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City of Alexandria, Virginia

MEMORANDUM

DATE: NOVEMBER 7, 2003

TO: THE HONORABLE MAYOR AND MEMBERS OF CITY COUNCIL

FROM: PHILIP SUNDERLAND, CITY MANAGER

SUBJECT: AIR QUALITY ISSUES RELATED TO THE OPERATIONS AT MIRANT POTOMAC RIVER GENERATING PLANT

The purpose of this memorandum is to address air quality issues related to two types of emissions from the Mirant Potomac River Plant, particulate matter ("PM") emissions and oxides of nitrogen ("NOx") emissions. The memorandum provides a summary of the information included in the Mirant Power Plant Emissions and Health Effects Report ("Report") (Attachment 1), submitted to the City in late August by Elizabeth Chimento and Poul Hertel, identifies the air quality issues related to the Mirant Alexandria plant emissions that are raised by the Report, and describes the steps the City is pursuing to address these issues.

I.

Particulate Matter Emissions from the Mirant Plant

Summary of Studies Presented in Report

The Report is an excellent compilation of some of the more recent studies relating to air pollution and the health effects of fine particulates, both in general and from coal fired power plants in the Washington Region, including the Mirant plant in Alexandria. The information below summarizes the studies included in the Report, which can be categorized into three types:

1. A number of recent general health studies indicate that substantial long-term exposure to fine particulate matter – i.e., particulates of a diameter less than 2.5 microns ("$PM_{2.5}$") – may pose a risk to human health. The central theme of these studies, including Levy et al. and Pope et al. (JAMA article) which are addressed in the Report, is that there is a correlation between substantial, long-term exposure to ambient concentrations of $PM_{2.5}$ and increases in cardiopulmonary mortality, lung cancer and other adverse health impacts, even when the concentrations are below the National Ambient Air Quality Standards ("NAAQS") for $PM_{2.5}$ that have been established by the federal government.[1]

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[1] The NAAQS for $PM_{2.5}$ is 15 micrograms per cubic meter ($\mu g/m^3$) annual mean, and 65 $\mu g/m^3$ measured on a 24 hour basis. Further discussion of these standards is on page 6 below.

2. The Levy study finds that if "Best Available Control Technology," or BACT (a term referring to the most effective, currently available pollution control technology) for PM, NOx and sulfur dioxide (SO_2) were installed on the five coal fired power plants in the Washington region (including the Mirant plant in Alexandria), regional $PM_{2.5}$ concentrations would be reduced by up to 0.9 $\mu g/m^3$ on an annual basis, which in turn would produce health benefits within the region, including reductions in cardiovascular admissions and pediatric hospital emergency room visits. The Levy study also finds that these health benefits would occur predominantly in sensitive populations, such as the elderly, diabetics, asthmatic children and those with lower incomes. The Levy study focused on a 250 mile radius area around Washington, D.C., with a population of 47 million people.

3. Separate reports from Penn State University and the Virginia Department of Environmental Quality ("VDEQ") addressed the makeup of particulate matter collected from homes in the immediate neighborhood of the Mirant plant. These reports concluded that coal dust was present in the neighborhood samples of particulate matter, as was flyash, although to a much lesser extent. The Penn State report also concluded that the majority of the particulates in the sample were course particulates, greater that 10 microns in size.

   The Penn State report (attached to the Report) concluded that this coarse coal dust came from operations (not from the stacks) at the Mirant plant (e.g., from the coal pile or coal handling processes). The VDEQ report concluded that, while coal dust was a significant component of the particulate matter found in the neighborhood samples, the level of particulates, including coal dust and flyash did not exceed what is typically found in an urban setting and did not show that the Mirant plant was producing particulates in violation of relevant regulations. (These VDEQ conclusions are set out in a June 10, 2003, memorandum attached to the Report, and in an August 12, 2003, memorandum which is Attachment 2 to this memorandum.)

   Neither of these two studies was quantitative; thus, neither determined the amount of coal-related and flyash particulates in the neighborhood around the Mirant plant that had come from the plant.

Background Information on Fine Particulate Matter

Particulate matter refers to all solid and liquid particles found in the air. Attachment 3 summarizes the size characteristics of particulates. A size of 1μm (1 micron) is equal to one-thousandth of a millimeter or one-millionth of a meter. $PM_{2.5}$ refers to fine particulates that are less than 2.5μm in diameter; particulates less than 10μm in diameter are referred as PM_{10}. Particulates smaller than 2.5μm are respirable, have a greater chance of getting deposited in lungs and, thus, are considered to have a far greater potential health impact compared to larger or coarse particulates.

The primary source of fine particulates typically found in urban areas consists of various combustion activities -- specifically, "point sources" such as power plants, "area sources" such as industrial boilers and commercial and home heating systems (including wood burning stoves), and "mobile sources" such as buses, trucks, automobiles, trains and aircraft. As earlier noted, the current National Ambient Air Quality Standard for $PM_{2.5}$ is an annual mean of 15 $\mu g/m^3$. The NAAQS for PM_{10} is an annual mean of 50 $\mu g/m^3$. Alexandria and the metropolitan Washington area are currently meeting these standards. (For additional information on fine particulates, see pages 18 and 19 of the Report.)

Particulate Emissions from the Mirant Plant

Three types of particulate matter are "produced" at the Mirant plant.

The first is primary particulate matter some of which is released as a result of the combustion process through the plant's stacks as uncollected flyash (i.e., not captured by the control equipment described below), and some of which is released during the handling of collected flyash. Mirant operates air pollution control equipment to control flyash particulate emissions. The plant uses hot and cold electrostatic precipitators (ESPs) to control flyash emissions leaving the stacks, and uses baghouses to control flyash emissions from the silos where flyash collected by the ESPs is stored prior to being loaded on to trucks. The ESPs control greater than 99% of the primary particulate emissions leaving the stacks. Nonetheless, Mirant reported to VDEQ that the plant emitted 588.3 tons of PM_{10} from its stacks during calender year 2002.[2] A portion of these particulate emissions are less than 2.5 microns, and are referred to as primary $PM_{2.5}$.

The second type of particulates generated by the Mirant plant consists of secondary $PM_{2.5}$. These are referred to as secondary particulates because they are formed away from the plant when gaseous emissions from the plant react in the atmosphere to produce $PM_{2.5}$, typically in the form aerosols, nitrates, sulfates and similar compounds. These $PM_{2.5}$ particulates are formed downwind and miles from the plant. Because of their nature and the location of their formation, secondary $PM_{2.5}$ emissions are not measured or reported by power plants.

The third type of particulates produced by the Mirant plant is in the form of coal dust that is released during the delivery, handling and storage of coal at the facility. These particulates tend to be coarse and large (PM_{10} or larger), and in some cases are visible to the naked eye.

Mirant employs the following measures to control coal dust at the plant.

- Uses a car dumper water spray header to suppress dust during the unloading the individual coal cars;

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[2] A July 2001 study conducted by a consultant for Mirant identified the flyash silos as a source of particulate emissions, and calculated that up to 29 tons a year of PM_{10} could be emitted from the silos, some of which would be $PM_{2.5}$.

- Uses a car dumper door curtain to enclose the area during the unloading process;
- Uses a primary process surfactant spray, coupled with an enclosed chute, during coal transport;
- Maintains the coal chute with a surfactant spray nozzle to reduce the coal dust plume when coal is dropping to the pile;
- Routinely compacts the coal pile with a bulldozer and maintains the surface in a manner not conducive to releasing fugitive dust; and
- Maintains the coal handling area in the main plant building under a slightly negative pressure so that any leakage in this area flows into the plant.

Even with these measures, the City has received complaints in reference to particulates observed by the naked eye in the neighborhood of the plant. In addition, it has been reported by citizens that the coal pile is periodically higher than in previous years. The Penn State and VDEQ studies confirm that particulates from the Mirant plant -- the first and third types of PM identified above -- are leaving the site and being released into the community. These particulates tend to be relatively large in size and weight and, as a result, settle to the ground quickly and near the plant. For example, Penn State found the mean size of the coal dust particles in the neighborhood sample it analyzed to be 45μm, and the mean size of the flyash particles to be 30μm. These larger, coarse particulates tend to be a nuisance, and present considerably less of a health risk (if any) because they are filtered by our natural immune systems, such as the throat and nose, and do not make it deep into the lungs, the way $PM_{2.5}$ particulates do.

Particulate Monitoring

There are currently two types of particulate monitoring in the area around the Mirant plant. The closest monitor is a PM_{10} station operated by the City. This was installed at the Health Department at 517 North St. Asaph Street in October 2001 in response to community concerns about particulate emissions from the plant. Previously, the City had been monitoring PM_{10} on the west end, at Cameron Station; this was suspended when the property was sold for redevelopment. Based upon the data produced by the monitoring station at the Health Department, the levels of PM_{10} found in the north end of Old Town are similar to the PM_{10} levels found in the west end of the City in the early 1990s, and the levels currently found in urban areas throughout Northern Virginia.

The City continues to monitor for PM_{10} at the Health Department. Attachment 4 summarizes the ambient PM_{10} data from monitoring stations in and around Alexandria. Attachment 5 shows the location of other monitoring stations, which are operated by VDEQ in Northern Virginia, and their distance from the Mirant plant.

There are three $PM_{2.5}$ ambient air monitoring stations operated by VDEQ in Northern Virginia. None of these stations is within the City. Two stations are within 4.5 miles of the Mirant plant, one to the north and one to the south. Attachment 6 summarizes the ambient $PM_{2.5}$ data from these monitoring stations (Attachment 5 shows their location and distance from the plant). The VDEQ monitoring section has consistently maintained that the $PM_{2.5}$ monitoring it currently undertakes adequately covers the Northern Virginia region, including Alexandria. Based on discussions with VDEQ, available monitoring data, and dispersion characteristics of $PM_{2.5}$, the levels of $PM_{2.5}$ in the City and the immediate neighborhood are expected to be comparable to those throughout the Washington region.

Activity at the Federal level on PM Standards

The National Ambient Air Quality Standards for a pollutant are set at the national level by the Environmental Protection Agency ("EPA") after an evaluation of the sources, atmospheric levels, exposures and health effects of the pollutant. EPA promulgated the standards for $PM_{2.5}$ in 1997, but said that it would further review the standards before any areas could be designated as non-attainment for $PM_{2.5}$ and any new $PM_{2.5}$ controls would be required. EPA is in process of conducting this review, and has drafted a "Criteria Document" which evaluates the sources, atmospheric levels, exposures and the health effects of $PM_{2.5}$.

On September 2, 2003, EPA staff recommended an annual $PM_{2.5}$ standard between 12 $\mu g/m^3$ and 15 $\mu g/m^3$ (the current standard) and a 24-hour $PM_{2.5}$ standard between 30 $\mu g/m^3$ and 50 $\mu g/m^3$ (the current 24 hour standard is 65 $\mu g/m^3$). Staff also recommended that a new standard for the larger fraction of PM be set, which would cover particulates ranging from $PM_{2.5}$ to PM_{10}. Clearly, more debate will occur at the federal level before enforceable air quality standards for $PM_{2.5}$ will be in effect.

II.

NOx Emissions from the Mirant Plant

The process of burning coal generates oxides of nitrogen or NOx. There is a National Ambient Air Quality Standard for NOx which the Washington region does not meet. NOx emissions are important because they contribute to acid rain and are a precursor pollutant for the formation of ozone. Ozone is a summertime gaseous pollutant that is formed by a chemical reaction when NOx and volatile organic compounds react with sunlight. Ozone is the only pollutant for which the Washington region is not meeting the applicable NAAQS. The Washington region is classified as a "severe" non-attainment area for ozone. As a result, Virginia is required to develop and submit to EPA, for approval, a State Implementation Plan ("SIP") demonstrating how Virginia will meet the ozone standard by 2005.

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[3] The Clear Skies Initiative, proposed by President Bush in February 2002, is currently being debated at the national level. This program proposes a multiple pollutant approach targeting NOx, mercury and sulfur dioxide emissions. If enacted, the program will likely have significant impacts on pollution controls and regulations governing older power plants, like the Mirant Potomac River plant.

The revised SIP for ozone requires that, beginning in 2003 NOx emissions from the Mirant plant in Alexandria be limited to an average rate of 0.15 pounds per million BTU of heat input, resulting in a cap of 1,019 tons during the ozone season from May through September. This emissions cap is enforced through a state operating permit that was issued by VDEQ in 2000. This past September, VDEQ issued a Notice of Violation ("NOV") to Mirant, charging it with violating its permit by exceeding the allowed level of NOx emissions during the 2003 ozone season (Attachment 7). Mirant has responded to the NOV with a letter dated September 19, 2003, disputing the NOV (Attachment 8).

VDEQ and Mirant are currently discussing options for achieving compliance with, or otherwise dealing with, the existing Mirant permit and its NOx cap. Among the proposals currently being discussed is the installation of "separate overfire air operational improvements" on the plant's boiler units 3, 4, and 5, which is projected to result in a 30% reduction of emissions from these boilers over three years. This level of emission reductions, however, would not produce the amount of reductions necessary for the plant to comply with the currently applicable NOx cap.

Another option for Mirant to achieve the required NOx reductions, is to install NOx-control technology similar to that now in use at the waste-to-energy facility ("selective non-catalytic reduction" or "SNCR" technology). This involves the injection of ammonia into the flue gas stream to control NOx emissions. This technology raises some important safety concerns, in that it would involve the delivery of large quantities of liquid ammonia (or a similar compound) by train or tanker truck to the Mirant plant and the potential for ammonia slippage, where excess ammonia is released from the stack .

Another means for Mirant to achieve NOx compliance is to produce or obtain NOx reductions at one or more other NOx-producing facilities in the region, and to "trade" these reductions for the reductions otherwise required at the Potomac River plant. Under this alternative, no additional controls would need to be installed at the Mirant plant in Alexandria.

A further way for Mirant to meet the NOx emissions requirements at its Alexandria plant is to change the type of fuel that is burned at the plant, from coal to natural gas. This would require bringing a high pressure gas line to the plant, at a very significant cost.

All of these options have significant positive and negative impacts that require further analysis.

III.

Ongoing and Future City Efforts to Address These Issues

In order to assist the City and neighbors of the Mirant plant understand the nature of the particulate emissions coming from the Mirant plant, the health impacts, if any, of the plant's $PM_{2.5}$ emissions in the immediate neighborhood, and the pros and cons of the various options relating to the control of NOx at the plant, we plan to retain the services of a member of the

faculty of the Harvard School of Public Health, Dr. Jonathan Levy, who was an author of one of the studies attached to the Report. Working with the authors of the Report, we are developing a series of questions and a scope of work for Dr. Levy. We hope to have a final scope worked out in the next week.

The following issues are of particular significance and need to be understood before any decisions can be reached regarding emissions from and operations at the Mirant plant. The issues address (i) $PM_{2.5}$ emissions from the Mirant plant, (ii) the larger, coarse particulates that come from the plant, and (iii) NOx emissions from the plant.

- The amount of $PM_{2.5}$ that is emitted from the Mirant plant.
- The extent to which the Mirant plant's $PM_{2.5}$ emissions contribute to the ambient levels of $PM_{2.5}$ that are found near the plant and elsewhere in Alexandria.
- The most effective means of reducing $PM_{2.5}$ emissions from the Mirant plant, if reductions are needed to reduce unacceptable levels of this pollutant near the plant or elsewhere in Alexandria or the region.
- The extent to which coarse particulates (i.e., significantly larger than $PM_{2.5}$) that are emitted from the Mirant's stacks or arise from its coal and flyash handling operations contribute to the levels of such particulates that are found near the plant or elsewhere in Alexandria.
- The most effective means of reducing the amount of coarse particulates that leave the Mirant plant site and settle in the nearby neighborhood or elsewhere in Alexandria.
- The pros and cons to Alexandria of adding new control equipment to the Mirant plant to further reduce its NOx emissions vs. adding new equipment or taking other steps to further reduce NOx emissions at one or more other NOx-producing facilities in the region. (This is intended to address the "trading" issue -- i.e., considering air quality, the risks associated with NOx control technology and other factors, whether Alexandria would be better served by NOx reductions at the Mirant plant or at one or more plants in the region.)

In addition to moving forward with this analytical work, we have prepared a letter from the Mayor to VDEQ (Attachment 10) expressing the City's interest in the particulate emissions coming from the Mirant plant and related nuisance and health impacts. The letter also notifies VDEQ of the City's desire to participate in discussions related to Mirant's NOx compliance issues and to the issuance of a new Title V air permit for the Mirant plant, and asks that no decisions be reached on any of these matters without City participation.

Also, City staff will continue to monitor VDEQ's enforcement action against Mirant for its exceedance of the NOx emissions cap during 2003 ozone season. Staff will continue its ongoing

discussions with VDEQ concerning air quality monitoring near the Mirant plant. We also will continue to monitor regional, state and federal issues and legislation that may directly or indirectly impact the Mirant Plant and its operations.

City staff currently inspect the Mirant plant at least twice every year. More frequent visits are made in response to noise or air pollution complaints. Staff will now increase the frequency of inspections to quarterly inspections, in order to better ensure that particulate control measures at the plant are in place and functional. Staff will also evaluate how existing measures can be improved and initiate discussions with Mirant on the installation of additional controls.

Finally, we will keep you informed on the work performed by Dr. Levy, who will be working with staff and the authors of the Report.

Attachment 1: Mirant Power Plant Emissions and Health Effects Report prepared by Elizabeth Chimento and Poul Hertel
Attachment 2: VDEQ Memorandum dated August 12, 2003
Attachment 3: Particle Size Chart
Attachment 4: PM_{10} data for Northern Virginia
Attachment 5: Air Monitoring Stations and Power Plant Locations
Attachment 6: $PM_{2.5}$ data for Northern Virginia
Attachment 7: NOV issued by VDEQ dated September 10, 2003
Attachment 8: Letter from Mirant to VDEQ dated September 19, 2003 disputing the NOV.
Attachment 9: Glossary of Terms
Attachment 10: Letter from Mayor to VDEQ

cc: Richard Baier, P.E., Director, Transportation & Environmental Services
Charles Konigsberg, M.D., Director, Alexandria Health Department
Michele Evans, Assistant City Manager
Bernard Caton, Legislative Director
William Skrabak, Chief, Div. Environmental Quality, T&ES

ATTACHMENTS NOT PROVIDED.