ENSR analysis of Letter Dated September 28, 2005, from City of Alexandria to U.S. EPA Commenting on "Dispersion Modeling of Downwash from Mirant's Potomac River Power Plant"

ENSR Project No. 10350-002-400

November 1, 2005

1. Mercury emission rate should represent this site's current-day coal purchases and these ESP's capability to control mercury.

Mirant's analysis uses a mercury emission rate that is based on an average of test results from 1995, developed by an industry trade group, and applies a reduction factor that is not proven for these aged ESPs. As Mr. McKie writes in his correspondence to Mirant,[8] the emission factor that Mirant applies is less than one third the average result provided by AP-42.

The emission factor must be representative of the highest possible mercury content from today's coal vendors and the worst-case emission rates. An AAQS analysis routinely must apply either a plant-specific test result or use the AP-42 emission factor. Mirant should be required to immediately test for the mercury and chlorine content in its present-day coal purchases and to test for the capability of its ESPs to reduce mercury to the level it assumes.

Response:

Mirant's analysis is not based on average test results from 1995, was not developed by an industry trade group, and does not apply a reduction factor that is unproven. In fact, no reduction factor was used. There is no need to obtain more fuel analysis data or to test for mercury emissions because ambient impacts are clearly well below the established threshold value. A more detailed response that addresses specific issues is provided below.

Mirant's analysis uses emission rates based on analyses of 47 coal delivery samples collected from January 1, 1999 through December 21, 1999. These data were collected as part of an U.S. EPA Information Collection Request (ICR) for coal-fired electric utility boilers. The results are shown in Figure 1.

Mirant used the maximum result of 0.10 ppm to calculate short term impacts and an average value of 0.056 ppm to calculate long term impacts. The maximum and average mercury content of the coal based on these concentrations are 7.7 lb/TBtu and 4.3 lb/TBtu, respectively (0.1 lb/1,000,000 lb x 1 lb/13,000 Btu x 1012 Btu/TBtu = 7.7 lb/TBtu).

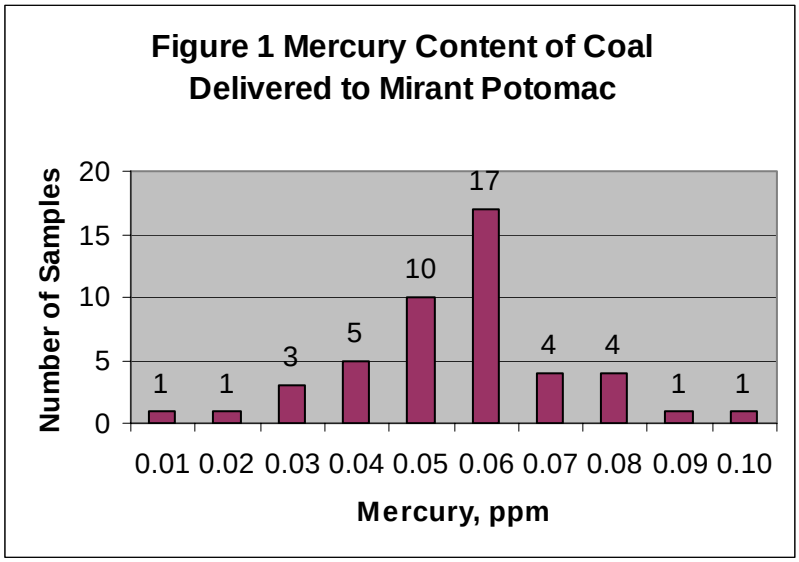
Mirant did not apply any control efficiency. Maximum AERMOD modeling results were based on emission rates of 7.7 lb/TBtu and 4.3 lb/TBtu that conservatively assumed no additional control.

Mirant's maximum emission rate is approximately one half the uncontrolled emission factor from AP-42 factor in Table 1.1-17 (16 lb/TBtu) while Mirant's average emission rate is approximately one third of the AP-42 factor. However, Mirant's maximum emission rate is approximately 2.7 times the controlled emission factor from AP-42 factor (8.3 E-05lb/ton x 1 ton/2,000 lb x 1 lb/13,000 Btu x 10^{12} Btu/TBtu = 12.77 lb/TBtu) in Table 1.1-18 while Mirant's average emission is approximately 1.3 times the controlled AP-42 factor. Based on Mirant's emission factors, maximum short term

mercury impacts are only 5.8% of the ambient criteria while long term impacts are 6.8% of the ambient criteria (see Table 5-5 in the August, 2005 report).

If Mirant used the uncontrolled AP-42 emission factor, which the City of Alexandria indicates is acceptable, the conclusion that mercury impacts are below the threshold value would not change because short term impacts would be 12% of the ambient criteria while long term impacts would be 25% of the ambient criteria.

There is no need to test current day coal purchases. Current day coal is purchased from the same or similar sources as the 1999 purchases. Collection of one or two more years of coal samples is not going to change the conclusions of Mirant's ambient air quality analysis. No significant differences between current day coal purchases and the 1999 purchases would be anticipated. However, even if the current data coal purchases were found to contain 10 times as much mercury as the 1999 samples, which is not even a remote possibility, the conclusions of the analysis would not change.



2. The PM_{10} rate from fly ash silos is unproven.

The City objects to the use of an emission rate for the flyash silo baghouses that is equivalent to BACT emission rates. This control rate should be tested for current conditions, instead of relying on the engineering judgement of a Mirant consultant that briefly visited the site five years ago, as Mirant currently does.

Mirant attempts to support the silo baghouse emission rate estimates by stating that it is consistent with BACT. However, Mirant's silo baghouses have not been recently installed and there has not been any demonstration that controls on any of the silos represent BACT. If Mirant had installed BACT on these units recently, then it could rely on that vendor's specifications and the required demonstration test results after installation.

Mirant should either be required to assume a value of 0.1 grains per dry standard cubic foot for all of the baghouses, or to provide recent test data demonstrating these specific unit's capability to achieve lower values. The low stack heights and non-buoyant releases of these sources produce high impacts on receptors and neighboring residences. Lack of attention to actual impacts by these sources will delay their operation in compliance with the AAQS.

Response:

Mirant used an emission rate of 0.02 gr/dscf from the ash silos in the modeling analysis. This emission rate was accepted by John McKie of the VADEQ as a conservative value. Recent BACT emission limits for silos with bin vent filters range from 0.010 – 0.015 gr/dscf. Mirant continually maintains the silo bags, replacing them on a scheduled basis. There are no visible emissions from any of the silos. The 0.02 gr/dscf emission rate is therefore a reasonable value. The emission rates for modeling were developed based on permitted emissions. For units with no permitted emissions, e.g., the ash silos, reasonable engineering judgment was used.

3. Mirant assumes roadway silt loading equal to 0.01% of the mean value, and uses meteorological data that is not representative of this site.

Mirant assumes a value of 0.1 grams per cubic meter of silt loading in its calculation of roadway emissions, while AP-42[7] presents a range of silt loading from 0.03 to 400 grams per square meter. Mirant provides no data to support its use of this value. The City's analysis uses a value for silt loading that is less than the mean value (70 grams per square meter) but still applies to an industrial site, and its analysis shows that roadway emissions are major contributors to PM_{10} exceedances in the residential areas southwest of the facility's fenceline. Mirant should be required to use a value that is consistent with an industrial, heavily used site with daily particulate matter loads from silos, stacks and fugitive processes.

Mirant assumes a value for the number of days of precipitation that is more than two times the value specific to this site. Solar and Meteorological Surface Observation Network for the DC National observational site and the City of Alexandria's own storm water

monitoring records show that the number of days with precipitation exceeding 0.01 inches equals a value very close to 43[8] versus Mirant's assumption of 110. As Mr. McKie of VADEQ states repeatedly in correspondence regarding inputs for emissions for this analysis, estimates must represent worst-case conditions. Mirant should recalculate roadway emissions using a value for silt loading that is consistent with industrial sites, and recalculate roadway, coal pile, and railcar fugitive emissions (see below) using worst-case site-specific meteorological conditions.

Response:

Mirant used a value of 6 grams per square meter, not 0.1 grams per cubic meter. Roadways at PRGS are cleaner than at typical industrial sites. They are routinely swept and washed. All empty ash trucks arriving on site are loaded at the ash silos and are then thoroughly washed prior to leaving the site. As discussed in an email dated May 24, 2005 from Dave Shea (ENSR) to John McKie of VADEQ "We have increased the silt content on the paved roads to 6 g/m^2. This value is ten times the ubiquitous baseline value for a public road in Table 13.2.1-3 in AP-42, Section 13.2.1 Paved Roads. We believe the silt content to be less than this. [sic: see the discussion above]. The 6 g/m^2 value is comparable to the silt loading for iron and steel production (9.7 g/m^2), municipal sold waste landfill (7.4 g/m^2) and a quarry (8.2 g/m^2). Our facility is cleaner than these facilities."

The number of days with precipitation of at least 0.01 inches used in Mirant's fugitive emission calculations is 100 (see P. B-5 of Appendix B in the August modeling report). This number represents a drier than normal year. The average for the Alexandria area is 110 – 115 days based on data for Washington D.C. from Climates of the States for years 1941 – 1960 and 159 - 1970. A review of climatological normals from other cities in Virginia, Maryland and Delaware indicated the following number of days per year with precipitation exceeding 0.01 inches:

- *Lynchburg 119-120 days*
- *Norfolk 114 - 116 days*
- *Richmond 113 days*
- *Roanoke 120- 121 days*
- *Baltimore 112 days*
- *Wilmington, Del. 116 – 117 days*

The only areas in the U.S. that receive 0.01 inches of precipitation on the order of 43 days per year are the deserts of California (Bakersfield = 36 days; Bishop = 29 days) and Arizona (Phoenix = 34 days; Tucson = 50 days) where total annual precipitation is approximately 6- 8 inches per year.

Mirant suggests that the City recalculate its own fugitive dust emissions using Mirant's correct values for silt loading and for the number of days with precipitation exceeding 0.01 inches.

4. Fugitive emissions and impacts from 62 loaded uncovered railcars must be included in analysis.

The City's analysis includes the contribution to impacts by fugitive emissions from the 62 railcars,[9] loaded with coal, that line almost the entire length of the facility's western fenceline. These rail cars represent a total exposed area of 0.7 acres, and the City's analysis shows that because of the proximity to the fenceline, wind erosion of the materials in the railcars contributes significantly to impacts in the residential areas adjacent to the western/southwestern fenceline. A proposed compliance scenario may easily address these impacts by incorporating the assumption of a permit condition, such as covers, to mitigate their impacts. However, a proposed compliance scenario cannot do this if the baseline scenario fails to evaluate their impacts.

Response:

This comment is incorrect because it assumes that uncovered railcars have fugitive emissions, and, based on this assumption, Mirant is accused of impacting local residential areas. Railcars arrive at the PRGS after traveling 100 or more miles from mines in West Virginia. Winds and turbulence encountered on the trip no doubt caused fugitive dust releases along the way. It is highly likely that most of the fugitive silt and coal fines that was available to be blown away have long since been released from the uncovered railcars during transit. In the winter, or in the event of the frequent precipitation in the area, the coal will be wet or frozen, with less of a likelihood for any significant erosion potential. Besides being enclosed on all sides except the top, the railcars themselves present a wind barrier and a control mechanism to the wind erosion of open rail cars. The EPA's AP-42 emission factors do not mention wind erosion from coal rail cars because it is generally a very minor emission source.

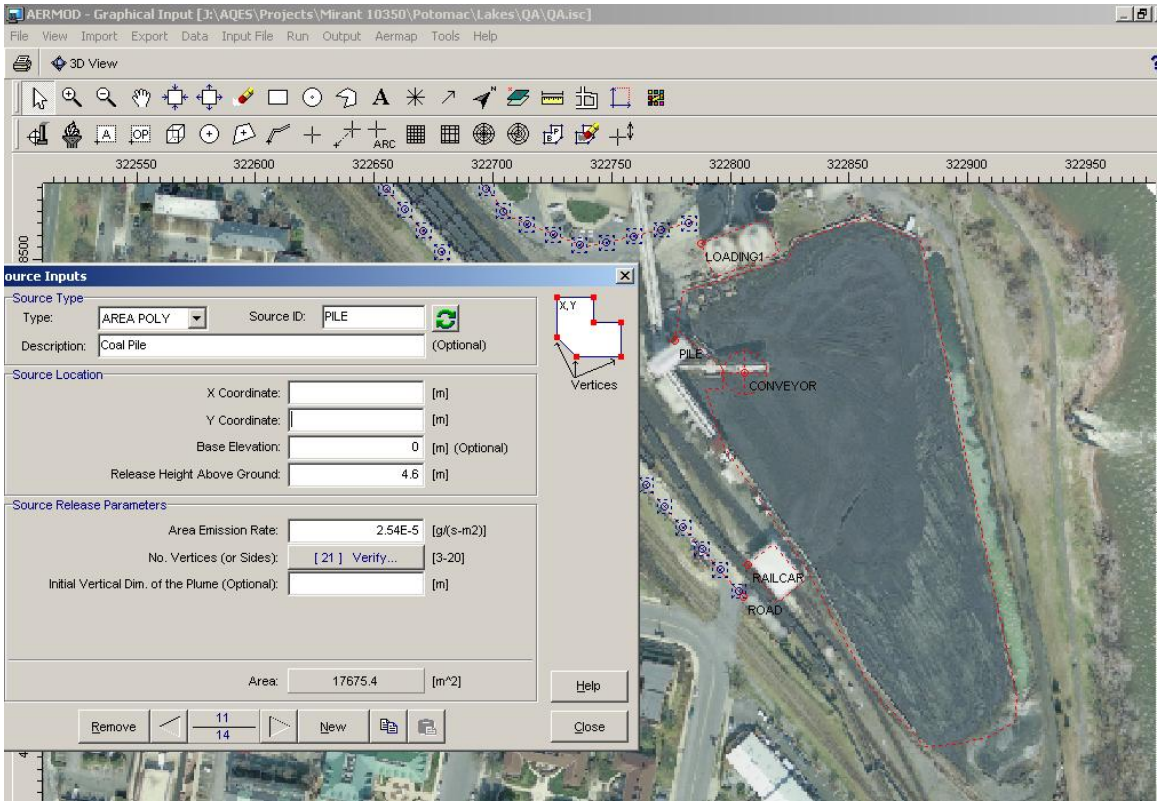
5. Coal pile area equals six acres by visual inspection.

Mirant's analysis assumes that its coal pile equals four acres in area. However, inspection of the orthophotography[10] of the site indicates a much larger area, i.e., six acres. While Mirant states to Mr. McKie in correspondence relating to this assumption that the larger dimension is due to coal that strays from the pile, this stray coal is also eroded by wind and therefore impacts offsite locations. Although the pile height may be lower around the perimeter of this pile, the full pile must size must be represented correctly within AERMOD, which cannot correctly evaluate impacts at receptors if the spatial coordinates and areal extent of the source are not represented correctly. Mirant should correctly calculate emissions and coordinates using the entire coal pile.

Response:

As can be seen from the picture below, Mirant used geo-referenced orthophotography, provided by the Department of Planning & Zoning of the City of Alexandria, VA, Fall 2004, and digitized the coal pile area using Lakes Environmental Software. The pile is

outlined in red color. The screen capture of the information window shows that the pile area is equal to 17,675.4 m^2 or 4.4 acres.



6. *Mirant's GEP Building Dimensions do not Reflect PRGS's Maximum Projected Width*

Inspection of orthophotography for the site, the USGS map[11] that includes the site, and Mirant's own site plan[12] shows that the boiler/turbine building has a maximum projected width of 197 meters. In its own analysis, the City found that use of Mirant's site plan alone was not sufficient for determination of this width; discrepancies between the building's width using the scale indicated on Mirant's site plan could not be resolved using these other data sources.

There appears to be several problems with Mirant's calculation of downwash dimensions: 1) while Mirant's Table 3-1 presents a value for maximum projected width of 170 meters, inspection of their Figure 3-1 shows that the maximum projected width (southwest to northeast dimension) of the boiler/turbine building equals approximately 200 meters; and 2) Mirant's Appendix C includes widths for all 36 wind directions that are significantly less than either its own calculation of maximum projected width or the City's determination.

Mirant's GEP determination should be re-run using BPIP-PRIME. This is the version of BPIP that is correct for the application of AERMOD-PRIME.[13] Additionally, that GEP analysis must include the ESP housings as part of the building tier defining the boiler building; the heights of the boiler building and ESP housings are equal and the housings are solid structures, representing obstructions to wind flow. All impact results should be re-derived using corrected input dimensions.

Response:

- *Table 3-1 and Figure 3-1 of the report show that the Boiler Building and the Turbine Building are two separate structures because of their difference in height, and therefore cannot be treated as one building. Therefore, use of a projected width for the boiler/turbine building would be incorrect. However, BPIP-PRIME will combine these structures internally if its algorithm determines that such a combination is appropriate. The external user does not need to artificially combine the structures.*

- *The maximum projected width (MPW) of the Boiler Building, shown in Table 3-1, is only used to determine 5L calculation. It is not used in the dispersion modeling.*

- *ESP 1-4, ESP 5 and the boiler building were input to the GEP analysis as separate structures because they are individual structures. The ESPs are not solid structures as is the Boiler Building. Because these structures are adjacent to the Boiler Building, BPIP PRIME may combine ESP1-4, ESP5 and the boiler building into one structure to determine the controlling structure, that is, the structure that produces the highest GEP height.*

- *The height of the Boiler Building, ESPs 1-4 and ESP 5 are all 35.3 meters above stack base elevation. The height of ESPs 1-4 was determined from a photograph to be equal to the height of the adjacent Boiler Building whereas the height of the Boiler Building and ESP 5 were determined from an elevation drawing. When setting up BPIP PRIME, ENSR input the height of ESPs 1-4 as 35.290 meters and the height of the Boiler Building and ESP 5 as 35.287, the latter dimension based on converting from feet to meters from the elevation drawing. As a result, BPIP PRIME determined that the ESPs 1-4 structure produces a slightly higher GEP height (and is thus the controlling structure for stack 1) because the ESPs 1-4 structure was input as 0.003 meters taller than the adjacent structures, yet is also a squat structure. In response to the City's comment above, ENSR reran BPIP PRIME using the height of 35.290 for all three structures: the Boiler Building, ESPs 1-4 and ESP 5. ENSR then used the BPIP PRIME output (representing wind direction specific building dimensions) to rerun AERMOD. Results are essentially identical to those presented in Table 5-1 of the August 2005 modeling report, with no difference in maximum predicted SO_2 concentrations for the H2H 3-hour averaging period (9,263 ug/m^3). The AERMOD rerun predicted lower concentrations for the H2H 24-hour concentration (5,025 ugm3 versus 5,061 ug/m^3 in the August 2005 report) and a lower maximum annual concentration (682 ug/m^3 versus 693 ug/m^3 in the August report). Therefore, the modeling results and conclusions presented in the August 2005 report are, if anything, conservatively high.*

- *Mirant had determined GEP heights using BPIP PRIME, consistent with the recommendation provided in the comment. BPIP PRIME has three additional inputs that are not present in just BPIP. They are:*

  - BUILDLEN projected length of the building along the flow.
  - XBADJ along-flow distance from the stack to the center of the upwind face of the projected building.
  - YBADJ across-flow distance from the stack to the center of the upwind face of the projected building.

These inputs were used in the August 2005 modeling and included in Appendix C of the report.

7. Mirant's analysis fails to evaluate impacts in important areas of public access.

The City's analysis, using the same meteorological conditions as Mirant's, found that for several pollutants with maximum impacts dominated by the stacks' plumes and for several averaging periods ($PM_{2.5}$, 24-hour and annual and SO_2, 24-hour and annual), the maximum impact among all receptors occurs at a receptor that lies along the northeast section of the fenceline. However, Mirant's analysis misses the calculation of impacts at this important location by incorrectly placing receptors in this area much further to the east.

Comparison between Mirant's Figure 3-4 and the City's Figure 2-2 illustrates this: Mirant places fenceline receptors along the river's edge rather than along the actual PRGS fenceline. This location includes a frequently used recreational path for City residents. This location for the fenceline is evident on the "Potomac River Site Plan," submitted by Mirant to the City of Alexandria. That figure shows that the parcel of land which Mirant encloses within its own fenceline is labeled as the property of the US Government.

Response:

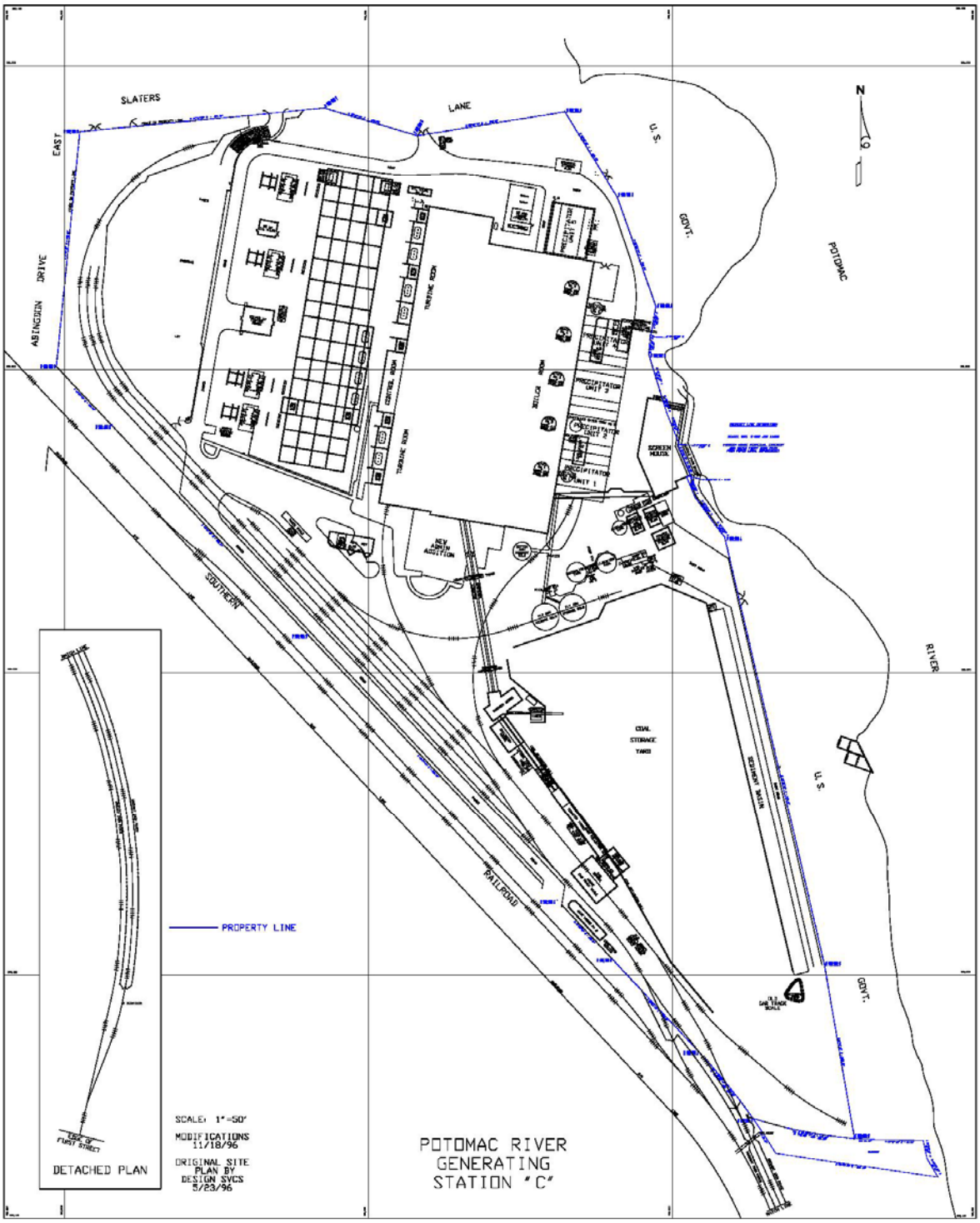
The receptors referenced by the City are located as follows with respect to Boiler Stack 5:

- *13 meters east, 60 meters north and*
- *25 meters east, 10 meters north;*

Mirant placed fenceline receptors at or within a few meters of these two locations. Mirant's fenceline receptors were selected with approximately 50 meters spacing following the exact property boundary outlined in blue color on the figure below. Is the City disputing the property boundaries shown in this figure?

The next figure shows the fenceline receptors in yellow. Beyond the fenceline, Mirant placed discrete Cartesian receptors at every 100 meters. There is a bit of land located outside of the plant property that extends into the Potomac River. A close inspection of the next figure (below) shows that there is a receptor on this piece of land.

Mirant does not understand where the City believes we are lacking in receptors.



Marina Towers
Flagpole Receptors
Locus Map
Arlington
District of Columbia
Alexandria
Prince George's
Fairfax
Charles
Legend
Site Location
AERMOD Receptors
AERMOD Fenceline Receptors
Mirant Potomac River Generating Station
AERMOD Receptors and Marina Towers Flagpole Receptors
Receptors extend out to 5 km with 100 m spacing
MIRANT
ENSR INTERNATIONAL
Scale
0
40
80
160
240
320
400
Meters

A recommended by US EPA guidance,[14] emissions of PM_{10} emissions by the boilers are assumed equal to $PM_{2.5}$.

The Order by Consent requires Mirant to prepare an AAQS compliance demonstration. Yet the facility's emissions and impacts for $PM_{2.5}$, a federal and state pollutant regulated under AAQS requirements, were never evaluated by Mirant. Until Virginia's $PM_{2.5}$ nonattainment state implementation plan is final (less than 3 years from now),[15] US EPA provides guidance in the interim on how States should treat major sources of $PM_{2.5}$ in nonattainment areas.[16] This guidance stipulates that States assume that PM_{10} emissions are equal to $PM_{2.5}$ emissions, and that impacts be assessed in accordance with a nonattainment program for PM_{10}. This requires that Mirant's impacts of $PM_{2.5}$ be demonstrated as insignificant.

Mirant must remedy this lack of analysis by demonstrating how its impacts of $PM_{2.5}$ compare against the insignificance levels for PM_{10}. There is nothing about the interim US EPA guidance, the proposed US EPA $PM_{2.5}$ implementation rule,[17] or the VADEQ standards for criteria pollutants[18] that supports ignoring this pollutant's impacts or treating it in the context of an attainment pollutant.

Response:

The referenced U.S. EPA guidance (Implementation of New Source Review Requirements in $PM_{2.5}$ Nonattainment Areas, April 5, 2005) does not specify that $PM_{2.5}$ be evaluated within a PM_{10} program [sic: Nonattainment Area]. This guidance specifies the opposite, that PM_{10} be evaluated within a $PM_{2.5}$ nonattainment area. Furthermore, this guidance deals with New Source Review in $PM_{2.5}$ Nonattainment Areas. It reaffirms a 1997 EPA Memorandum entitled Interim Implementation of New Source Review Requirements for $PM_{2.5}$ from John Seitz, OAQPS which directs EPA Regions to require use of PM_{10} as a surrogate for $PM_{2.5}$ until such time that technical difficulties with monitoring, $PM_{2.5}$ emission estimation and modeling are resolved.

Both of these memoranda deal exclusively with New Source Review (NSR). NSR applies to new major sources or major modifications at sources located within $PM_{2.5}$ Nonattainment areas. The August 2005 NAAQS compliance analysis is for an existing source and has nothing to do with New Source Review.

Nevertheless, these memoranda are the only EPA guidance dealing with the issue of $PM_{2.5}$ versus PM_{10}. Both memoranda indicate that PM_{10} is a surrogate for $PM_{2.5}$ and that, until emissions estimation and modeling methods can be developed, PM_{10} remains the surrogate for $PM_{2.5}$. This means that PM_{10} emissions are to be modeled and compared to the NAAQS for PM_{10}.

In September 2005 EPA issued its Proposed Rule to Implement the Fine Particle National Ambient Air Quality Standard. There is nothing in this rule or in the two memoranda listed above that requires Mirant to model $PM_{2.5}$. This Rule does provide guidance to states and regions on general plans for developing State Implementation

Plans to attain and maintain the $PM_{2.5}$ NAAQS. On Page 133 under the Heading 9. Modeling Guidance, EPA states that they are "not recommending a specific model for use in the attainment demonstration for the $PM_{2.5}$ NAAQS. At present there is no single model which has been extensively tested and shown to be clearly superior to other available models. The current modeling guideline, 40 CFR Part 51, Appendix W, does not identify a preferred model for use in attainment demonstrations of the NAAQS for $PM_{2.5}$."