ash hauling can be expected. Actual ash haul records should be requested by VDEQ for verification.

Annual Flyash Totals (tons) within 2005 Downwash Analysis and Estimated for Current Operations.

	2005	2006
Tons of Coal Delivered [a]	807,344	702,901
Expected Ash Differential for Lower Fuel Consumption		- 20,000 tons
Tons of Trona Used and Collected as Ash[b]	0.	+ 50,000 to 70,000 tons (records should be provided)
Tons of SO_2 Converted from Gaseous to Particulate Form[c]	0.	+ 13,000 tons (approximate)
Tons of Ash Assumed in Fugitive Emission Calculation	164,060 (as presented in 2005 Downwash Analysis)	Likely exceeds 2005 estimate by 40,000 to 60,000 tons.

a. From http://www.eia.doe.gov/cneaf/electricity/page/f423xls/f4232004.xls and f4232006.xls . Fuel consumed as available from DOE Net Generation Stats per Month from Forms 906, 920 is higher for the year 2004, i.e., 889,896 tons., but DOE Net Gen. Stats not yet available for 2006..
b. Based on usage for February 22, 2007 of 150 tons per day.
c. Based on delivered sulfur content of coal and reported annual emissions of 3,178 tons of SO2 for the year 2006 (from eia.doe.gov and www.epa.gov/airmarket, respectively.

Additionally, Mirant's protocol currently includes no estimation of emissions associated with diesel combustion in truck traffic onto and off the site. Using the maximum predicted daily and annual ash hauling requirements for both the existing and potential future configuration, combustion emissions should be calculated using US EPA's MOBILE6 emission factor model. These emissions can easily be included within the already-defined road section volume sources in AERMOD that are shown in Attachment 8 in "Re- suspended Roadway Dust from Ash Trucks" (see page B-4).

The table below shows approximate annual emissions from diesel combustion emissions for only the scenario where approximately 160,000 tons per year of ash are handled. These totals include emissions from truck travel on the haul road, and engine idling during queuing before ash loading. Note that while these emissions are small compared to stack emissions, they are similar to emissions from other coal and ash yard sources, and impacts from any fugitive sources can be significant due to reduced dispersion at lower release heights and temperatures at areas along the southwest fenceline which are in close proximity to residences.

Tons Per Year in Approximate Diesel Combustion Emission due to Heavy-duty Diesel Traffic along the Ash Haul Road.							
	No. of Trips, Trip Length, Idle Times			CO	NO_x	$PM_{2.5}$	SO_2
Existing Operations	25 trips	0.4 miles/trip	10 mins	0.25	0.16	0.01	0.01
Future Operations	50	0.4	15 mins.	0.5	0.3	0.01	0.03

Notes:
a. Based on MOBILE6.2 emission factors for vehicle HDDV6 class.
b. Assumes approximately160,000 tons per year for existing operations and approximately twice that amount of ash in future operations (due to request within Form 7 for at least double the SO_2 emissions of year 2006 for the post-merge configuration).

8. Interacting Source Inventory

As discussed during the meeting on March 12, 2007, VDEQ asked that Mirant provide a list of proposed sources to include as interacting sources. It was proposed by VDEQ that all sources within a 75 kilometer area around the plant, including sources in Maryland, District of Columbia and Virginia, be evaluated to establish if they contribute a significant concentration impact gradient on an annual and short-term basis in the region of this source's own significant impact area. Actual annual emissions of these pollutants should be included in the annual emissions compliance evaluation, while maximum potential emission rates should be included in short-term compliance analyses. In previous analysis of the ambient air quality impacts of the PRGS,[39] several sources in the District of Columbia contributed significantly to impacts at close-in receptors (PEPCO Buzzard Point and Benning, George Washington University's Ross Hall energy plant, and Bolling Air Force Base's Central Heating Plant). These and many other District of Columbia sources contributed significantly within the outer reaches of this plant's significant impact area. All analyses to evaluate interacting sources should be included within the subsequent modeling protocol.

9. Meteorological Data

As agreed by VDEQ in the meeting on March 12, 2007, the most recent five-year period of representative National Weather Service (NWS) meteorological data should be used for the purposes of demonstrating compliance with both the existing and future proposed scenarios. Surface meteorological files deriving from National Reagan Airport should be processed with upper air data from the closest location (Sterling, Virginia) for the five-year period of 2002-2006.

The NWS reporting threshold changed in 1992, leading to an increase in the threshold speed for which low wind speeds are reported as calms. For example, recent NWS data from Reagan National include approximately 800 hours for each of the years 2000 through 2004 which are reported as calms, i.e., when wind speeds are less than 3 knots (approximately 1.5 meter per second). As a result, impacts are not evaluated under approximately 10% of hourly conditions. Analysis using meteorological data that

[39] "Ambient Air Quality Analysis – Potomac River Generating Station – Alexandria, Virginia," AERO Engineering Services, August, 2005.

are processed with the older, lower reporting threshold (1.0 meter per second) show that these hourly periods can have significant bearing on results for some receptors, especially for the analysis of pollutants with short-term standards, like CO and SO_2. For AERMOD results derived using surface meteorological data that include wind speeds in the 1.0 to 1.5 meter per second category,[40] overall for several of the boilers and for all-boilers combined, overall highest one-hour impacts over the course of one year increase significantly, occurring during hours showing the lowest recorded non-calm wind speed, i.e., 1.0 m/s. Additionally, inclusion of these data allows for a more thorough analysis, by recovering approximately 500 hours of previously-reported calm conditions.[41]

As discussed, higher-frequency Automated Surface Observing System meteorological data include these lower non-calm wind speeds. ASOS data from NWS' National Reagan site for the years 2002 through 2006 should be processed to provide one-hour average wind speeds and other surface parameters. These data should then be used within AERMET processing.

(a) Planned Use of Onsite Meteorological Monitoring

Mirant's current meteorological monitoring program at the site does not conform to EPA siting criteria, and until the siting issues are resolved, data collected from this system is not of suitable quality to meet the objectives stated in the protocol. However, the data that have been made available to date show positive and significant average vertical wind speed, which is inconsistent with representative turbulence data. Based on three days of data that Mirant has made available for public review (associated with the exceedance on February 23, 2007), the data show anomalous readings for the vertical turbulence data that is being collected. There also are violations of EPA siting criteria for nearby trees and a building that will need to be resolved; the wind sensors are within the influence of trees and other obstructions. More detailed review could not be done because Mirant has not released the data for public review. The monitoring site, therefore, would need to be relocated and sufficient data collected prior to use of these data for modeling purposes.

(b) Treatment of Surface Conditions

A comprehensive set of peer-reviewed analyses[42] provide the primary basis for the comments that follow regarding surface roughness transition effects. Although there

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[40] TD-1440 formatted NWS surface meteorological data from Reagan National for 1991 from US EPA's Support Center for Regulatory Air Models, www.epa.gov/ttn/scram.

[41] SCRAM (TD-1440 formatted) data processed through AERMET for the year 1991 shows 243 calm hours versus the 740 calm hours identified within AERMET for year 2002.

[42] Blom, J. and L. Wartena, "The Influence of Changes in Surface Roughness on the Development of the Turbulent Boundary Layer in the Lower Layers of the Atmosphere," Journal of Atmospheric Sciences, 26, 1969, 255-265;Bradley, E.F., "A Micrometeorological Study of Velocity Profiles and Surface Drag in the Region Modified by a Change in Surface Roughness," Quarterly Journal of the Royal Meteorological Society, 95, 1968, 361-379; Deaves, D.M., "Computations of Wind Flow Over Changes in Surface Roughness," Journal of Wind Engineering and Industrial Aerodynamics, 7, 1981, 65-94; Panofsky, H.A., and A.A. Townsend, "Change of Terrain Roughness and the Wind Profile," Quarterly Journal of the Royal Meteorological Society, 90, 1964, 147-155.; Rao, K.S., Wyngaard, J.C., and O.R. Cote, "The Structure of the Two-Dimensional Internal Boundary Layer Over a Sudden Change in Surface Roughness," 31, 1974, 738-746;

clearly is some confusion that is generated by the different definitions for the transition layer, some general agreement can be identified once the references are sorted out by common definitions:

1. Adjustment to Stress - changes in stress are propagated vertically much faster than wind speed or the attainment of equilibrium conditions. Slopes on the order of 1:10 were typically shown in these references.

2. Adjustment to Wind Speed – The general consensus within these references is that wind speed adjustment occurs at a much slower pace than the adjustment to stress, e.g. with slopes in the range of roughly 1:10 to 1:20.

3. Attainment of Equilibrium - This factor is generally defined as the point where 90 percent of the new stress value is attained, i.e., this adjustment is much slower than the two preceding terms. A value of 1:100 for smooth to rough and 1:200 for rough to smooth was the consensus.

The differences in definition range between the case where the effect of the roughness change have propagated to the height in question, compared to the much slower case where equilibrium is achieved. Most of the change occurs rapidly, but to get to 90 percent of the adjusted value takes much more time. For modeling purposes, it is more relevant that the transition layer has reached the height in question rather than the attainment of full equilibrium. Using 1:20 as a general rule of thumb, the ASOS monitoring height of 10m would be expected to be substantially affected by local conditions within a fetch of 200 m or more. Very similar surface roughness values exist within 400 m of the ASOS location, including the shortest direction to an abrupt change (towards the Potomac River to the East).

On this basis, it is reasonable to conclude that the surface roughness "obs erved" by the ASOS wind sensors is on the order of 5-10 cm roughness for 1 through 360 degrees. At a height of 10 meters above ground level the wind speed would be expected to adjust to low roughness lengths well within the 1:10 to 1:20 range. If this analysis were to use a three kilometer upwind fetch, the surface roughness would be mismatched to the surface conditions that the sensors are observing.

For albedo and Bowen ratios, a reasonable compromise is achieved by using a weighted average three kilometer upstream fetch to represent the effective plume height. These two input terms do not need to be matched to measured conditions, as is needed to match the surface roughness term to the conditions at the wind sensors. The differences between overwater and overland conditions are summarized below:

Albedo: 0.10 to 0.14 (overwater); 0.14 to 0.18 (overland)

Shir, C.C., " A Numerical Computation of Air Flow Over a Sudden Change of Surface Roughness," Journal of the Atmospheric Sciences, 29, 1972, 304-310; Taylor, P.A., "The Planetary Boundary Layer Above a Change in Surface Roughness," Journal of the Atmospheric Sciences, 26, 1969, 432-440; Townsend, A. A., " The Flow in a Turbulent Boundary Layer After a Change in Surface Roughness," Fluid Mechanics, 26, 1966, 255-266; Wood, D.H., "C alculation of the Neutral Wind Profile Following a Large Step Change in Surface Roughness," Quarterly Journal of the Royal Meteorological Society, 104, 1978, 383-392.

Bowen Ratio: 0.1 (overwater); 1-2 (overland)

Bowen ratios are more sensitive to differences in surface conditions. The general approach taken in the current protocol is acceptable for these two terms, with recommendations for small shifts in the boundaries of the sub-regions, as shown in the table below. Use of weighted averages for these zones computed in a similar manner as the 2005 Downwash Analysis is acceptable.

Region	Previous Protocol	Recommended Changes
Western	180 through 360 (clockwise)	157 through 015 (clockwise)
Northeast	00 through 60	15 through 60
East	60-120	60-120
Southeast	120-180	120-158

10. Background Concentrations

The current protocol includes no presentation of the proposed background concentrations for each of the criteria pollutants of this analysis. Table 4-1 of the 2005 Downwash Analysis should be updated to incorporate measured concentrations from the closest VDEQ monitoring sites from the most recent three-year period (assumed to be 2004 through 2006) for each of SO_2, NO_2, CO, PM_{10} and $PM_{2.5}$.

11. Elevated Receptors

In addition to the elevated receptors used in Mirant's 2005 Downwash Analysis, elevated receptors corresponding to rooftop height should be placed on each one of the four raised commercial structures to the west of Marina Towers on Slater's Lane, and on each of the two levels of Harbor Terrace.

12. Results Presentation

Mirant's 2005 Downwash Analysis did not present spatial plots of the facility's maximum impacts for each of the criteria and toxic pollutants of the analysis. Plots on recognizable backgrounds of the surrounding area would greatly facilitate review of results. These plotted results are of significant interest to residents living adjacent to the facility, and in the case of the regional impacts derived using CALPUFF, of interest to residents of the metropolitan region.

Summary

1. The Protocol should be revised to include the evaluation of the existing five-stack and proposed merge configurations.
2. The protocol should be revised to include the evaluation of $PM_{2.5}$, CO and NO_x impacts. For $PM_{2.5}$, recent test results should be serve as the basis for proposed 24-hour emission rates to be used within the AERMOD analysis, with test results increased to reflect increased emissions from ESP rapping, soot blowing, and startup and shutdown. Background levels of short-term $PM_{2.5}$ NAAQS should derive from the nearest northern Virginia monitor. For $PM_{2.5}$, impacts below a SIL selected through either recommended method can serve as an alternative compliance level if the margin between background and the NAAQS is less.

a) For CO, continuous in-stack monitor emission records for 2006 should be relayed to VDEQ and used to determine maximum 1-hour and 8-hour rates for use in the modeling analysis.

b) Mirant must also revise the protocol to propose the method by which it intends to demonstrate annual compliance for $PM_{2.5}$, PM_{10}, SO_2 and NO_x. For $PM_{2.5}$, due to the nonattainment status of the region, compliance must be determined against the selected SIL.

c) Mirant must revise the protocol to include emission rates for all pollutants during startup and shutdown, and describe how these periods of operation will be simulated.

3. The use of EBDs should be limited to only the following model simulations: a) mid-range loads; b) neutral stability; c) moderate to strong wind speeds (e.g., 5 to 10 meter per second), d) receptors beyond the cavity zone of the building. Mirant's protocol should be revised to detail the use of BPIP-PRIME default downwash dimensions for all other conditions.

4. All proposed emission rates, including for $PM_{2.5}$, PM_{10}, HCl and HF, should be proposed to reflect all conditions of operation, including ESP rapping, boiler blowdown, startup and shutdown and trona use variability. Mirant should propose the installation of continuous emission monitors on each of the five stacks for these pollutants.

5. The protocol in its current form includes no comprehensive presentation of flue gas parameters and emissions for minimum and maximum load for the existing five-stack configuration. VDEQ should request in-stack continuous monitor records of CO emissions, flue gas flowrates and temperatures to determine the worst-case short-term values for these parameters.

6. Mirant should provide VDEQ with input continuous monitoring records of heat input for the year 2006 to establish actual maximum values of heat input. Additional records relating to this discrepancy between design heat input and current heat input ratings should also be provided by Mirant and fully analyzed by VDEQ.

7. Coal and ash yard fugitive emissions should be revised to include process-specific calculations for each of the five-stack and post-merge configurations, using the maximum potential ash and coal throughputs for each configuration. Combustion emissions from heavy duty diesel trucks that haul ash should be calculated and simulated for both configurations.

8. Mirant should propose the interacting source inventory to include in the NAAQS compliance demonstration. All sources within a 75 kilometer diameter should be evaluated. The protocol should be revised to include the final sources, with all of the calculations for the evaluation presented.

9. Higher frequency ASOS data that reports wind speeds as low as 1 meter per second from Reagan National should be processed to form an hourly five-year representative meteorological data set for use in AERMET. Mirant's current meteorological monitoring program at the site does not conform to EPA siting criteria, and until the siting issues are resolved, data collected from this system is not of suitable quality to meet the objectives stated in the protocol. The monitoring site, therefore, would need to be relocated and sufficient data collected prior to use of these data for modeling purposes. The protocol should be revised to include the use of surface roughness as "o bserved" by the ASOS wind sensor, equivalent to approximately 5-10 centimeter roughness for 1 through 360 degrees. For albedo and Bowen ratios, the general approach taken

in the current protocol is acceptable, with recommendations for small shifts in the boundaries of the sub regions, as shown herein.

10. The background concentrations of the 2005 Downwash Analysis should be revised to reflect the three most recent years of available data, and $PM_{2.5}$ background levels should be included.
11. Elevated receptors should be defined on Harbor Terrace (at each of its two levels), and on the rooftop of the four commercial structures to the west of Marina Towers on Slater's Lane.
12. All final results should be presented within spatial plots on easily recognizable backgrounds. Local and regional impacts should be displayed.

The City of Alexandria would like to thank you and the VDEQ for the opportunity to comment on Mirant's modeling protocol.

Yours sincerely,

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