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BART EXEMPTION ANALYSIS
FOR
MOSAIC FERTILIZER, LLC
RIVERVIEW FACILITY

Prepared For:

Mosaic Fertilizer, LLC
P.O. Box 2000
Mulberry, Florida 33860

Prepared By:

Golder Associates Inc.
6241 NW 23rd Street, Suite 500
Gainesville, Florida 32653-1500

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LIST OF ACRONYMS AND ABBREVIATIONS

BART	Best Available Retrofit Technology
CALMET	California Meteorological Model
CALPUFF	California Puff
CAA	Clean Air Act
CFR	Code of Federal Regulations
dv	deciview
EPA	U.S. Environmental Protection Agency
F.A.C.	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
gr/dscf	grains per dry standard cubic foot
H_2SO_4	sulfuric acid
IMPROVE	Interagency Monitoring of Protected Visual Environments
km	kilometer
lb/hr	pounds per hour
lb/ton	pounds per ton
NP	National Park
NPS	National Park Service
NWA	National Wilderness Area
PM	particulate matter
PSD	prevention of significant deterioration
RHR	1999 Regional Haze Rule
SAM	sulfuric acid mist
SAP	sulfuric acid plant
SO_2	sulfur dioxide
SO_3	sulfur trioxide
TPD	tons per day
UTM	Universal Transverse Mercator

1.0 INTRODUCTION

Pursuant to Section 403.061(35), Florida Statutes, the Federal Clean Air Act (CAA), and the regional haze regulations contained in Title 40, Part 51 of the Code of Federal Regulations (40 CFR 51), Subpart P – Protection of Visibility, the Florida Department of Environmental Protection (FDEP) is required to ensure that certain sources of visibility-impairing pollutants in Florida use Best Available Retrofit Technology (BART) to reduce the impact of their emissions on regional haze in Federal Class I areas. Requirements for individual source BART control technology determinations and for BART exemptions are contained in Rule 62-296.340 of the Florida Administrative Code (F.A.C.).

Rule 62-296.340(5)(c), F.A.C., states that a BART-eligible source may demonstrate that it is exempt from the requirement for a BART determination for all pollutants by performing an individual source attribution analysis in accordance with the procedures contained in 40 CFR 51, Appendix Y. A BART-eligible source is exempt from BART determination requirements if its contribution to visibility impairment, as determined below, does not exceed 0.5 deciview (dv) above natural conditions in any Class I area.

FDEP has adopted the U.S. Environmental Protection Agency's (EPA's) visibility protection guidelines contained in 40 CFR 51, Subpart P. Based on the guidelines, the 98th percentile, i.e., the 8th highest 24-hour average visibility impairment value in any single year, or the 22nd highest 24-hour average visibility impairment value over 3 years combined, whichever is higher, is compared to 0.5 dv in the source attribution analysis.

This report is submitted to FDEP to present the source attribution analysis for the Mosaic Fertilizer, LLC (Mosaic) Riverview facility, which is a BART-eligible source with multiple BART-eligible emissions units. These units include:

- EU 004: No. 7 Sulfuric Acid Plant (SAP);
- EU 005: No. 8 SAP;
- EU 006: No. 9 SAP;
- EU 063: Molten Sulfur Storage Tank Nos. 1, 2, and 3; and
- EU 066, 067, 068: Molten Sulfur Storage and Handling – Pits 7, 8, and 9.

Mosaic is proposing to lower the sulfur dioxide (SO_2) and sulfuric acid mist (SAM) emission limits of the Nos. 7, 8, and 9 SAPs. At the proposed lower emission limits, Mosaic's Riverview facility is exempt from BART because its contribution to visibility impairment does not exceed 0.5 dv above natural conditions in any Class I area. The objective of the source attribution analysis is to demonstrate that the Riverview facility, with the proposed lower limits, is exempt from a BART determination.[1]

This report contains a description of the BART-eligible emissions units and proposed limits, the visibility modeling methodology, and the visibility modeling analysis results for the facility. The source information and methodologies used for the BART exemption analysis are presented in the document entitled "Air Modeling Protocol to Evaluate BART Options for the Mosaic Riverview Facility", which is included as Appendix A to this report. This Protocol is a revised version of the modeling protocol document entitled "Revised Air Modeling Protocol to Evaluate BART Options for Affected Mosaic Fertilizer Facilities", submitted with the BART Determination Analysis for the Mosaic Riverview Facility in January 2007.

FDEP permit application forms are provided in Appendix B. The purpose of these forms is to request that the proposed lower emission limits for SO_2 and SAM be incorporated into an air construction permit for the Mosaic Riverview facility, in order to make the limits federally enforceable, and thereby formally exempt this facility from BART.

[1] Mosaic originally submitted a BART application to FDEP in January 2007. The January 2007 application was submitted prior to Mosaic's decisions to reduce SO_2 and SAM emissions and, therefore, did not demonstrate a basis for BART exemption. At the reduced emission levels, however, Mosaic should be considered exempt from BART and upon FDEP's concurrence, the prior application may be considered superceded by this exemption application.

2.0 DESCRIPTION OF BART-ELIGIBLE EMISSIONS UNITS

The Mosaic Riverview facility is located in Riverview, about 7 miles south of Tampa, in Hillsborough County, Florida. An area map showing the facility location and prevention of significant deterioration (PSD) Class I areas located within 300 kilometers (km) of the facility is presented in Figure 1-1 of the BART Modeling Protocol (see Appendix A). The PSD Class I areas and their distances from the Riverview facility are as follows:

- Chassahowitzka National Wilderness Area (NWA) – 87 km;
- Everglades National Park (NP) – 239 km; and
- St. Marks NWA – 291 km.

The Universal Transverse Mercator (UTM) coordinates of the Riverview facility are approximately 362.9 km east and 3,082.5 km north in UTM Zone 17.

Mosaic operates three SAPs, one phosphoric acid plant (PAP), two diammonium phosphate (DAP) plants, one material handling system, one auxiliary boiler, two animal feed plants, and a molten sulfur storage and handling system at the Riverview facility to produce phosphate fertilizers for agricultural use. The Mosaic Riverview facility is currently operating under Title V Permit No. 0570008-045-AV, most recently renewed on May 31, 2006.

Based on the BART applicability analysis contained in the Protocol, five emissions units at the Riverview facility were identified as BART-eligible emissions units, as previously described in Section 1.0.

It is to be noted that the Nos. 3 and 4 MAP Plants (EUs 022 and 023) and the South Cooler (EU024) have been permanently shut down and therefore these units, which are listed in FDEP's List of Potential BART-Eligible Sources, were not included in the BART analysis for Mosaic Riverview. A description of each BART-eligible emissions unit at the Riverview facility is presented in the following sections. Also included are the proposed BART emission limits, and the means by which Mosaic plans to achieve these proposed limits.

2.1 Nos. 7, 8, and 9 SAPs (EU004, EU005, and EU006)

2.1.1 Current Operation

Mosaic operates three Leonard-Monsanto design sulfur burning, dual conversion, dual-absorption SAPs at the Riverview facility – Nos. 7, 8, and 9 SAPs. These plants have a permitted capacity of 3,200 tons per day (TPD), 2,700 TPD, and 3,400 TPD of 100-percent sulfuric acid (H_2SO_4), respectively. In the acid-making process, molten sulfur is combusted (oxidized) with dry air in the sulfur furnace. The resulting SO_2 gas is catalytically converted (further oxidized) to sulfur trioxide (SO_3) over a catalyst bed in a converter tower. The SO_3 is then absorbed in H_2SO_4. Any remaining SO_2, not previously oxidized, is passed over a final converter bed of catalyst and the SO_3 produced is then absorbed in H_2SO_4. The remaining gases exit to the atmosphere through a high-efficiency mist eliminator. The plants also incorporate a waste heat boiler system for generating steam from the heat energy produced by the combustion of molten sulfur and by the catalytic conversion of SO_2 to SO_3.

The current 24-hour average SO_2 emission limits for the all three SAPs is 3.5 pounds per ton (lb/ton) of 100-percent H_2SO_4, equivalent to 467.0 pounds per hour (lb/hr), 393.8 lb/hr, and 495.8 lb/hr, for Nos. 7, 8, and 9 SAPs, respectively. The current SAM emission limit for the No. 7 SAP is 0.12 lb/ton of 100-percent H_2SO_4, equivalent to 16 lb/hr. The SAM emission limits for the Nos. 8 and 9 SAPs are 11.3 lb/hr and 14.2 lb/hr, respectively. These limits have all been based on recently issued Best Available Control Technology (BACT) determinations. Currently there are no nitrogen oxides (NO_x) emission limits for any of the SAPs.

2.1.2 SO_2 Emission Reductions for BART

Mosaic is proposing to lower the 24-hour daily average SO_2 emission limits for the all three SAPs, in order to meet the BART exemption criteria, as follows: [2]

- No. 7 SAP – reduction from 467 lb/hr to 400 lb/hr;
- No. 8 SAP – reduction from 393.8 lb/hr to 315 lb/hr; and
- No. 9 SAP – reduction from 495.8 lb/hr to 425 lb/hr.

[2] Although Mosaic is not revising the existing SO_2 emission limits in terms of lb/ton H_2SO_4 produced (since the BART limit should be a 24-hour daily limit on mass emissions), for informational purposes only, the approximate equivalent lb/ton emission rates at full production rate for each SAP are: 3.0, 2.8 and 3.0 lb/ton H_2SO_4 for Nos. 7, 8, and 9 SAPs, respectively.

The total proposed reduction in allowable SO_2 emissions is 216.6 lb/hr.

Mosaic has developed intended strategies for achieving the lower SO_2 emission rates on the SAPs. These strategies are described below for each SAP.

No. 7 SAP- During the currently scheduled May 2010 turnaround, the standard vanadium catalyst loading will be increased from the current approximate 578,000 liters to approximately 647,000 liters. This will increase the catalyst loading ratio from approximately 181 liters per ton H_2SO_4 per day (L/TPD) to approximately 202 L/TPD. In addition, the cold gas-to-gas heat exchanger will be replaced. The current estimated cost to perform this work is in the approximate range of $3.5 million to $4.5 million.

No. 8 SAP- During the currently scheduled May 2009 turnaround, the converter will be replaced with a larger converter to accommodate increased catalyst loading (an air construction permit application is currently under review by FDEP for this project). The standard vanadium catalyst loading will be increased from the current approximate 472,000 liters to approximately 575,000 liters. This will increase the total catalyst loading ratio from approximately 175 L/TPD to approximately 213 L/TPD (note that the available volume for catalyst in the new converter will be approximately 616,000 liters, or 228 L/TPD, allowing Mosaic to add additional catalyst at a later turnaround if necessary to meet the new SO_2 emission limit). In addition, the cold gas-to-gas heat exchanger and a superheater will be replaced. The current estimated cost to perform this work is approximately $13 million.

No. 9 SAP- During the currently scheduled February 2010 turnaround (could occur as late as May 2010), the standard vanadium catalyst loading will be increased from the current approximate 508,000 liters to approximately 663,000 liters. This will increase the catalyst loading ratio from approximately 149 L/TPD to approximately 195 L/TPD. In addition, a heat recovery system (HRS) tower will be installed to replace the current interpass absorption (IPA) tower. The current estimated cost to perform this work is in the range of $25 million to $30 million.

Mosaic has been working with their catalyst supplier (Haldor Topsoe) to provide assurances that the proposed catalyst loadings are expected to meet the proposed SO_2 emission limits. The supplier has responded with a study which confirms that the proposed catalyst loadings, using all vanadium catalyst, are expected to achieve an SO_2 emission rate of 2.8 to 3.0 lb/ton H_2SO_4 (see Appendix C). Note that the study addresses the current configuration of No. 8 SAP, i.e., not the future

configuration after replacement of the converter with a larger converter. Notwithstanding this study, Mosaic may include various types of catalyst and/or different catalyst loadings in order to achieve the desired SO_2 emissions.

Mosaic will demonstrate compliance with the new proposed lb/hr limits by using the existing CEMS for SO_2, along with monitoring of daily H_2SO_4 production for each plant. The CEMS is already capable of providing these data.

2.1.3 SAM Emission Reductions for BART

Mosaic is proposing to lower the SAM emission limits for the all three SAPs, in order to meet the BART exemption criteria, as follows:[3]

- No. 7 SAP – reduction from 16 lb/hr to 6.7 lb/hr;
- No. 8 SAP – reduction from 11.25 lb/hr to 5.6 lb/hr; and
- No. 9 SAP – reduction from 14.2 lb/hr to 7.1 lb/hr.

The total proposed reduction in allowable SAM emissions is 22.1 lb/hr. Mosaic's intended strategies for achieving the lower SAM emission rates on the SAPs are described below for each SAP.

Nos. 7, 8 and 9 SAPs- Each of these SAPs employ impaction-type candles for mist elimination. The historic test data shown in Table 2-1 indicates that the current technology is capable of meeting the proposed emission limit. Only one past emission test from all three SAPs has indicated SAM emissions above 0.05 lb/ton (0.056 lb/ton on No. 8 SAP in 2005). None of the other historic emission tests have indicated SAM emissions above 0.05 lb/ton. Therefore, no change to the current technology for SAM emission control is proposed at this time.

Although Mosaic is not currently planning any changes to the current SAM control technologies employed on the three SAPs, if the current technology is later deemed by Mosaic to be insufficient, Mosaic may consider installing Brownian diffusion-type candles or other technology, and Mosaic requests that the air construction permit reflect this flexibility.

[3] Although Mosaic is not proposing lower SAM emissions in terms of lb/ton of H_2SO_4 produced (since the BART limit should be a 24-hour daily limit on mass emissions), the equivalent SAM emissions in terms of lb/ton H_2SO_4 produced for each SAP are 0.05 lb/ton H_2SO_4.

2.1.4 Implementation of New Emission Limits

Mosaic has described above its tentative plan to meet the new emission limits on the SAPs in order to meet the BART exemption criteria. This plan is centered on replacing the converter in the No. 8 SAP and increasing catalyst loading in all three SAPs, replacement of an HRS tower, replacement of heat exchange and superheater equipment to minimize leaks, as well as adding or replacing other heat recovery steam generating equipment. No changes are anticipated to the SAM mist elimination systems; although, Mosaic requests flexibility in the construction permit if alternative technology is deemed beneficial by Mosaic.

The BART regulations require sources to comply with any BART emission limits as expeditiously as practical, but no later than December 31, 2013. Mosaic intends to meet this requirement by implementing the proposed changes during the next full turnaround of each SAP. The current schedule for each of these turnarounds is shown in Table 2-2 (2009 for No. 8 SAP; 2010 for No. 7 and No. 9 SAP). For each turnaround, the major activities that will act to reduce SO_2 emissions are indicated.

Turnarounds are the only mechanism by which Mosaic can implement the proposed changes. Due to the nature of the propose changes, they require significant downtime. Also note that turnaround schedules can change based on changes in design/build schedules.

As discussed above, Mosaic may include various types of catalyst and/or different catalyst loadings in order to achieve the desired SO_2 emissions, while it is believed that no changes to the SAM mist elimination systems will be required. However, additional issues may arise or problems identified, requiring a modified approach. More in-depth engineering studies will be performed prior to the respective SAP turnarounds to address any such issues.

It should be recognized that even with the best planning, actual operation after the proposed changes are implemented may not immediately meet the goals of the projects. Process equipment operating rates, flow rates, etc., may need to be optimized through actual operation to fully meet the goals, and additional equipment or catalyst may be necessary. Therefore, the new emission limits may not be fully achieved until sometime after the turnarounds, or potentially until the second set of turnarounds scheduled for 2011 for No. 8 SAP and 2012 for Nos. 7 and 9 SAPs. In any event Mosaic will meet the regulatory deadline of December 31, 2013, for compliance with the BART exemption emission limits.

2.2 Molten Sulfur Storage Tank Nos. 1, 2, and 3 (EU063)

The Molten Sulfur System at the Riverview facility consists of three storage tanks, three covered storage pits, a ship unloading dock, a truck loading station and associated transfer pumps and piping for storage and handling of molten sulfur. Each of the three storage tanks (Nos. 1, 2, and 3) has a capacity of 19,845 tons.

Molten sulfur from ships may be transferred to any combination of the three molten sulfur storage tanks at a combined maximum total of 2,277,081 tons of molten sulfur per any consecutive 12-month period. These tanks transfer molten sulfur to the molten sulfur storage pits at the SAPs and also to the molten sulfur truck loading station.

A wet scrubber is used to control particulate matter (PM) emissions from the molten sulfur storage tanks. PM emissions from the molten sulfur storage tanks and the truck loading station are limited to a total of 0.03 grain per dry standard cubic foot (gr/dscf).

The requested lower SO_2 and SAM emission limits for the Nos. 7, 8 and 9 SAPs will reduce the Riverview BART-eligible sources' contribution to visibility impairment at the Class I areas to less than the exemption threshold of 0.5 dv. Therefore, no changes in control technology or emissions are proposed for the Molten Sulfur System in order to meet the BART exemption requirements.

2.3 Molten Sulfur Storage Pit Nos. 7, 8, and 9 (EU066, EU067, and EU068)

The three molten sulfur storage pits (Nos. 7, 8, and 9) at the Riverview facility are located at the three SAPs, and receive molten sulfur from the molten sulfur storage tanks and/or by truck. Each of the storage pits may receive molten sulfur at a constant rate of 336 tons per hour.

Molten sulfur storage pit Nos. 7, 8, and 9 are each allowed to transfer molten sulfur to SAP Nos. 7, 8, and 9, respectively, at a maximum throughput rate of 492,361 tons per any consecutive 12-month period.

The three molten sulfur storage pits are uncontrolled (i.e., emissions from the pits do not pass through a control device), although they are covered.

The requested lower SO_2 and SAM emission limits for the Nos. 7, 8 and 9 SAPs will reduce the Riverview BART-eligible sources' contribution to visibility impairment at the Class I areas to less than the exemption threshold of 0.5 dv. Therefore, no changes in control technology or emissions are proposed for the Molten Sulfur Storage Pits in order to meet the BART exemption requirements.

TABLE 2-1
SUMMARY OF SAM TEST DATA, MOSAIC RIVERVIEW

Plant	Test Date	H_2SO_4 Production Rate (TPH)	H_2SO_4 Production Rate (TPD)	% of Permitted Rate	H_2SO_4 Emissions (lb/ton of 100% acid) Run 1	Run 2	Run 3	Average
No. 7 SAP	2/10/2000				0.026	0.037	0.032	0.032
No. 7 SAP	3/8/2001	126.3	3,031	94.7%	0.026	0.021	0.024	0.024
No. 7 SAP	3/21/2002	118.5	2,844	88.9%	0.030	0.049	0.044	0.041
No. 7 SAP	6/4/2002				0.023	0.022	0.023	0.023
No. 7 SAP	4/17/2003	128	3,072	96.0%	0.028	0.029	0.064	0.040
No. 7 SAP	5/12/2004	122	2,928	91.5%	0.033	0.038	0.037	0.036
No. 7 SAP	4/14/2005	125	3,000	93.8%	0.042	0.036	0.036	0.038
No. 7 SAP	4/3/2006	116	2,784	87.0%	0.018	0.034	0.021	0.024
No. 7 SAP	7/6/2006	119	2,856	89.3%	0.047	0.039	0.047	0.044
No. 7 SAP	2/22/2007	118	2,832	88.5%	0.014	0.015	0.036	0.022
No. 8 SAP	1/8/2002	110	2,640	97.8%	0.028	0.032	0.037	0.032
No. 8 SAP	1/30/2003	98.3	2,359	87.4%	0.034	0.014	0.043	0.030
No. 8 SAP	2/6/2004	108.7	2,609	96.6%	0.023	0.023	0.026	0.024
No. 8 SAP	2/9/2005	97	2,328	86.2%	0.063	0.063	0.042	0.056
No. 8 SAP	6/24/2005	107	2,568	95.1%	0.050	0.044	0.048	0.047
No. 8 SAP	1/31/2006	110.3	2,647	98.0%	0.024	0.023	0.035	0.027
No. 8 SAP	1/24/2007	92	2,208	81.8%	0.049	0.051	0.045	0.048
No. 9 SAP	2/10/2003	135	3,240	95.3%	0.013	0.045	0.039	0.032
No. 9 SAP	5/6/2004	130.5	3,132	92.1%	0.035	0.045	0.035	0.038
No. 9 SAP	2/9/2006	130	3,120	91.8%	0.024	0.018	0.013	0.018
No. 9 SAP	3/8/2007	136	3,264	96.0%	0.015	0.013	0.014	0.014

TABLE 2-2
CURRENT SULFURIC ACID PLANT TURNAROUND SCHEDULE
MOSAIC RIVERVIEW

PLANT	2008	2009	2010	2011	2012	2013
No. 7 SAP			MAY - Increase catalyst loading; replace cold G-G heat exchanger		NOV - turnaround	
No. 8 SAP		MAY - Replace converter; increase catalyst loading; replace cold G-G heat exchanger and superheater		NOV - turnaround		
No. 9 SAP			FEB - Increase catalyst loading; replace IPA tower with HRS tower		AUG - turnaround	

3.0 BART EXEMPTION ANALYSIS AND RESULTS

A revised BART modeling protocol for the Mosaic Riverview facility is included in Appendix A to this BART Exemption Analysis. The baseline emissions and methodology used for the exemption modeling and the exemption modeling results are presented below.

3.1 Emission Rates

The emission rates used for the initial visibility modeling for the Riverview facility are contained in Table 2-3 of the BART modeling protocol (Protocol), which is included as Appendix A. The initial modeling performed in January 2007 did not include any proposed emission reductions from the SAPs.

3.2 Modeling Methodology

The California Puff (CALPUFF) model, Version 5.756, was used to predict the maximum visibility impairment at the PSD Class I areas located within 300 km of the Mosaic Riverview facility. Recent technical enhancements, including changes to the over-water boundary layer formulation and coastal effects modules (sponsored by the Minerals Management Service), are included in this version. The methods and assumptions used in the CALPUFF model are presented in the Protocol. The 4-km spacing Florida domain was used for the BART exemption. The refined California Meteorological Model (CALMET) domain used for the Mosaic Riverview BART modeling analysis has been provided by FDEP. The major features used in preparing these CALMET data are also described in Section 3.0 of the Protocol.

Currently, atmospheric light extinction is estimated by an algorithm developed by the Interagency Monitoring of Protected Visual Environments (IMPROVE) committee, which was adopted by the EPA under the 1999 Regional Haze Rule (RHR) and is referred to as the "1999 IMPROVE algorithm". This algorithm for estimating light extinction from particle speciation data tends to underestimate light extinction for the highest haze conditions and overestimate it for the lowest haze conditions, and does not include light extinction due to sea salt, which is important at sites near coastal areas. As a result of these limitations, the IMPROVE Steering Committee recently developed a new algorithm (the "new IMPROVE algorithm") for estimating light extinction from PM component concentrations, which provides a better correspondence between measured visibility and

that calculated from PM component concentrations. A detailed description of the new IMPROVE algorithm and its implementation is presented in Section 3.4 of the Protocol.

Both the 1999 IMPROVE algorithm and the new IMPROVE algorithm were used to calculate the natural background light extinction at the Class I areas for the Mosaic Riverview BART modeling analysis. Visibility impacts were predicted at each PSD Class I area using receptors provided by the National Park Service (NPS), as presented in the BART protocol.

3.3 BART Exemption Modeling Results

Summaries of the maximum visibility impairment values for the Mosaic Riverview BART-eligible emissions units estimated using the 1999 IMPROVE algorithm are presented in Tables 3-1 and 3-2. These results are based upon the emission rates presented in Table 2-3 of the Protocol (prior to taking any reductions). The 98th percentile 24-hour average visibility impairment values (i.e., 8th highest) for the years 2001, 2002, and 2003, and the 22nd highest 24-hour average visibility impairment value over the 3 years, are presented in Table 3-1. This table also presents the number of days and receptors for which the visibility impairment was predicted to be greater than 0.5 dv. The eight highest visibility impairment values predicted at the PSD Class I areas for each year is presented in Table 3-2.

As shown in Tables 3-1 and 3-2, the highest 8th highest visibility impairment values predicted for each year at the Everglades NP and the St. Marks NWA PSD Class I areas using the 1999 IMPROVE algorithm are less than 0.5 dv. The 22nd highest visibility impairment values predicted over the 3-year period at these PSD Class I areas are also less than 0.5 dv. However, at the Chassahowitzka NWA, the highest 8th highest visibility impairment value is predicted to be 0.80 dv in 2002, and the 22nd highest visibility impairment value predicted over the 3-year period is 0.77 dv.

Based on the initial modeling results, additional modeling was performed for Chassahowitzka NWA using the new IMPROVE algorithm and the proposed lower SO_2 and SAM emissions for the Nos. 7, 8, and 9 SAPs (see Table 2-4 of the Protocol). The 8th highest visibility impairment values for the Riverview facility BART-eligible emission units, estimated using the new IMPROVE algorithm and the proposed SO_2 and SAM emission rates, are presented in Tables 3-3 and 3-4 for Chassahowitzka NWA.

As shown in Table 3-3, the 8th highest visibility impairment values predicted for each year, using the new IMPROVE algorithm, are lower than 0.5 dv. In addition, as shown in Table 3-4, the 22nd highest

24-hour average visibility impairment value over the 3 years is also less than 0.5 dv. Based on these results, which demonstrate that the maximum visibility impairment values for the Riverview facility are predicted to be less than FDEP's BART exemption criteria of 0.5 dv, an exemption from BART determination is requested for the Mosaic Riverview facility.

Based on these results, the Riverview facility is exempt from the BART requirements. Mosaic is proposing the following emissions limits for the Nos. 7, 8, and 9 SAPs:

- SO_2:
  - No. 7 SAP – 400 lb/hr 24-hour average;
  - No. 8 SAP – 315 lb/hr 24-hour average; and
  - No. 9 SAP – 425 lb/hr 24-hour average.
- SAM:
  - No. 7 SAP – 6.7 lb/hr;
  - No. 8 SAP – 5.6 lb/hr; and
  - No. 9 SAP – 7.1 lb/hr.

These new limits will be demonstrated by the use of existing continuous emission monitoring systems for SO_2 at each of the SAPs, and through annual stack testing for SAM using EPA Method 8.

TABLE 3-1
SUMMARY OF BART EXEMPTION MODELING RESULTS, MOSAIC FERTILIZER, LLC, RIVERVIEW FACILITY
1999 IMPROVE ALGORITHM

Class I Area	Distance from Source to Nearest Class I Area Boundary (km)	Number of Days and Receptors with Visibility Impacts >0.5 dv									22nd Highest Impact (dv) Over 3-Yr Period
		2001			2002			2003			
		No. of Days	No. of Receptors	8th Highest Impact (dv)	No. of Days	No. of Receptors	8th Highest Impact (dv)	No. of Days	No. of Receptors	8th Highest Impact (dv)	
Chassahowitzka NWA	87	15	113	0.665	17	113	0.801	27	113	0.776	0.767
Everglades NP	239	1	6	0.289	5	478	0.402	1	7	0.349	0.349
St. Marks NWA	291	6	101	0.439	3	99	0.360	1	101	0.351	0.396

TABLE 3-2
BART EXEMPTION ANALYSIS RESULTS FOR MOSAIC FERTILIZER, LLC, RIVERVIEW FACILITY
VISIBILITY IMPACT RANKINGS AT CLASS I AREAS
1999 IMPROVE ALGORITHM

Class I Area	Predicted Change in Visibility Impact (dv)			
	Rank	2001	2002	2003
Chassahowitzka NWA	1	1.478	1.750	1.129
	2	1.303	1.689	1.077
	3	0.997	1.101	0.955
	4	0.768	0.927	0.919
	5	0.768	0.869	0.913
	6	0.762	0.848	0.891
	7	0.689	0.811	0.873
	8	0.665	0.801	0.776
St. Marks NWA	1	0.759	0.564	0.656
	2	0.665	0.526	0.434
	3	0.596	0.516	0.432
	4	0.554	0.449	0.406
	5	0.531	0.409	0.394
	6	0.518	0.396	0.372
	7	0.476	0.396	0.364
	8	0.439	0.360	0.351
Everglades NP	1	0.513	0.736	0.524
	2	0.404	0.678	0.460
	3	0.387	0.676	0.416
	4	0.373	0.555	0.384
	5	0.350	0.500	0.376
	6	0.342	0.462	0.369
	7	0.341	0.431	0.352
	8	0.289	0.402	0.349

TABLE 3-3
SUMMARY OF BART EXEMPTION MODELING RESULTS - NEW IMPROVE ALGORITHM
WITH PROPOSED 24-HOUR AVERAGE SO_2 AND H_2SO_4 EMISSION LIMITS FOR THE NOS. 7, 8, AND 9 SAPs
MOSAIC FERTILIZER, LLC, RIVERVIEW FACILITY

Class I Area	Distance from Source to Nearest Class I Area Boundary (km)	Number of Days and Receptors with Visibility Impacts >0.5 dv									22nd Highest Impact (dv) Over 3-Yr Period
		2001			2002			2003			
		No. of Days	No. of Receptors	8th Highest Impact (dv)	No. of Days	No. of Receptors	8th Highest Impact (dv)	No. of Days	No. of Receptors	8th Highest Impact (dv)	
Chassahowitzka NWA	87	8	NA	0.405	11	NA	0.481	16	NA	0.494	0.346

TABLE 3-4
VISIBILITY IMPACT RANKINGS AT THE CNWA - NEW IMPROVE ALGORITHM WITH PROPOSED 24-HOUR AVERAGE SO_2 AND H_2SO_4 EMISSION LIMITS FOR THE NOS. 7, 8, AND 9 SAPs MOSAIC RIVERVIEW FACILITY

Class I Area	Predicted Change in Visibility Impact (dv)			
	Rank	2001	2002	2003
Chassahowitzka NWA	1	0.895	1.065	0.703
	2	0.795	1.058	0.625
	3	0.580	0.649	0.574
	4	0.455	0.541	0.550
	5	0.437	0.533	0.550
	6	0.417	0.533	0.540
	7	0.411	0.502	0.527
	8	0.405	0.481	0.494

4.0 REFERENCES

Guidelines for Best Available Retrofit Technology. Federal Register, Volume 70, pages 39104-39172. August 1, 2005.

OAQPS Cost Control Manual, Fifth Edition, EPA-4531B-96-001. February 1996.

MANE-VU, March 2005. Assessment of Control Technology Options for BART-Eligible Sources; Northeast States for Coordinated Air Use Management, in partnership with the Mid-Atlantic/Northeast Visibility Union.

VISTAS, March 2006. Protocol for the Application of the CALPUFF Model for Analyses of Best Available Control Technology (BART), Revision 2, March 2006.

APPENDIX A

AIR MODELING PROTOCOL TO EVALUATE BART OPTIONS FOR THE MOSAIC RIVERVIEW FACILITY

AIR MODELING PROTOCOL TO EVALUATE BEST AVAILABLE RETROFIT TECHNOLOGY (BART) OPTIONS FOR MOSAIC FERTILIZER RIVERVIEW FACILITY

Prepared For:
Mosaic Fertilizer, LLC
P.O. Box 2000
Mulberry, Florida 33860

Prepared By:
Golder Associates Inc.
6241 NW 23rd Street, Suite 500
Gainesville, Florida 32653-1500

July 2008
063-7643

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1.0 INTRODUCTION

1.1 Objectives

Under the regional haze regulations, contained in Title 40, Part 51 of the Code of Federal Regulations (40 CFR 51), Subpart P – Protection of Visibility, the U.S. Environmental Protection Agency (EPA) has issued final rules and guidelines dated July 6, 2005, for Best Available Retrofit Technology (BART) determinations [Federal Register (FR), Volume 70, pages 39104-39172]. BART applies to certain large stationary sources known as BART-eligible sources. Sources are BART-eligible if they meet the following three criteria:

- Contains emissions units that are one of the 26 listed source categories in the guidance;
- Contains emissions units that were put in place between August 7, 1962 and August 7, 1977; and
- Potential emissions from these emissions units of at least 250 tons per year (TPY) of a visibility-impairing pollutant [sulfur dioxide (SO_2), nitrogen oxides (NO_x), and direct particulate matter of size equal to or less than 10 microns (PM_{10})].

The Florida Department of Environmental Protection (FDEP) has adopted EPA's visibility protection rules and guidelines contained in 40 CFR 51, Subpart P. FDEP's BART Rules are described in 62-296.340 of the Florida Administrative Code (F.A.C.), effective January 31, 2007.

The basic tenet of the regional haze program is the achievement of natural visibility conditions in Prevention of Significant Deterioration (PSD) Class I areas by the year 2064. Florida has four PSD Class I areas while Georgia has two PSD Class I areas that can be affected by Florida sources [i.e., located in Florida or within 300 kilometers (km) of Florida].

BART is required for any BART-eligible source that FDEP determines emits any air pollutant that may "reasonably be anticipated to cause or contribute to any impairment of visibility in any Class I area." The BART guidelines establish a threshold value of 0.5 deciview (dv) for any single source for determining whether the source contributes to visibility impairment.

FDEP has identified Mosaic Fertilizer, LLC's Riverview facility (Facility ID 0570008) as a BART-eligible source with multiple BART-eligible emissions units.

Throughout this protocol the terms "source" and "facility" have the same meanings. The term "BART-eligible emissions unit" is defined as any single emissions unit that meets the criteria described above, except for the 250 TPY criterion, which applies to the entire BART-eligible source. A "BART-eligible source" is defined as the collection of all BART-eligible emissions units at a single facility. If a source has several emissions units, only those that meet the BART-eligible criteria are included in the definition of "BART-eligible source."

FDEP requires that the California Puff (CALPUFF) modeling system be used to determine visibility impacts from BART-eligible sources at the PSD Class I areas. A source-specific modeling protocol is required to be submitted by the affected sources to FDEP for review and approval.

The BART application for Mosaic Riverview, which was submitted to FDEP in January 2007, included a source-specific modeling and also a modeling protocol for all the BART-eligible Mosaic facilities. The protocol described the modeling procedures followed for performing the air modeling and included site-specific data for Mosaic's BART-eligible emissions units. The site-specific data included emissions unit locations, stack parameters, emission rates, and PM_{10} speciation information.

This revised protocol includes only the Riverview facility, and is for the purpose of demonstrating that the Riverview facility meets the BART facility exemption criteria. The Protocol reflects proposed lower emission limits for the Sulfuric Acid Plant (SAP) Nos. 7, 8, and 9 at the facility.

For guidance in preparing the air modeling protocol, the Visibility Improvement State and Tribal Association of the Southeast (VISTAS) has developed a "common" modeling protocol outline that describes the recommended procedures for performing a visibility impairment analysis under the BART regulations [see *Protocol for the Application of the CALPUFF Model for Analyses of Best Available Retrofit Technology (BART)*, December 22, 2005 (Revision 3-2 – August 31, 2006)]. This modeling protocol for the Mosaic Riverview facility follows the general procedures recommended by VISTAS.

1.2 Location of Source

An area map showing the Mosaic Riverview facility and PSD Class I areas within 300 km of each facility is presented in Figure 1-1. The PSD Class I areas and their distances from the Riverview facility are as follows:

- Mosaic Riverview — Chassahowitzka NWA – 87 km
  Everglades NP – 239 km
  St. Marks NWA – 291 km

The general location of the Mosaic Riverview facility is 362.9 km east and 3,082.5 km north in Universal Transverse Mercator (UTM) Zone 17. Physically the Riverview facility is located at 8813 US Hwy 41 South in Riverview, Hillsborough County.

1.3 Source Impact Evaluation Criteria

The common BART modeling protocol describes the application of the CALPUFF modeling system for two purposes:

- Air quality modeling to determine whether a BART-eligible source is "subject to BART" – to evaluate whether a BART-eligible source is exempt from BART controls because it is not reasonably expected to cause or contribute to impairment of visibility in Class I areas, and
- Air quality modeling of emissions from sources that have been found to be subject to BART – to evaluate regional haze benefits of alternative control options and to document the benefits of the preferred option.

The common BART protocol identifies the first activity as the "BART exemption analysis" and the second activity as the "BART control analysis."

The final BART rule (70 FR 39118) states that the proposed threshold at which a source may "contribute" to visibility impairment should not be higher than 0.5 dv, and has also been adopted by FDEP (Rule 62-296.340, F.A.C.).

Based on VISTAS' recommendations regarding BART exemption analysis, "initial screening" and "refined" analyses can be performed to determine whether a BART-eligible source is subject to or exempt from BART. The initial screening analysis, which is based on a coarse scale 12-km regional VISTAS domain, is optional and answers two questions – whether (a) a particular source may be

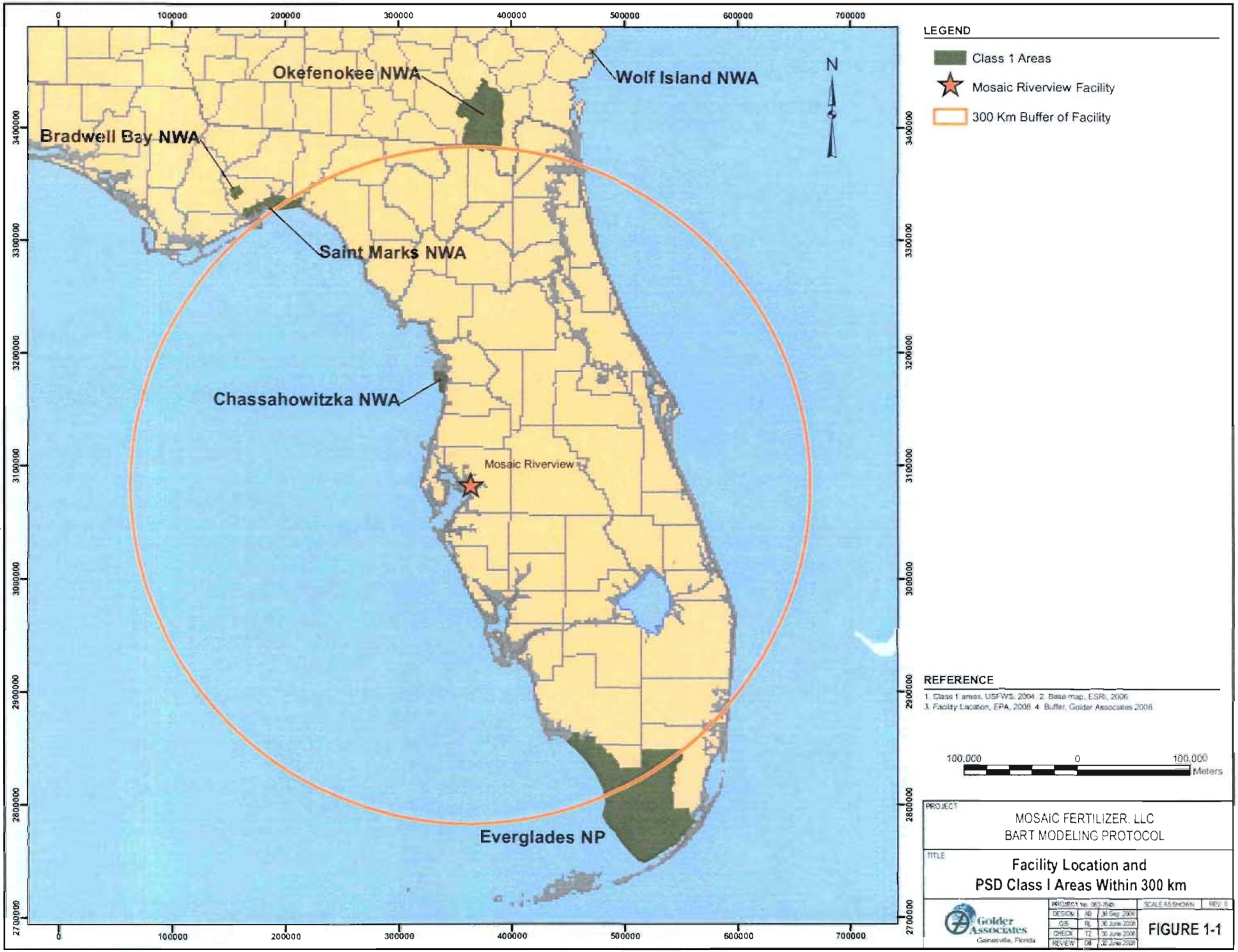
exempted from further BART analyses and (b) if refined (finer grid) CALPUFF analyses were to be undertaken, which Class I areas should be included.

For the screening analysis, the highest predicted 24-hour impairment value is compared to the 0.5 dv criteria. If the highest predicted impacts are found to be less than 0.5 dv, no further analysis is required. But if the highest impact is predicted to be greater than 0.5 dv, then a refined, finer grid, analysis may be performed.

The refined analysis, which is based on a finer grid subregional California Meteorological Model (CALMET) domain, is the definitive test for whether a source is subject to BART. In the refined analysis, the 98th percentile, i.e., the 8th highest 24-hour average visibility impairment value in 1 year or the 22nd highest 24-hour average visibility impairment value over 3 years combined, whichever is higher, is compared to the 0.5-dv exemption criterion.

The screening analysis is optional for large sources that will clearly exceed the initial screening thresholds or sources that are very close to the Class I areas, which will be better analyzed by a finer grid resolution. For the Mosaic Riverview BART analyses, only the refined analysis will be performed to determine whether the facility is exempt from BART. All Class I areas within 300 km will be included in the refined modeling analysis and modeling results will be presented for each evaluated Class I area.

If the BART exemption analysis reveals that the BART-eligible source is subject to BART control analysis, part of the BART review process involves evaluating the visibility benefits of different BART control measures. These benefits will be determined by the refined analysis, where CALPUFF will be executed with the baseline emission rates and again with emission rates reflective of BART control options.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Okefenokee NWA
Wolf Island NWA
Bradwell Bay NWA
Saint Marks NWA
Chassahowitzka NWA
Mosaic Riverview
Everglades NP
N
LEGEND
Class 1 Areas
Mosaic Riverview Facility
300 Km Buffer of Facility
REFERENCE
1. Class 1 areas, USFWS, 2004. 2. Base map, ESRI, 2006.
3. Facility Location, EPA, 2008. 4. Buffer, Golder Associates 2008
100,000
0
100,000
Meters
PROJECT
MOSAIC FERTILIZER, LLC
BART MODELING PROTOCOL
TITLE
Facility Location and
PSD Class I Areas Within 300 km
Golder Associates
Gainesville, Florida
PROJECT No. 063-7540
SCALE AS SHOWN
REV. 0
DESIGN AB 28 Sept. 2006
GIS RL 30 June 2008
CHECK TZ 30 June 2008
REVIEW DR 30 June 2008
FIGURE 1-1

2.0 SOURCE DESCRIPTION

2.1 Source Applicability

FDEP published a list of potential BART-eligible sources (updated January 11, 2007), which is based on a survey questionnaire sent by FDEP to selected facilities in Florida on November 4, 2002 and April 18, 2003. The FDEP list contains 12 potential BART-eligible emissions units at the Riverview facility. The Riverview facility is on the FDEP list since it is one of the 26 major source categories identified in the BART regulation (phosphate rock processing plants or chemical process plants) and has potential emissions of visibility impairment pollutants [i.e., SO_2, NO_x, and particulate matter (PM)] from its BART-eligible emissions units that are greater than 250 TPY.

From detailed information obtained from Mosaic, a BART-eligibility analysis was performed to verify the applicability of the BART rule to the facilities as well as the list of BART-eligible units at each facility. This analysis consisted of a three-step procedure.

First, each facility is a BART-eligible source since it is classified under the source category of "Phosphate Rock Processing Plants" or "Chemical Process Plants".

Second, each emissions unit and each facility was reviewed to determine which units met the date requirements for a BART-eligible unit. For each emissions unit, it was determined which units began operation after August 7, 1962, and also were in existence on August 7, 1977.

Third, if an emissions unit met the date requirements for BART eligibility, the potential emissions of visibility impairing pollutants from each unit were identified. At present, the visibility impairing pollutants include SO_2, NO_x, and PM_{10}. Other potential visibility impairing pollutants, such as volatile organic compounds (VOCs) and ammonia, have been determined by FDEP to have no significant effect on regional haze in Florida.

Based on this analysis, a revised list of BART-eligible emissions units at the Mosaic Riverview facility was prepared, which is presented in Table 2-1. As shown in this table, the potential annual SO_2, NO_x, and PM_{10} emissions from the BART-eligible emissions units total more than 250 TPY for each pollutant. Because the emissions of one or more pollutants are greater than the 250 TPY threshold, all of these pollutants will be included in the visibility impairment assessment for the facility. Since PM_{10} emissions from the non-fugitive emissions units are greater than 250 TPY, it is not necessary to quantify fugitive PM emissions from the BART-eligible emissions units for source

applicability under the BART regulation. Only the visibility impairing pollutants of SO_2, NO_x, and PM_{10} are required to be included in the visibility modeling analysis. Therefore, BART-eligible emissions units that do not emit these pollutants will not be included in the modeling analysis. In addition, FDEP is not requiring fugitive emissions to be included in the modeling unless the source is relatively close (i.e., 50 km) to a PSD Class I area.

Based on discussions with FDEP, if a BART-eligible emissions unit does not emit SO_2, NO_x, or PM_{10}, the emissions unit is not required to undergo a BART control technology determination. Also, if a facility is more than 50 km from the nearest PSD Class I area, fugitive PM emissions from BART-eligible emissions units are not required to undergo BART control evaluation.

2.2 Stack Parameters

The stack height above ground, stack diameter, exit velocity, and exit temperature for the BART-eligible emissions units at the Mosaic Riverview facility are presented in Table 2-2. The facility location is provided in UTM coordinates and in the VISTAS domain Lambert Conformal Conic (LCC) coordinate system.

2.3 Emission Rates for Visibility Impairment Analyses

The EPA BART guidance indicates that the emission rate to be used for BART modeling is the highest 24-hour actual emission rate representative of normal operations for the modeling period. Depending on the availability of the source data, the source emissions information should be based on the following in order of priority, based on the BART common protocol:

- 24-hour maximum emissions based on continuous emission monitoring (CEM) data for the period 2001-2003,
- Facility stack test emissions,
- Potential to emit,
- Allowable permit limits, and
- AP-42 emission factors.

Emission rates for each emissions unit based on this hierarchy are presented in Table 2-3. However, Mosaic is proposing to lower the 24-hour average SO_2 and sulfuric acid mist emission rates from the SAP Nos. 7, 8, and 9 (EUs 003, 004, and 005). The emission rates to be used in the visibility

impairment analyses, which include the proposed 24-hour emissions limits for the SAPs, are presented in Table 2-4.

2.4 PM Speciation

Based on the latest regulatory guidance, PM emissions by size category need to be considered in the appropriate species for the visibility analysis. The effect that each species has on visibility impairment is related to a parameter called the extinction coefficient. The higher the extinction coefficient, the greater the species' effect on visibility. Filterable PM is speciated into coarse (PMC), fine (PMF), and elemental carbon (EC), with default extinction efficiencies of 0.6, 1.0, and 10.0, respectively. PMC is PM with aerodynamic diameter between 10 microns and 2.5 microns. Both EC and PMF have aerodynamic diameters equal to or less than 2.5 microns. Condensable PM is composed of inorganic PM such as sulfate (SO_4) and organic PM such as secondary organic aerosols (SOA). The extinction efficiencies for these species are 3*f(RH) and 4, respectively, where f(RH) is the relative humidity factor.

As shown in Table 2-1, total PM_{10} emissions from the BART-eligible emissions units at the Riverview facility are much lower than the SO_2 emissions. Since PM_{10} emissions are much lower than SO_2 emissions, and the PM speciation profiles for the major PM emission sources are not known, as a conservative approach, all PM_{10} emissions will be considered as organic PM with extinction efficiency of 4.0. Sulfuric acid (H_2SO_4) mist emissions from the SAPs will be considered as inorganic condensable PM and will be modeled as SO_4 with the extinction efficiency of 3*f(RH).

2.5 Building Dimension

Based on discussions with FDEP, building downwash effects will not be considered in the modeling because these effects are considered to be minimal in assessing impacts as the distance of the nearest PSD Class I area, which is more than 50 km from the Mosaic Riverview facility.

TABLE 2-1
BART ELIGIBILITY ANALYSIS FOR MOSAIC RIVERVIEW
FACILITY ID 0570008

EU ID	Emission Unit	BART Category [a]	Dates		In Existence on 8/7/1977 ?	Began Operation After 8/7/1962 ?	Meets BART Date Criteria ?	SO_2, NO_x, or PM Source ?	BART Eligible ?	Potential Emissions [b]			Comments
			Start-Up Date	Initial Construction Date	(Yes/No)	(Yes/No)	(Yes/No)	(Yes/No)	(Yes/No)	SO_2 (TPY)	NO_x (TPY)	PM_{10} (TPY)	
004	No. 7 Sulfuric Acid Plant	13	--	1974	Yes	Yes	Yes	Yes	Yes	2,044.0	--	--	
005	No. 8 Sulfuric Acid Plant	13	--	1974	Yes	Yes	Yes	Yes	Yes	1724.6	--	--	
006	No. 9 Sulfuric Acid Plant	13	--	1974	Yes	Yes	Yes	Yes	Yes	2171.8	--	--	
007	DAP Manufacturing Plant	13	--	10/23/1978	No	Yes	No	--	NO	--	--	--	Did not exist on 8/7/1977
008	GTSP Ground Rock Handling	13	--	--	--	--	--	--	--	--	--	--	Shut down [c]
022	No. 3 MAP Plant	13	--	--	--	--	--	--	--	--	--	--	Shut down [d]
023	No. 4 MAP Plant	13	--	--	--	--	--	--	--	--	--	--	Shut down [d]
024	South Cooler	13	--	--	--	--	--	--	--	--	--	--	Shut down [d]
034	Phosphate Rock Railcar/Truck Unloading System	13	--	--	--	--	--	--	--	--	--	--	Shut down [c]
041	Sodium Silicofluoride/Sodium Fluoride Plant Dryer	13	--	--	--	--	--	--	--	--	--	--	Shut down [c]
043	Auxiliary Steam Boiler	13	--	12/27/1977	No	Yes	No	--	NO				Did not exist on 8/7/1977
051	West Bag Filter	13	--	8/31/1977	No	Yes	No	--	NO	--	--	--	Did not exist on 8/7/1977
052	South Baghouse	13	--	8/31/1977	No	Yes	No	--	NO	--	--	--	Did not exist on 8/7/1977
053	Vessel Loading System -- Tower Baghouse Exhaust	13	--	11/2/1987	No	Yes	No	--	NO				Did not exist on 8/7/1977
054	Sodium Silicofluoride/Sodium Fluoride Plant Handling	13	--	--	--	--	--	--	--	--	--	--	Shut down [c]
055	No. 5 DAP Plant	13	--	1980	No	Yes	No	--	NO	--	--	--	Did not exist on 8/7/1977
058	Building #6 Belt to Conveyor #7 Transfer Point	13	--	11/2/1987	No	Yes	No	--	NO	--	--	--	Did not exist on 8/7/1977
059	Conveyor #7 to Conveyor #8 Transfer Point with Baghouse	13	--	11/2/1987	No	Yes	No	--	NO	--	--	--	Did not exist on 8/7/1977
060	Conveyor #8 to Conveyor #9 Transfer Point with Baghouse	13	--	11/2/1987	No	Yes	No	--	NO	--	--	--	Did not exist on 8/7/1977
061	East Vessel Loading Facility -- Shiphold/Chokefeed	13	--	11/2/1987	No	Yes	No	--	NO	--	--	--	Did not exist on 8/7/1977
063	TANK Nos. 1, 2, and 3 for molten sulfur storage w/scrubber	13	--	<8/7/77	Yes	Yes	Yes	Yes	Yes	--	--	1.02	
066	Molten Sulfur Storage and Handling System -- Pit #7	13	--	<8/7/77	Yes	Yes	Yes	Yes	Yes	--	--	1.02	
067	Molten Sulfur Storage and Handling System -- Pit #8	13	--	<8/7/77	Yes	Yes	Yes	Yes	Yes	--	--	1.02	
068	Molten Sulfur Storage and Handling System -- Pit #9	13	--	<8/7/77	Yes	Yes	Yes	Yes	Yes	--	--	1.02	
070	GTSP Storage Building No. 2	13	--	--	--	--	--	--	--	--	--	--	Shut down [c]
071	GTSP Storage Building No. 4	13	--	--	--	--	--	--	--	--	--	--	Shut down [c]
072	GTSP Truck Loading Station	13	--	--	--	--	--	--	--	--	--	--	Shut down [c]
073	Phosphoric Acid Production Facility	13	--	--	Yes	Yes	Yes	No	Yes	--	--	--	Not a SO_2, NO_x, or PM source
074	Molten Sulfur Storage and Handling System -- Truck Load Stn	13	--	1994	No	Yes	No	--	NO	--	--	--	Did not exist on 8/7/1977
078	Animal Feed Ingredient (AFI) Plant No. 1	13	--	1994	No	Yes	No	--	NO	--	--	--	Did not exist on 8/7/1977
079	Diatomaceous Earth Silo	13	--	1994	No	Yes	No	--	NO	--	--	--	Did not exist on 8/7/1977
080	Limestone Silo	13	--	1994	No	Yes	No	--	NO	--	--	--	Did not exist on 8/7/1977
081	Animal Feed Plant Loadout System	13	--	1994	No	Yes	No	--	NO	--	--	--	Did not exist on 8/7/1977
100	Raymond Mill No. 5	13	--	--	--	--	--	--	--	--	--	--	Shut down [c]
101	Raymond Mill No. 9	13	--	--	--	--	--	--	--	--	--	--	Shut down [c]
102	Ground Rock Handling/Storage System	13	--	--	--	--	--	--	--	--	--	--	Shut down [c]
103	Animal Feed Ingredient Plant No. 2	13	--	Nov-01	No	Yes	No	Yes	NO	--	--	--	Did not exist on 8/7/1977
104	Phosphogypsum Stack	13	--	--	Yes	Yes	Yes	No	Yes	--	--	--	Not a SO_2, NO_x, or PM source
106	No. 7 Rock Drying/Grinding Mill	13	--	--	--	--	--	--	--	--	--	--	Shut down [c]
108	Phosphogypsum Stack (no 2)	13	--	--	No	Yes	No	--	NO	--	--	--	Did not exist on 8/7/1977
									Total TPY =	5,940.4	0.0	4.1	

[a] BART Category 13 is "Phosphate Rock Processing Plants."

[b] Permit No. 0570008-045-AV and 0570008-036-AC/PSD-FL-315.

[c] Source has been permanently shutdown per Permit No. 0570008-045-AV.

[d] Shutdown in September 2004; request to remove from Title V permit made in Construction permit application dated June 2007.

TABLE 2-2
SUMMARY OF STACK AND OPERATING PARAMETERS AND LOCATIONS FOR THE BART-ELIGIBLE EMISSIONS UNITS
MOSAIC RIVERVIEW

			Stack Parameters[a]				Operating Parameters[a]				
			Height		Diameter		Flow Rate	Exit Temperature		Velocity	
EU ID	Emission Unit	Model ID	ft	m	ft	m	(acfm)	°F	K	ft/s	m/s
004	No. 7 Sulfuric Acid Plant	NO7SAP	150	45.72	7.5	2.29	122,000	170	349.8	46.0	14.03
005	No. 8 Sulfuric Acid Plant	NO8SAP	150	45.72	8.0	2.44	105,000	150	338.7	34.8	10.61
006	No. 9 Sulfuric Acid Plant	NO9SAP	150	45.72	9.0	2.74	149,000	152	339.8	39.0	11.90
063	Molten Sulfur Storage Tank Nos. 1, 2, and 3	MSSKTL	33	10.06	0.83	0.25	665	110	316.5	20.5	6.24
66,67,68	Molten Sulfur Storage and Handling -- Pits 7, 8, 9 [b]	MSPITS	6	1.83	0.58	0.18	--	70	294.3	0.3	0.1

[a] Stack and operating parameters from PSD Permit Application for facility expansion, May 2001.

Note: All emissions units will be collocated for the purpose of modeling. The facility coordinates are as follows:

UTM Coordinates: Zone 17, 362.9 km East, 3,082.5 km North.

Lat/Long: 27° 51' 28" North, 82° 23' 15" West.

Lambert Conformal Conic (LCC) coordinate, VISTAS Domain: 1,448.7 km, -1,233.5 km.

[b] Modeled as volume sources. Dimensions are based on methods presented in accordance with AERMOD User's Manual, and are as follows:

Physical Dimensions (ft		Model Dimensions (ft)		
Height (H)	Width (W)	Height (H or H/2)	Sigma Y (W/4.3)	Sigma Z (H/2.15)
8.0	210.0	8.0	48.8	3.72

TABLE 2-3
SUMMARY OF MAXIMUM 24-HOUR AVERAGE EMISSION RATES BASED ON BART COMMON PROTOCOL
MOSAIC RIVERVIEW

Source	EU ID	Model ID	PM_{10} lb/hr	NO_x lb/hr	SO_2 lb/hr	H_2SO_4 lb/hr
No. 7 Sulfuric Acid Plant	004	NO7SAP	--	16.0 [b]	467.0 [a]	16.0 [a]
No. 8 Sulfuric Acid Plant	005	NO8SAP	--	13.5 [b]	393.8 [c]	11.3 [c]
No. 9 Sulfuric Acid Plant	006	NO9SAP	--	17.0 [b]	495.8 [c]	14.2 [c]
Molten Sulfur Storage Tank Nos. 1, 2, and 3	063	MSTKTL	0.28 [b]	--	3.34 [b]	--
Molten Sulfur Storage and Handling -- Pits 7, 8, 9	66,67,68	MSPITS	1.31 [b]	--	0.13 [b]	--

[a] Based on permit limit in permit No. 0570008-045-AV

[b] Based on PSD permit application for facility expansion dated May, 2001.

[c] Based on permit limit in permit No. 0570008-036-AC/PSD-FL-315

TABLE 2-4
SUMMARY OF 24-HOUR AVERAGE EMISSION RATES INCLUDING PROPOSED EMISSION LIMITS USED IN BART MODELING
MOSAIC RIVERVIEW

Source	EU ID	Model ID	PM_{10} lb/hr	NO_x lb/hr	SO_2 lb/hr	H_2SO_4 lb/hr
No. 7 Sulfuric Acid Plant	004	NO7SAP	--	16.0 [b]	400.0 [a]	6.7 [a]
No. 8 Sulfuric Acid Plant	005	NO8SAP	--	13.5 [b]	315.0 [a]	5.6 [a]
No. 9 Sulfuric Acid Plant	006	NO9SAP	--	17.0 [b]	425.0 [a]	7.1 [a]
Molten Sulfur Storage Tank Nos. 1, 2, and 3	063	MSTKTL	0.28 [b]	--	3.34 [b]	--
Molten Sulfur Storage and Handling -- Pits 7, 8, 9	66,67,68	MSPITS	1.31 [b]	--	0.13 [b]	--

[a] Based on proposed limit.

[b] Based on PSD permit application for facility expansion dated May, 2001.

3.0 GEOPHYSICAL AND METEOROLOGICAL DATA

3.1 Modeling Domain and Terrain

CALMET data sets have been developed by EarthTech, Inc. that are based on the following 3 years of Fifth Generation Mesoscale Model (MM5) meteorological data assembled by VISTAS:

- 2001 MM5 data set at 12 km grid (developed by EPA),
- 2002 MM5 data set at 12 km grid (developed by VISTAS), and
- 2003 MM5 data set at 36 km grid (developed by Midwest Regional Planning Organization).

For the finer grid modeling analysis (refined analysis), the 4-km spacing Florida CALMET domain will be used. VISTAS has prepared a total of five sub-regional 4-km spacing CALMET domains. Domain 2 covers all Florida sources and Class I areas that can be potentially affected by the Florida sources.

Golder Associates Inc. (Golder) obtained these data sets from FDEP. As indicated in Section 1.3 of this protocol, the exemption modeling will be based on the finer grid modeling since the Mosaic Riverview facility is a large source that is likely to exceed the initial screening thresholds. Therefore, for the Riverview BART analyses, only the refined analysis will be performed to determine whether the source is exempt from BART.

3.2 Land Use and Meteorological Database

The CALMET meteorological domains to be used in the exemption modeling have been supplied by VISTAS. The CALMET data sets contain meteorological data and land use parameters for the three-dimensional modeling domain.

3.3 Air Quality Database

3.3.1 Ozone Concentrations

For these analyses, observed ozone data for 2001-2003 from CASTNet and Aerometric Information Retrieval System (AIRS) stations will be used. These data sets have been obtained from EarthTech's website as recommended by FDEP.

3.3.2 Ammonia Concentrations

A fixed monthly background ammonia concentration of 0.5 parts per billion (ppb) will be used based on FDEP's recommendation.

3.4 Natural Conditions at Class I Area

Based on VISTAS' recommendation, Visibility Method 6 will be used in all BART-related modeling, which computes extinction coefficients for hygroscopic species (modeled and background) using a monthly f(RH) in lieu of calculating hourly RH factors. Monthly RH values from Table A-3 of EPA's *Guidance for Estimating Natural Visibility Conditions under the Regional Haze Rule* (Haze Guideline) will be used. Monthly RH factors for the Class I areas within 300 km of the Mosaic facilities are as follows:

Month	Chassahowitzka NWA	Everglades NP	St. Marks NWA
January	3.8	2.7	3.7
February	3.5	2.6	3.4
March	3.4	2.6	3.4
April	3.2	2.4	3.4
May	3.3	2.4	3.5
June	3.9	2.7	4.0
July	3.9	2.6	4.1
August	4.2	2.9	4.4
September	4.1	3.0	4.2
October	3.9	2.8	3.8
November	3.7	2.6	3.7
December	3.9	2.7	3.8

Method 6 requires input of natural background (BK) concentrations of ammonium sulfate ($BKSO_4$), ammonium nitrate ($BKNO_3$), coarse particulates (BKPMC), organic carbon (BKOC), soil (BKSOIL), and elemental carbon (BKEC) in micrograms per cubic meter ($\mu g/m^3$). The model then calculates the natural background light extinction and haze index (HI) based on these values.

According to FDEP recommendations, the natural background light extinction may be based on HI values (in dv) for either the annual average or the 20-percent best visibility days provided by EPA in Appendix B of the Haze Guideline document (using the 10^{th} percentile HI value). For Mosaic's BART analysis, the annual average HI values will be used to determine natural background light extinction of the Class I areas. The light extinction coefficient in inverse megameters (Mm^{-1}) is based on the concentration of the visibility impairing components and the extinction efficiency, in square meters per gram (m^2/g), for each component.

Per VISTAS and FDEP recommendations, the natural background light extinction that is equivalent to EPA-provided background HI values for each Class I area, based on the annual average, will be estimated using the following background values:

- Rayleigh scattering = 10 Mm^{-1};
- Concentrations of $BKSO_4$, $BKNO_3$, BKPMC, BKOC, and BKEC = 0.0; and
- BKSOIL concentration, which is estimated from the extinction coefficient that corresponds to EPA's HI value (corresponding to annual average) and then subtracting the Rayleigh scattering of 10 Mm-1 (assumes that the extinction efficiency of soil is 1 m^2/g).

According to Appendix B of the Haze Guideline document document, the annual average background light extinction coefficient for each PSD Class I area and corresponding calculated BKSOIL concentrations are as follows:

- Chassahowitzka NWA – 21.45 Mm^{-1} (equivalent to 7.63 dv); 11.45 $\mu g/m^3$
- Everglades NP – 20.77 Mm^{-1} (equivalent to 7.31 dv); 10.77 $\mu g/m^3$
- St. Marks NWA – 21.53 Mm^{-1} (equivalent to 7.67 dv); 11.53 $\mu g/m^3$

Currently, the atmospheric light extinction is estimated by an algorithm developed by the Interagency Monitoring of Protected Visual Environments (IMPROVE) committee, which was adopted by the EPA under the 1999 Regional Haze Rule (RHR). This algorithm for estimating light extinction from particle speciation data tends to underestimate light extinction for the highest haze conditions and overestimate it for the lowest haze conditions and does not include light extinction due to sea salt, which is important at sites near the sea coasts. As a result of these limitations, the IMPROVE Steering Committee recently developed a new algorithm (the "new IMPROVE algorithm") for estimating light extinction from particulate matter component concentrations, which provides a better correspondence between measured visibility and that calculated from particulate matter component concentrations.

The new algorithm splits the total sulfate, nitrate, and organic carbon compound concentrations into two fractions, representing small and large size distributions of those compounds. New terms added to the algorithm are light absorption by NO_2 gas and light scattering due to fine sea salt accompanied by its own hygroscopic scattering enhancement factor and Class I area specific Rayleigh scattering values rounded off to the nearest whole number. The EPA and the Federal Land Managers (FLMs) from the National Park Service and the U.S. Fish and Wildlife Service have determined that adding site-specific data (e.g., sea salt and site-specific Rayleigh scattering) to the old IMPROVE algorithm, for a hybrid approach, is not recommended and is allowing the optional use of the new IMPROVE algorithm.

Because one or more of the Class I areas within 300 km of the Mosaic Riverview facility are located near the sea coast, the new IMPROVE algorithm may additionally be used to calculate the natural background at these Class I areas. The new IMPROVE algorithm accounts for the background sea salt concentrations and site-specific Rayleigh scattering. Since the new IMPROVE equation cannot be directly implemented using the existing version of the CALPUFF model without additional post-processing or model revision, VISTAS has developed a methodology for implementing the new IMPROVE equation using existing CALPUFF/CALPOST output in a spreadsheet. This spreadsheet, known as the CALPOST-IMPROVE processor, will be used to re-calculate visibility impacts due to Mosaic Riverview's BART-eligible units in addition to the visibility impacts determined using the old IMPROVE equation.

It is assumed that ambient NO_2 concentrations due to Mosaic's BART eligible units would be very small, as to cause negligible light absorption. Therefore, light absorption by NO_2 gas, which is a new term added to the new IMPROVE algorithm, will not be considered for Mosaic Riverview's BART modeling analysis. The following Class I area specific Rayleigh scattering (in Mm^{-1}) and sea salt concentrations (in $\mu g/m^3$) values will be used to evaluate the visibility impacts using the new CALPOST-IMPROVE processor:

- Chassahowitzka NWA – 11 Mm^{-1} ; 0.08 $\mu g/m^3$
- Everglades NP – 11 Mm^{-1} ; 0.31 $\mu g/m^3$
- St. Marks NWA – 11 Mm^{-1} ; 0.03 $\mu g/m^3$

4.0 AIR QUALITY MODELING METHODOLOGY

For predicting maximum visibility impairment at the Class I Area, the CALPUFF modeling system will be used. For BART-related visibility impact assessments, Version 5.756 (060725) of the CALPUFF model is recommended for use by EPA and VISTAS. Recent technical enhancements, including changes to the over-water boundary layer formulation and coastal effects modules (sponsored by the Minerals Management Service), are included in this version. The CALPUFF model is a non-steady-state long-range transport Lagrangian puff dispersion model applicable for estimating visibility impacts. The methods and assumptions used in the CALPUFF model will be based on the latest recommendations for CALPUFF analysis as presented in the VISTAS modeling protocol, Interagency Workgroup on Air Quality Models (IWAQM) Phase 2 Summary Report and the Federal Land Managers' Air Quality Related Values Work Group (FLAG) document. This model is also maintained by EPA on the Support Center for Regulatory Air Models (SCRAM) website.

4.1 Modeling Domain Configuration

The 4-km spacing Florida domain will be used for the BART exemption modeling and if required, modeling to evaluate visibility benefits of different BART control measures. VISTAS has prepared five sub-regional 4-km spacing CALMET domains. Domain 2 covers sources in Florida and Class I areas that are affected by the sources in Florida.

4.2 CALMET Meteorological Domain

The refined CALMET domain to be used for the Mosaic BART modeling has been provided by FDEP. The major features used in preparing these CALMET data are described in Section 4.0 of the VISTAS BART modeling protocol.

4.3 CALPUFF Computational Domain and Receptors

The computational domain to be used for the refined modeling will be equal to the full extent of the meteorological domain. Visibility impacts will be predicted at each PSD Class I area using receptor locations provided by the FLMs. The receptors to be used for each of the PSD Class I areas are presented in Figures 4-1 through 4-3.

4.4 CALPUFF Modeling Options

The major CALPUFF modeling options recommended in the IWAQM guidance (EPA, 1988; Pages B-1 through B-8), in addition to the recommendations in Section 4.3.3 of the VISTAS BART modeling protocol, will be used. An example CALPUFF input file showing the default modeling options and modeling options to be used for Mosaic Riverview's BART analysis is presented in Attachment A.

4.5 Light Extinction and Haze Impact Calculations

The CALPOST program will be used to calculate the light extinction and the haze impact. The Method 6 technique, which is recommended by the BART guidance, will be used to compute change in light extinction.

4.6 Quality Assurance and Quality Control (QA/QC)

Quality assurance procedures will be established to ensure that the setup and execution of the CALPUFF model and processing of the modeling results satisfy the regulatory objectives of the BART program. The meteorological datasets to be used in the modeling were developed and provided by VISTAS and therefore, no further QA will be required for these.

The CALPUFF modeling options are described in Section 4.4. The site-specific source data will be independently confirmed by an independent modeler not involved in the initial setup of the modeling files. The verification will include:

- Units of measure;
- Verification of the correct source and receptor locations, including datum and projection;
- Confirmation of the switch selections relative to modeling guidance;
- Checks of the program switches and file names of the various processing steps; and
- Confirmation of the use of the proper version and level of each model program.

In addition, all the data and program files needed to reproduce the modeling results will be supplied with the modeling report.

The source and emission data will be independently verified by Golder and Mosaic. The source coordinates and related projection/datum parameters will be checked using the CALPUFF GUI's COORDS software and other comparable coordinate translation software such as CORPSCON and National Park Services Conversion Utilities software.

The POSTUTIL and CALPOST post-processor input files will be carefully checked to make sure of the following:

- Appropriate CALPUFF concentrations files are used in the POSTUTIL run;
- The PM species categories are computed using the appropriate fractions;
- Background light extinction computation method selected as Method 6;
- Correct monthly relative humidity adjustment factors used for the appropriate Class I area;
- Background light extinction values as described in Section 3.4 of this protocol;
- Appropriate species names for coarse and fine PM;
- Appropriate Rayleigh scattering term used; and
- Appropriate Class I receptors selected for each Class I area-specific CALPOST run.

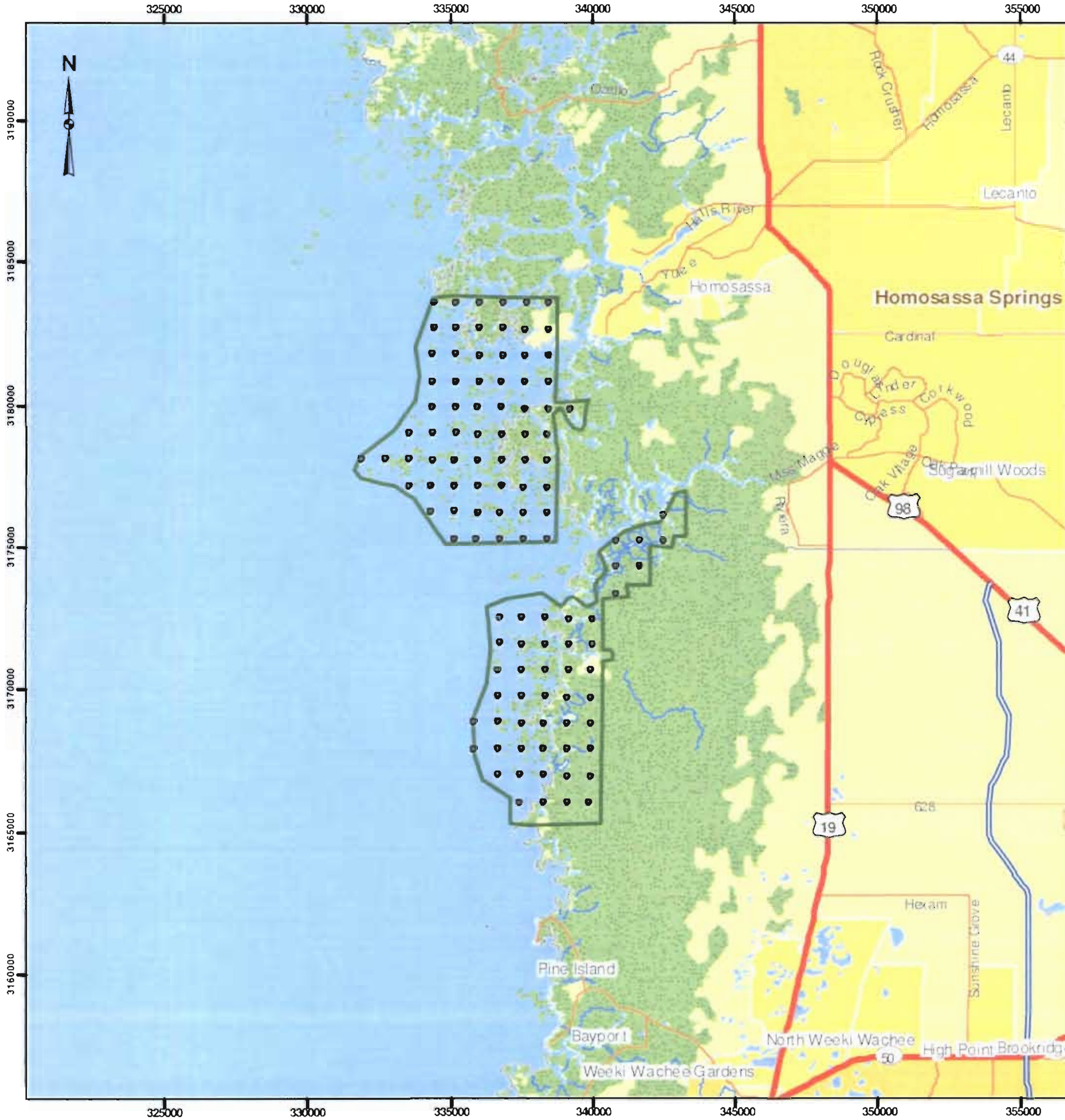
4.7 Modeling Report

A modeling report will be submitted containing the following information:

- Map of source location and Class I areas within 300 km of the source;
- Table showing visibility impacts at each Class I area within 300 km of the source, which would include the following:
  - 8^{th} highest impact each year;
  - number of days and number of receptors with visibility impacts more than 0.5 dv for each year; and
  - 22^{nd} highest impact over a period of three years.
- For the refined modeling analysis, a table showing the eight highest visibility impairment values ranked in a descending order for the prime Class I area(s) of interest.

If Mosaic Riverview elects to demonstrate that its impacts meet the BART exemption criteria, the predicted visibility impairment results for the exemption case will be presented. If the facility is not exempt, the predicted visibility impairment results for the base emission case and all evaluated BART

emission scenarios will be included in the report to show the effect on visibility for each proposed control technology. Final recommendations for BART will also be presented, based on the analysis results of the five evaluation criteria presented in the regulation.



LEGEND

Chassahowitzka NWA

• 113 Receptor Grid

Class I Boundary

REFERENCE

Projection: Transverse Mercator Datum: NAD 27 Coordinate System: UTM Zone 17

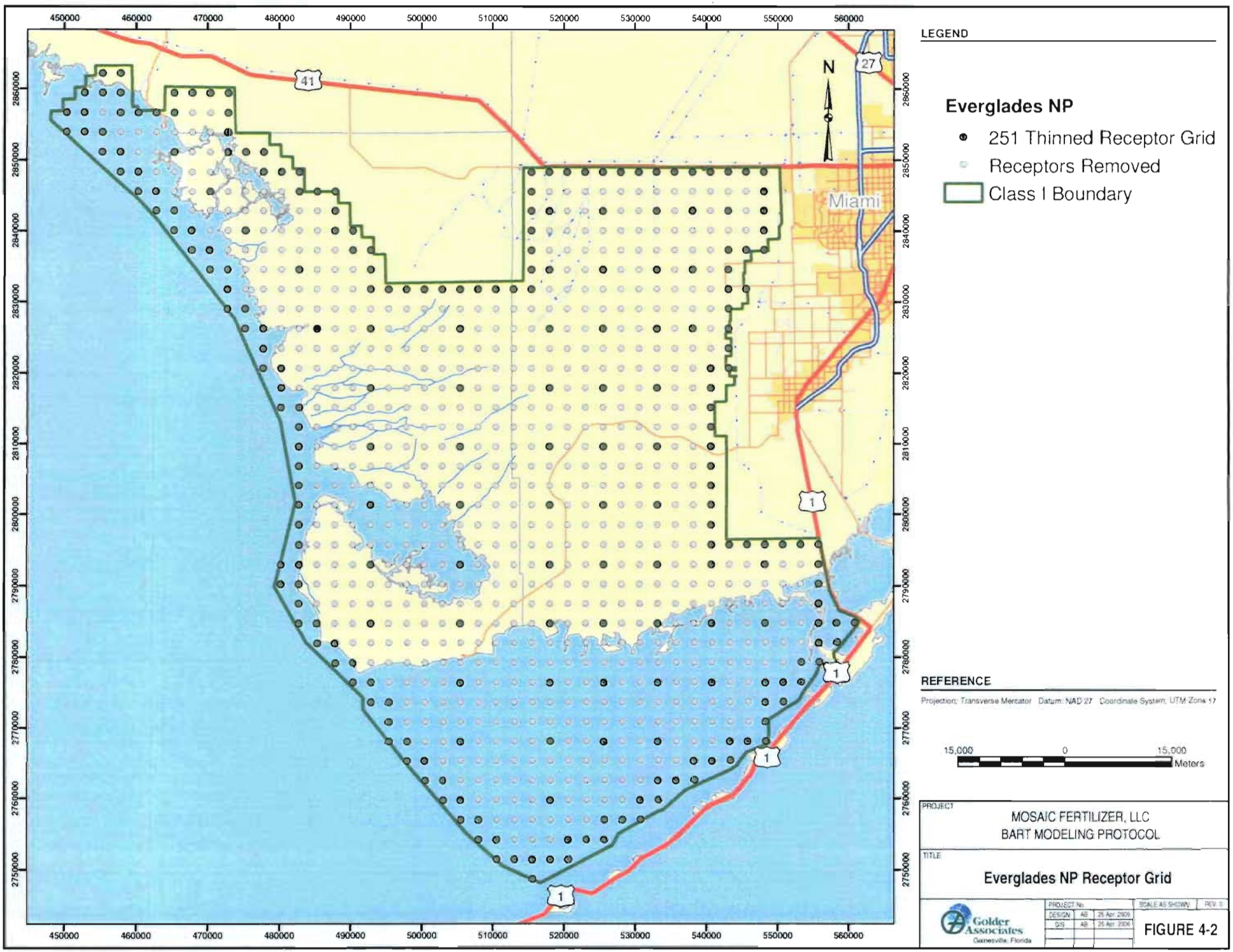
5,000 0 5,000 Meters

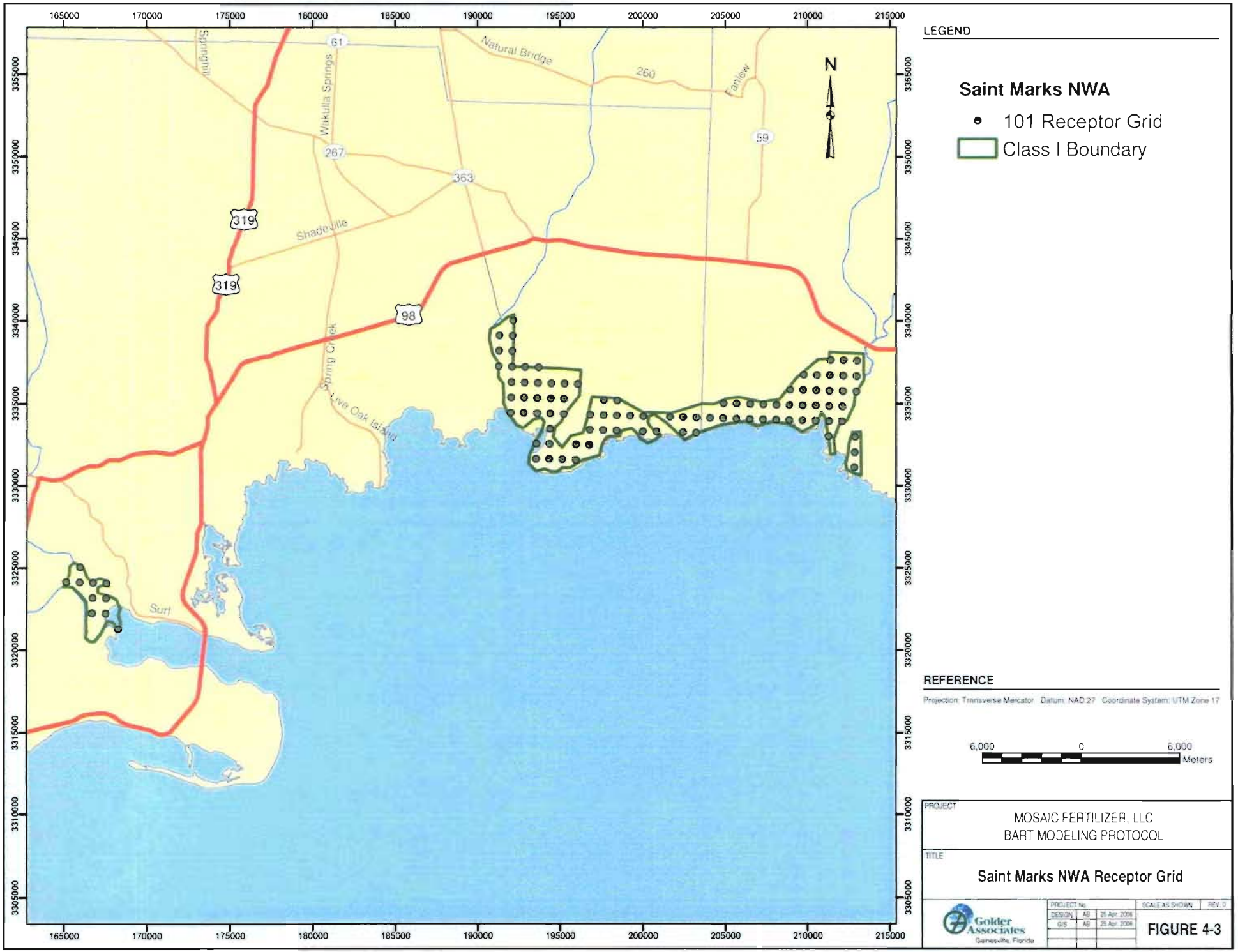
PROJECT
MOSAIC FERTILIZER, LLC
BART MODELING PROTOCOL

TITLE
Chassahowitzka NWA Receptor Grid

Golder Associates
Gainesville, Florida

FIGURE 4-1


450000
460000
470000
480000
490000
500000
510000
520000
530000
540000
550000
560000
2860000
2850000
2840000
2830000
2820000
2810000
2800000
2790000
2780000
2770000
2760000
2750000
N
41
27
1
Miami
LEGEND
Everglades NP
251 Thinned Receptor Grid
Receptors Removed
Class I Boundary
REFERENCE
Projection: Transverse Mercator Datum: NAD 27 Coordinate System: UTM Zone 17
15,000
0
15,000
Meters
PROJECT
MOSAIC FERTILIZER, LLC
BART MODELING PROTOCOL
TITLE
Everglades NP Receptor Grid
Golder Associates
Gainesville, Florida
PROJECT No.
DESIGN AB 25 Apr 2006
DR AB 25 Apr 2006
SCALE AS SHOWN
REV. 0
FIGURE 4-2


LEGEND
Saint Marks NWA
101 Receptor Grid
Class I Boundary
N
Natural Bridge
Wakulla Springs
Shadeville
Live Oak Island
Spring Creek
Surf
61
260
267
363
59
319
319
98
165000
170000
175000
180000
185000
190000
195000
200000
205000
210000
215000
3355000
3350000
3345000
3340000
3335000
3330000
3325000
3320000
3315000
3310000
3305000
REFERENCE
Projection: Transverse Mercator Datum: NAD 27 Coordinate System: UTM Zone 17
6,000 0 6,000
Meters
PROJECT
MOSAIC FERTILIZER, LLC
BART MODELING PROTOCOL
TITLE
Saint Marks NWA Receptor Grid
Golder Associates
Gainesville, Florida
PROJECT No.
DESIGN AB 25 Apr. 2006
GIS AB 25 Apr. 2006
SCALE AS SHOWN
REV. 0
FIGURE 4-3

ATTACHMENT A

EXAMPLE CALPUFF INPUT FILE

```
EXAMPLE FACILITY XYZ - CALPUFF
IMPACTS AT SOURCE-SPECIFIC CLASS I AREAS
4-km FLORIDA DOMAIN (VISTAS REFINED DOMAIN 2), 2001
---------------- Run title (3 lines) ------------------------------------------

                  CALPUFF MODEL CONTROL FILE
                  --------------------------

------------------------------------------------------------------------------

INPUT GROUP: 0 -- Input and Output File Names

--------------
Default Name  Type          File Name
------------  ----          ---------
CALMET.DAT    input    * METDAT =             *
    or
ISCMET.DAT    input    * ISCDAT =             *
    or
PLMMET.DAT    input    * PLMDAT =             *
    or
PROFILE.DAT   input    * PRFDAT =             *
SURFACE.DAT   input    * SFCDAT =             *
RESTARTB.DAT  input    * RSTARTB=             *
------------------------------------------------------------------------------
CALPUFF.LST   output   ! PUFLST = PUFFEXP.LST !
CONC.DAT      output   ! CONDAT = PUFFEXP.CON !
DFLX.DAT      output   * DFDAT  =             *
WFLX.DAT      output   * WFDAT  =             *

VISB.DAT      output   * VISDAT =             *
TK2D.DAT      output   * T2DDAT =             *
RHO2D.DAT     output   * RHODAT =             *
RESTARTE.DAT  output   * RSTARTE=             *
------------------------------------------------------------------------------
Emission Files
--------------
PTEMARB.DAT   input    * PTDAT  =             *
VOLEMARB.DAT  input    * VOLDAT =             *
BAEMARB.DAT   input    * ARDAT  =             *
LNEMARB.DAT   input    * LNDAT  =             *
------------------------------------------------------------------------------
Other Files
-----------
OZONE.DAT     input    ! OZDAT  =C:\BARTHRO3\2001FLOz.DAT !
VD.DAT        input    * VDDAT  =             *
CHEM.DAT      input    * CHEMDAT=             *
H2O2.DAT      input    * H2O2DAT=             *
HILL.DAT      input    * HILDAT=              *
HILLRCT.DAT   input    * RCTDAT=              *
COASTLN.DAT   input    * CSTDAT=              *
FLUXBDY.DAT   input    * BDYDAT=              *
BCON.DAT      input    * BCNDAT=              *
DEBUG.DAT     output   * DEBUG =              *
MASSFLX.DAT   output   * FLXDAT=              *
MASSBAL.DAT   output   * BALDAT=              *
FOG.DAT       output   * FOGDAT=              *
------------------------------------------------------------------------------
All file names will be converted to lower case if LCFILES = T
Otherwise, if LCFILES = F, file names will be converted to UPPER CASE
         T = lower case      ! LCFILES = T !
         F = UPPER CASE
NOTE: (1) file/path names can be up to 70 characters in length


Provision for multiple input files
----------------------------------

     Number of CALMET.DAT files for run (NMETDAT)
                                Default: 1       ! NMETDAT =   36  !

     Number of PTEMARB.DAT files for run (NPTDAT)
                                Default: 0       ! NPTDAT =  0  !

     Number of BAEMARB.DAT files for run (NARDAT)
```

```
                                    Default: 0       ! NARDAT =  0  !

     Number of VOLEMARB.DAT files for run (NVOLDAT)
                                    Default: 0       ! NVOLDAT =  0  !

!END!

-------------
Subgroup (0a)
-------------

  The following CALMET.DAT filenames are processed in sequence if NMETDAT>1

Default Name  Type          File Name
------------  ----          ---------
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-01A.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-01B.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-01C.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-02A.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-02B.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-02C.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-03A.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-03B.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-03C.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-04A.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-04B.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-04C.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-05A.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-05B.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-05C.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-06A.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-06B.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-06C.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-07A.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-07B.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-07C.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-08A.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-08B.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-08C.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-09A.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-09B.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-09C.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-10A.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-10B.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-10C.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-11A.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-11B.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-11C.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-12A.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-12B.DAT ! !END!
CALMET.DAT    input    ! METDAT =E:\FLA4KM\2001\MET2001-DOM2-12C.DAT ! !END!
-------------------------------------------------------------------------------

INPUT GROUP: 1 -- General run control parameters
--------------

    Option to run all periods found
    in the met. file      (METRUN)   Default: 0       ! METRUN =   0  !

         METRUN = 0 - Run period explicitly defined below
         METRUN = 1 - Run all periods in met. file

     Starting date:   Year (IBYR) -- No default       ! IBYR =  2001  !
     (used only if   Month (IBMO) -- No default       ! IBMO =  1  !
      METRUN = 0)      Day (IBDY) -- No default       ! IBDY =  1  !
                      Hour (IBHR) -- No default       ! IBHR =  1  !

     Base time zone         (XBTZ) -- No default       ! XBTZ = 5.0  !
        PST = 8., MST = 7.
        CST = 6., EST = 5.

     Length of run (hours) (IRLG) -- No default       ! IRLG = 8760 !

     Number of chemical species (NSPEC)
                                    Default: 5       ! NSPEC = 11   !
```

```
     Number of chemical species
     to be emitted  (NSE)            Default: 3       ! NSE = 9   !

     Flag to stop run after
     SETUP phase (ITEST)             Default: 2       ! ITEST =  2   !
     (Used to allow checking
     of the model inputs, files, etc.)
           ITEST = 1 - STOPS program after SETUP phase
           ITEST = 2 - Continues with execution of program
                       after SETUP

     Restart Configuration:

        Control flag (MRESTART)      Default: 0       ! MRESTART =  0   !

           0 = Do not read or write a restart file
           1 = Read a restart file at the beginning of
               the run
           2 = Write a restart file during run
           3 = Read a restart file at beginning of run
               and write a restart file during run

        Number of periods in Restart
        output cycle (NRESPD)        Default: 0       ! NRESPD =  0   !

           0 = File written only at last period
          >0 = File updated every NRESPD periods

     Meteorological Data Format (METFM)
                                     Default: 1       ! METFM =  1   !

           METFM = 1 - CALMET binary file (CALMET.MET)
           METFM = 2 - ISC ASCII file (ISCMET.MET)
           METFM = 3 - AUSPLUME ASCII file (PLMMET.MET)
           METFM = 4 - CTDM plus tower file (PROFILE.DAT) and
                       surface parameters file (SURFACE.DAT)

     PG sigma-y is adjusted by the factor (AVET/PGTIME)**0.2
     Averaging Time (minutes) (AVET)
                                     Default: 60.0    ! AVET = 60. !
     PG Averaging Time (minutes) (PGTIME)
                                     Default: 60.0    ! PGTIME = 60. !

!END!

------------------------------------------------------------------------------

INPUT GROUP: 2 -- Technical options
--------------

     Vertical distribution used in the
     near field (MGAUSS)                 Default: 1     ! MGAUSS =  1   !
        0 = uniform
        1 = Gaussian

     Terrain adjustment method
     (MCTADJ)                            Default: 3     ! MCTADJ =  3   !
        0 = no adjustment
        1 = ISC-type of terrain adjustment
        2 = simple, CALPUFF-type of terrain
            adjustment
        3 = partial plume path adjustment

     Subgrid-scale complex terrain
     flag (MCTSG)                        Default: 0     ! MCTSG =  0   !
        0 = not modeled
        1 = modeled

     Near-field puffs modeled as
     elongated 0 (MSLUG)                 Default: 0     ! MSLUG =  0   !
        0 = no
```

```
   1 = yes (slug model used)

Transitional plume rise modeled ?
(MTRANS)                          Default: 1     ! MTRANS =  1   !
   0 = no  (i.e., final rise only)
   1 = yes (i.e., transitional rise computed)

Stack tip downwash? (MTIP)        Default: 1     ! MTIP =  1  !
   0 = no  (i.e., no stack tip downwash)
   1 = yes (i.e., use stack tip downwash)

Vertical wind shear modeled above
stack top? (MSHEAR)               Default: 0     ! MSHEAR =  0  !
   0 = no  (i.e., vertical wind shear not modeled)
   1 = yes (i.e., vertical wind shear modeled)

Puff splitting allowed? (MSPLIT)  Default: 0     ! MSPLIT =  0  !
   0 = no (i.e., puffs not split)
   1 = yes (i.e., puffs are split)

Chemical mechanism flag (MCHEM)   Default: 1     ! MCHEM =  1   !
   0 = chemical transformation not
       modeled
   1 = transformation rates computed
       internally (MESOPUFF II scheme)
   2 = user-specified transformation
       rates used
   3 = transformation rates computed
       internally (RIVAD/ARM3 scheme)
   4 = secondary organic aerosol formation
       computed (MESOPUFF II scheme for OH)

Aqueous phase transformation flag (MAQCHEM)
(Used only if MCHEM = 1, or 3)    Default: 0     ! MAQCHEM =  0   !
   0 = aqueous phase transformation
       not modeled
   1 = transformation rates adjusted
       for aqueous phase reactions

Wet removal modeled ? (MWET)      Default: 1     ! MWET =  1   !
   0 = no
   1 = yes

Dry deposition modeled ? (MDRY)   Default: 1     ! MDRY =  1   !
   0 = no
   1 = yes
   (dry deposition method specified
    for each species in Input Group 3)

Method used to compute dispersion
coefficients (MDISP)              Default: 3     ! MDISP =  3   !

   1 = dispersion coefficients computed from measured values
       of turbulence, sigma v, sigma w
   2 = dispersion coefficients from internally calculated
       sigma v, sigma w using micrometeorological variables
       (u*, w*, L, etc.)
   3 = PG dispersion coefficients for RURAL areas (computed using
       the ISCST multi-segment approximation) and MP coefficients in
       urban areas
   4 = same as 3 except PG coefficients computed using
       the MESOPUFF II eqns.
   5 = CTDM sigmas used for stable and neutral conditions.
       For unstable conditions, sigmas are computed as in
       MDISP = 3, described above.  MDISP = 5 assumes that
       measured values are read

Sigma-v/sigma-theta, sigma-w measurements used? (MTURBVW)
(Used only if MDISP = 1 or 5)     Default: 3     ! MTURBVW =  3  !
   1 = use sigma-v or sigma-theta measurements
       from PROFILE.DAT to compute sigma-y
       (valid for METFM = 1, 2, 3, 4)
   2 = use sigma-w measurements
       from PROFILE.DAT to compute sigma-z
       (valid for METFM = 1, 2, 3, 4)
```

```
   3 = use both sigma-(v/theta) and sigma-w
       from PROFILE.DAT to compute sigma-y and sigma-z
       (valid for METFM = 1, 2, 3, 4)
   4 = use sigma-theta measurements
       from PLMMET.DAT to compute sigma-y
       (valid only if METFM = 3)

Back-up method used to compute dispersion
when measured turbulence data are
missing (MDISP2)                    Default: 3     ! MDISP2 =  3  !
(used only if MDISP = 1 or 5)
   2 = dispersion coefficients from internally calculated
       sigma v, sigma w using micrometeorological variables
       (u*, w*, L, etc.)
   3 = PG dispersion coefficients for RURAL areas (computed using
       the ISCST multi-segment approximation) and MP coefficients in
       urban areas
   4 = same as 3 except PG coefficients computed using
       the MESOPUFF II eqns.

PG sigma-y,z adj. for roughness?    Default: 0     ! MROUGH =  0  !
(MROUGH)
   0 = no
   1 = yes

Partial plume penetration of        Default: 1     ! MPARTL =  1  !
elevated inversion?
(MPARTL)
   0 = no
   1 = yes

Strength of temperature inversion   Default: 0     ! MTINV =  0  !
provided in PROFILE.DAT extended records?
(MTINV)
   0 = no (computed from measured/default gradients)
   1 = yes

PDF used for dispersion under convective conditions?
                                    Default: 0     ! MPDF =  0  !
(MPDF)
   0 = no
   1 = yes

Sub-Grid TIBL module used for shore line?
                                    Default: 0     ! MSGTIBL = 0  !
(MSGTIBL)
   0 = no
   1 = yes

Boundary conditions (concentration) modeled?
                                    Default: 0     ! MBCON = 0  !
(MBCON)
   0 = no
   1 = yes


Analyses of fogging and icing impacts due to emissions from
arrays of mechanically-forced cooling towers can be performed
using CALPUFF in conjunction with a cooling tower emissions
processor (CTEMISS) and its associated postprocessors.  Hourly
emissions of water vapor and temperature from each cooling tower
cell are computed for the current cell configuration and ambient
conditions by CTEMISS. CALPUFF models the dispersion of these
emissions and provides cloud information in a specialized format
for further analysis. Output to FOG.DAT is provided in either
'plume mode' or 'receptor mode' format.

Configure for FOG Model output?
                                    Default: 0     ! MFOG =  0  !
(MFOG)
   0 = no
   1 = yes  - report results in PLUME Mode format
   2 = yes  - report results in RECEPTOR Mode format
```

```
     Test options specified to see if
     they conform to regulatory
     values? (MREG)                          Default: 1     ! MREG =  1   !

        0 = NO checks are made
        1 = Technical options must conform to USEPA
          Long Range Transport (LRT) guidance
                      METFM    1 or 2
                      AVET     60. (min)
                      PGTIME   60. (min)
                      MGAUSS   1
                      MCTADJ   3
                      MTRANS   1
                      MTIP     1
                      MCHEM    1 or 3 (if modeling SOx, NOx)
                      MWET     1
                      MDRY     1
                      MDISP    2 or 3
                      MPDF     0 if MDISP=3
                               1 if MDISP=2
                      MROUGH   0
                      MPARTL   1
                      SYTDEP   550. (m)
                      MHFTSZ   0


!END!

-------------------------------------------------------------------------------

INPUT GROUP: 3a, 3b -- Species list
-------------------

------------
Subgroup (3a)
------------

  The following species are modeled:

! CSPEC =          SO2 !         !END!
! CSPEC =          SO4 !         !END!
! CSPEC =          NOX !         !END!
! CSPEC =         HNO3 !         !END!
! CSPEC =          NO3 !         !END!
! CSPEC =       PM0063 !         !END!
! CSPEC =       PM0100 !         !END!
! CSPEC =       PM0125 !         !END!
! CSPEC =       PM0250 !         !END!
! CSPEC =       PM0600 !         !END!
! CSPEC =       PM1000 !         !END!

                                                          Dry                OUTPUT GROUP
    SPECIES          MODELED          EMITTED        DEPOSITED                  NUMBER
     NAME         (0=NO, 1=YES)    (0=NO, 1=YES)    (0=NO,                   (0=NONE,
   (Limit: 12                                         1=COMPUTED-GAS           1=1st CGRUP,
    Characters                                        2=COMPUTED-PARTICLE      2=2nd CGRUP,
    in length)                                        3=USER-SPECIFIED)        3= etc.)

!          SO2  =         1,               1,            1,                  0   !
!          SO4  =         1,               1,            2,                  0   !
!          NOX  =         1,               1,            1,                  0   !
!         HNO3  =         1,               0,            1,                  0   !
!          NO3  =         1,               0,            2,                  0   !
!       PM0063  =         1,               1,            2,                  1   !
!       PM0100  =         1,               1,            2,                  1   !
!       PM0125  =         1,               1,            2,                  1   !
!       PM0250  =         1,               1,            2,                  1   !
!       PM0600  =         1,               1,            2,                  1   !
!       PM1000  =         1,               1,            2,                  1   !

!END!

-------------
Subgroup (3b)
```

```
-------------
  The following names are used for Species-Groups in which results
  for certain species are combined (added) prior to output.  The
  CGRUP name will be used as the species name in output files.
  Use this feature to model specific particle-size distributions
  by treating each size-range as a separate species.
  Order must be consistent with 3(a) above.

! CGRUP =          PM10 !     !END!

INPUT GROUP: 4 -- Map Projection and Grid control parameters
--------------

     Projection for all (X,Y):
     -------------------------

     Map projection
     (PMAP)                     Default: UTM     ! PMAP = LCC  !

         UTM :  Universal Transverse Mercator
         TTM :  Tangential Transverse Mercator
         LCC :  Lambert Conformal Conic
          PS :  Polar Stereographic
          EM :  Equatorial Mercator
        LAZA :  Lambert Azimuthal Equal Area

     False Easting and Northing (km) at the projection origin
     (Used only if PMAP= TTM, LCC, or LAZA)
     (FEAST)                    Default=0.0      ! FEAST  = 0.000  !
     (FNORTH)                   Default=0.0      ! FNORTH = 0.000  !

     UTM zone (1 to 60)
     (Used only if PMAP=UTM)
     (IUTMZN)                   No Default       ! IUTMZN =  0 !

     Hemisphere for UTM projection?
     (Used only if PMAP=UTM)
     (UTMHEM)                   Default: N       ! UTMHEM = N  !
         N    :  Northern hemisphere projection
         S    :  Southern hemisphere projection

     Latitude and Longitude (decimal degrees) of projection origin
     (Used only if PMAP= TTM, LCC, PS, EM, or LAZA)
     (RLAT0)                    No Default       ! RLAT0 =  40N !
     (RLON0)                    No Default       ! RLON0 =  97W !

         TTM :  RLON0 identifies central (true N/S) meridian of projection
                RLAT0 selected for convenience
         LCC :  RLON0 identifies central (true N/S) meridian of projection
                RLAT0 selected for convenience
         PS  :  RLON0 identifies central (grid N/S) meridian of projection
                RLAT0 selected for convenience
         EM  :  RLON0 identifies central meridian of projection
                RLAT0 is REPLACED by 0.0N (Equator)
         LAZA:  RLON0 identifies longitude of tangent-point of mapping plane
                RLAT0 identifies latitude of tangent-point of mapping plane

     Matching parallel(s) of latitude (decimal degrees) for projection
     (Used only if PMAP= LCC or PS)
     (XLAT1)                    No Default       ! XLAT1 = 33N  !
     (XLAT2)                    No Default       ! XLAT2 = 45N  !

         LCC :  Projection cone slices through Earth's surface at XLAT1 and XLAT2
         PS  :  Projection plane slices through Earth at XLAT1
                (XLAT2 is not used)

     ----------
     Note:  Latitudes and longitudes should be positive, and include a
            letter N,S,E, or W indicating north or south latitude, and
            east or west longitude.  For example,
            35.9  N Latitude  =  35.9N
            118.7 E Longitude = 118.7E


     Datum-region
```

The Datum-Region for the coordinates is identified by a character string. Many mapping products currently available use the model of the Earth known as the World Geodetic System 1984 (WGS-84). Other local models may be in use, and their selection in CALMET will make its output consistent with local mapping products. The list of Datum-Regions with official transformation parameters is provided by the National Imagery and Mapping Agency (NIMA).

NIMA Datum - Regions(Examples)

WGS-84	WGS-84 Reference Ellipsoid and Geoid, Global coverage (WGS84)
NAS-C	NORTH AMERICAN 1927 Clarke 1866 Spheroid, MEAN FOR CONUS (NAD27)
NAR-C	NORTH AMERICAN 1983 GRS 80 Spheroid, MEAN FOR CONUS (NAD83)
NWS-84	NWS 6370KM Radius, Sphere
ESR-S	ESRI REFERENCE 6371KM Radius, Sphere

Datum-region for output coordinates
(DATUM) Default: WGS-G ! DATUM = NWS-84 !

METEOROLOGICAL Grid:

Rectangular grid defined for projection PMAP,
with X the Easting and Y the Northing coordinate

No. X grid cells (NX)	No default	! NX = 263 !
No. Y grid cells (NY)	No default	! NY = 206 !
No. vertical layers (NZ)	No default	! NZ = 10 !
Grid spacing (DGRIDKM)	No default Units: km	! DGRIDKM = 4. !
Cell face heights (ZFACE(nz+1))	No defaults Units: m	

! ZFACE = 0.,20.,40.,80.,160.,320.,640.,1200.,2000.,3000.,4000. !

Reference Coordinates of SOUTHWEST corner of grid cell(1, 1):

X coordinate (XORIGKM)	No default	! XORIGKM = 721.995 !
Y coordinate (YORIGKM)	No default Units: km	! YORIGKM = -1598.000 !

COMPUTATIONAL Grid:

The computational grid is identical to or a subset of the MET. grid. The lower left (LL) corner of the computational grid is at grid point (IBCOMP, JBCOMP) of the MET. grid. The upper right (UR) corner of the computational grid is at grid point (IECOMP, JECOMP) of the MET. grid. The grid spacing of the computational grid is the same as the MET. grid.

X index of LL corner (IBCOMP) (1 <= IBCOMP <= NX)	No default	! IBCOMP = 1 !
Y index of LL corner (JBCOMP) (1 <= JBCOMP <= NY)	No default	! JBCOMP = 1 !
X index of UR corner (IECOMP) (1 <= IECOMP <= NX)	No default	! IECOMP = 263 !
Y index of UR corner (JECOMP) (1 <= JECOMP <= NY)	No default	! JECOMP = 206 !

SAMPLING Grid (GRIDDED RECEPTORS):

The lower left (LL) corner of the sampling grid is at grid point (IBSAMP, JBSAMP) of the MET. grid. The upper right (UR) corner of the

```
      sampling grid is at grid point (IESAMP, JESAMP) of the MET. grid.
      The sampling grid must be identical to or a subset of the computational
      grid.  It may be a nested grid inside the computational grid.
      The grid spacing of the sampling grid is DGRIDKM/MESHDN.

         Logical flag indicating if gridded
         receptors are used (LSAMP)          Default: T     ! LSAMP = F !
         (T=yes, F=no)

         X index of LL corner (IBSAMP)       No default     ! IBSAMP =  1   !
          (IBCOMP <= IBSAMP <= IECOMP)

         Y index of LL corner (JBSAMP)       No default     ! JBSAMP =  1   !
          (JBCOMP <= JBSAMP <= JECOMP)


         X index of UR corner (IESAMP)       No default     ! IESAMP =  263 !
          (IBCOMP <= IESAMP <= IECOMP)

         Y index of UR corner (JESAMP)       No default     ! JESAMP =  206  !
          (JBCOMP <= JESAMP <= JECOMP)


        Nesting factor of the sampling
         grid (MESHDN)                       Default: 1     ! MESHDN =  1  !
         (MESHDN is an integer >= 1)

!END!

-------------------------------------------------------------------------------


INPUT GROUP: 5 -- Output Options
--------------

                                        *                          *
     FILE                         DEFAULT VALUE              VALUE THIS RUN
     ----                         -------------              --------------

   Concentrations (ICON)                1                   !  ICON =  1   !
   Dry Fluxes (IDRY)                    1                   !  IDRY =  0   !
   Wet Fluxes (IWET)                    1                   !  IWET =  0   !
   Relative Humidity (IVIS)             1                   !  IVIS =  0   !
    (relative humidity file is
     required for visibility
     analysis)
   Use data compression option in output file?
   (LCOMPRS)                          Default: T          ! LCOMPRS = T !

   *
    0 = Do not create file, 1 = create file


    DIAGNOSTIC MASS FLUX OUTPUT OPTIONS:

       Mass flux across specified boundaries
       for selected species reported hourly?
       (IMFLX)                          Default: 0         ! IMFLX =  0  !
         0 = no
         1 = yes (FLUXBDY.DAT and MASSFLX.DAT filenames
                  are specified in Input Group 0)

       Mass balance for each species
       reported hourly?
       (IMBAL)                          Default: 0         ! IMBAL =  0  !
         0 = no
         1 = yes (MASSBAL.DAT filename is
              specified in Input Group 0)


    LINE PRINTER OUTPUT OPTIONS:

       Print concentrations (ICPRT)     Default: 0         ! ICPRT =  0   !
       Print dry fluxes (IDPRT)         Default: 0         ! IDPRT =  0   !
       Print wet fluxes (IWPRT)         Default: 0         ! IWPRT =  0   !
```

```
       (0 = Do not print, 1 = Print)

       Concentration print interval
       (ICFRQ) in hours                Default: 1         ! ICFRQ =  24  !
       Dry flux print interval
       (IDFRQ) in hours                Default: 1         ! IDFRQ =  1   !
       Wet flux print interval
       (IWFRQ) in hours                Default: 1         ! IWFRQ =  1   !

       Units for Line Printer Output
       (IPRTU)                         Default: 1         ! IPRTU =  3   !
                      for              for
                  Concentration    Deposition
           1 =       g/m**3          g/m**2/s
           2 =      mg/m**3         mg/m**2/s
           3 =      ug/m**3         ug/m**2/s
           4 =      ng/m**3         ng/m**2/s
           5 =     Odour Units

       Messages tracking progress of run
       written to the screen ?
       (IMESG)                         Default: 2         ! IMESG =  2   !
         0 = no
         1 = yes (advection step, puff ID)
         2 = yes (YYYYJJJHH, # old puffs, # emitted puffs)


    SPECIES (or GROUP for combined species) LIST FOR OUTPUT OPTIONS

                  ---- CONCENTRATIONS ----   ------ DRY FLUXES ------   ------ WET FLUXES ------   --
MASS FLUX --
   SPECIES
   /GROUP         PRINTED?  SAVED ON DISK?   PRINTED?  SAVED ON DISK?   PRINTED?  SAVED ON DISK?   SAVED
ON DISK?
   -------        ------------------------   ------------------------   ------------------------   ------
---------
!          SO2 =     0,          1,            0,          1,            0,          1,            0   !
!          SO4 =     0,          1,            0,          1,            0,          1,            0   !
!          NOX =     0,          1,            0,          1,            0,          1,            0   !
!         HNO3 =     0,          1,            0,          1,            0,          1,            0   !
!          NO3 =     0,          1,            0,          1,            0,          1,            0   !
!         PM10 =     0,          1,            0,          1,            0,          1,            0   !

     OPTIONS FOR PRINTING "DEBUG" QUANTITIES (much output)

       Logical for debug output
       (LDEBUG)                                Default: F     ! LDEBUG = F !

       First puff to track
       (IPFDEB)                                Default: 1     ! IPFDEB =  1  !

       Number of puffs to track
       (NPFDEB)                                Default: 1     ! NPFDEB =  1  !

       Met. period to start output
       (NN1)                                   Default: 1     ! NN1 =  1   !

       Met. period to end output
       (NN2)                                   Default: 10    ! NN2 =  10  !

!END!


--------------------------------------------------------------------------------


INPUT GROUP: 6a, 6b, & 6c -- Subgrid scale complex terrain inputs
-------------------------

---------------
Subgroup (6a)
---------------
       Number of terrain features (NHILL)      Default: 0     ! NHILL =  0   !

       Number of special complex terrain
```

```
       receptors  (NCTREC)                        Default: 0     ! NCTREC =  0   !

       Terrain and CTSG Receptor data for
       CTSG hills input in CTDM format ?
       (MHILL)                                    No Default     ! MHILL =  2   !
       1 = Hill and Receptor data created
           by CTDM processors & read from
           HILL.DAT and HILLRCT.DAT files
       2 = Hill data created by OPTHILL &
           input below in Subgroup (6b);
           Receptor data in Subgroup (6c)

       Factor to convert horizontal dimensions  Default: 1.0   ! XHILL2M = 1. !
       to meters (MHILL=1)

       Factor to convert vertical dimensions    Default: 1.0   ! ZHILL2M = 1. !
       to meters (MHILL=1)

       X-origin of CTDM system relative to      No Default     ! XCTDMKM = 0.0E00 !
       CALPUFF coordinate system, in Kilometers (MHILL=1)

       Y-origin of CTDM system relative to      No Default     ! YCTDMKM = 0.0E00 !
       CALPUFF coordinate system, in Kilometers (MHILL=1)

! END !

---------------
Subgroup (6b)
---------------

                      1 **
     HILL information

HILL           XC         YC        THETAH   ZGRID   RELIEF     EXPO 1     EXPO 2    SCALE 1     SCALE 2
AMAX1     AMAX2
 NO.          (km)       (km)       (deg.)    (m)      (m)        (m)        (m)        (m)         (m)         (m)
(m)
----          ----       ----       ------   -----   ------     ------     ------    -------     -------     ----
-      -----

---------------
Subgroup (6c)
---------------

    COMPLEX TERRAIN RECEPTOR INFORMATION

                     XRCT          YRCT          ZRCT          XHH
                     (km)          (km)           (m)
                    ------        -----        ------         ----


--------------------
1
     Description of Complex Terrain Variables:
          XC, YC  = Coordinates of center of hill
          THETAH  = Orientation of major axis of hill (clockwise from
                    North)
          ZGRID   = Height of the  0  of the grid above mean sea
                    level
          RELIEF  = Height of the crest of the hill above the grid elevation
          EXPO 1  = Hill-shape exponent for the major axis
          EXPO 2  = Hill-shape exponent for the major axis
          SCALE 1 = Horizontal length scale along the major axis
          SCALE 2 = Horizontal length scale along the minor axis
          AMAX    = Maximum allowed axis length for the major axis
          BMAX    = Maximum allowed axis length for the major axis

          XRCT, YRCT = Coordinates of the complex terrain receptors
          ZRCT    = Height of the ground (MSL) at the complex terrain
                    Receptor
          XHH     = Hill number associated with each complex terrain receptor
                    (NOTE: MUST BE ENTERED AS A REAL NUMBER)

   **
```

NOTE: DATA for each hill and CTSG receptor are treated as a separate input subgroup and therefore must end with an input group terminator.

INPUT GROUP: 7 -- Chemical parameters for dry deposition of gases

SPECIES NAME	DIFFUSIVITY (cm**2/s)	ALPHA STAR	REACTIVITY	MESOPHYLL RESISTANCE (s/cm)	HENRY'S LAW COEFFICIENT (dimensionless)
SO2 =	0.1509,	1000,	8,	0,	0.04 !
NOX =	0.1656,	1,	8,	5,	3.5 !
HNO3 =	0.1628,	1,	18,	0,	0.00000008 !

!END!

INPUT GROUP: 8 -- Size parameters for dry deposition of particles

For SINGLE SPECIES, the mean and standard deviation are used to compute a deposition velocity for NINT (see group 9) size-ranges, and these are then averaged to obtain a mean deposition velocity.

For GROUPED SPECIES, the size distribution should be explicitly specified (by the 'species' in the group), and the standard deviation for each should be entered as 0. The model will then use the deposition velocity for the stated mean diameter.

SPECIES NAME	GEOMETRIC MASS MEAN DIAMETER (microns)	GEOMETRIC STANDARD DEVIATION (microns)
SO4 =	0.48,	2. !
NO3 =	0.48,	2. !
PM0063 =	0.63,	0. !
PM0100 =	1.00,	0. !
PM0125 =	1.25,	0. !
PM0250 =	2.50,	0. !
PM0600 =	6.00,	0. !
PM1000 =	10.00,	0. !

!END!

INPUT GROUP: 9 -- Miscellaneous dry deposition parameters

Reference cuticle resistance (s/cm)
(RCUTR) Default: 30 ! RCUTR = 30.0 !
Reference ground resistance (s/cm)
(RGR) Default: 10 ! RGR = 10.0 !
Reference pollutant reactivity
(REACTR) Default: 8 ! REACTR = 8.0 !

Number of particle-size intervals used to evaluate effective particle deposition velocity
(NINT) Default: 9 ! NINT = 9 !

Vegetation state in unirrigated areas
(IVEG) Default: 1 ! IVEG = 1 !
IVEG=1 for active and unstressed vegetation
IVEG=2 for active and stressed vegetation

```
        IVEG=3 for inactive vegetation

!END!

------------------------------------------------------------------------------


INPUT GROUP: 10 -- Wet Deposition Parameters
---------------

                     Scavenging Coefficient -- Units: (sec)**(-1)

       Pollutant      Liquid Precip.       Frozen Precip.
       ---------      --------------       --------------
!          SO2 =         3.0E-05,              0.0E00 !
!          SO4 =         1.0E-04,             3.0E-05 !
!         HNO3 =         6.0E-05,              0.0E00 !
!          NO3 =         1.0E-04,             3.0E-05 !
!       PM0063 =         1.0E-04,             3.0E-05 !
!       PM0100 =         1.0E-04,             3.0E-05 !
!       PM0125 =         1.0E-04,             3.0E-05 !
!       PM0250 =         1.0E-04,             3.0E-05 !
!       PM0600 =         1.0E-04,             3.0E-05 !
!       PM1000 =         1.0E-04,             3.0E-05 !

!END!

------------------------------------------------------------------------------


INPUT GROUP: 11 -- Chemistry Parameters
---------------

     Ozone data input option (MOZ)      Default: 1            ! MOZ =  1   !
     (Used only if MCHEM = 1, 3, or 4)
        0 = use a monthly background ozone value
        1 = read hourly ozone concentrations from
            the OZONE.DAT data file

     Monthly ozone concentrations
     (Used only if MCHEM = 1, 3, or 4 and
      MOZ = 0 or MOZ = 1 and all hourly O3 data missing)
     (BCKO3) in ppb                     Default: 12*80.
     !  BCKO3 = 12*50. !

     Monthly ammonia concentrations
     (Used only if MCHEM = 1, or 3)
     (BCKNH3) in ppb                    Default: 12*10.
     !  BCKNH3 = 12*0.5 !

     Nighttime SO2 loss rate (RNITE1)
     in percent/hour                    Default: 0.2          ! RNITE1 = .2 !

     Nighttime NOx loss rate (RNITE2)
     in percent/hour                    Default: 2.0          ! RNITE2 = 2.0 !

     Nighttime HNO3 formation rate (RNITE3)
     in percent/hour                    Default: 2.0          ! RNITE3 = 2.0 !

     H2O2 data input option (MH2O2)     Default: 1            ! MH2O2 =  1   !
     (Used only if MAQCHEM = 1)
        0 = use a monthly background H2O2 value
        1 = read hourly H2O2 concentrations from
            the H2O2.DAT data file

     Monthly H2O2 concentrations
     (Used only if MQACHEM = 1 and
      MH2O2 = 0 or MH2O2 = 1 and all hourly H2O2 data missing)
     (BCKH2O2) in ppb                   Default: 12*1.
     !  BCKH2O2 = 12*1 !
```

```
--- Data for SECONDARY ORGANIC AEROSOL (SOA) Option
    (used only if MCHEM = 4)

    The SOA module uses monthly values of:
         Fine particulate concentration in ug/m^3 (BCKPMF)
         Organic fraction of fine particulate     (OFRAC)
         VOC / NOX ratio (after reaction)         (VCNX)
    to characterize the air mass when computing
    the formation of SOA from VOC emissions.
    Typical values for several distinct air mass types are:

       Month    1    2    3    4    5    6    7    8    9   10   11   12
                Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec

    Clean Continental
       BCKPMF   1.   1.   1.   1.   1.   1.   1.   1.   1.   1.   1.   1.
       OFRAC  .15  .15  .20  .20  .20  .20  .20  .20  .20  .20  .20  .15
       VCNX    50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.

    Clean Marine (surface)
       BCKPMF  .5   .5   .5   .5   .5   .5   .5   .5   .5   .5   .5   .5
       OFRAC  .25  .25  .30  .30  .30  .30  .30  .30  .30  .30  .30  .25
       VCNX    50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.

    Urban - low biogenic (controls present)
       BCKPMF  30.  30.  30.  30.  30.  30.  30.  30.  30.  30.  30.  30.
       OFRAC  .20  .20  .25  .25  .25  .25  .25  .25  .20  .20  .20  .20
       VCNX     4.   4.   4.   4.   4.   4.   4.   4.   4.   4.   4.   4.

    Urban - high biogenic (controls present)
       BCKPMF  60.  60.  60.  60.  60.  60.  60.  60.  60.  60.  60.  60.
       OFRAC  .25  .25  .30  .30  .30  .55  .55  .55  .35  .35  .35  .25
       VCNX    15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.

    Regional Plume
       BCKPMF  20.  20.  20.  20.  20.  20.  20.  20.  20.  20.  20.  20.
       OFRAC  .20  .20  .25  .35  .25  .40  .40  .40  .30  .30  .30  .20
       VCNX    15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.

    Urban - no controls present
       BCKPMF 100. 100. 100. 100. 100. 100. 100. 100. 100. 100. 100. 100.
       OFRAC  .30  .30  .35  .35  .35  .55  .55  .55  .35  .35  .35  .30
       VCNX     2.   2.   2.   2.   2.   2.   2.   2.   2.   2.   2.   2.

    Default: Clean Continental
    !  BCKPMF = 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00 !
    !  OFRAC  = 0.15, 0.15, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.15 !
    !  VCNX   = 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00 !

!END!

------------------------------------------------------------------------------

INPUT GROUP: 12 -- Misc. Dispersion and Computational Parameters
---------------

    Horizontal size of puff (m) beyond which
    time-dependent dispersion equations (Heffter)
    are used to determine sigma-y and
    sigma-z (SYTDEP)                          Default: 550.   ! SYTDEP = 5.5E02 !

    Switch for using Heffter equation for sigma z
    as above (0 = Not use Heffter; 1 = use Heffter
    (MHFTSZ)                                  Default: 0      ! MHFTSZ =  0   !

    Stability class used to determine plume
    growth rates for puffs above the boundary
    layer (JSUP)                              Default: 5      ! JSUP =  5   !

    Vertical dispersion constant for stable
    conditions (k1 in Eqn. 2.7-3)  (CONK1)    Default: 0.01   ! CONK1 = .01 !
```

```
Vertical dispersion constant for neutral/
unstable conditions (k2 in Eqn. 2.7-4)
(CONK2)                                 Default: 0.1     ! CONK2 = .1 !

Factor for determining Transition-point from
Schulman-Scire to Huber-Snyder Building Downwash
scheme (SS used for Hs < Hb + TBD * HL)
(TBD)                                   Default: 0.5     ! TBD = .5 !
   TBD < 0   ==> always use Huber-Snyder
   TBD = 1.5 ==> always use Schulman-Scire
   TBD = 0.5 ==> ISC Transition-point

Range of land use categories for which
urban dispersion is assumed
(IURB1, IURB2)                          Default: 10      ! IURB1 =  10  !
                                                 19      ! IURB2 =  19  !


Site characterization parameters for single-point Met data files ---------
(needed for METFM = 2,3,4)

   Land use category for modeling domain
   (ILANDUIN)                           Default: 20      ! ILANDUIN =  20  !

   Roughness length (m) for modeling domain
   (Z0IN)                               Default: 0.25    ! Z0IN = .25 !

   Leaf area index for modeling domain
   (XLAIIN)                             Default: 3.0     ! XLAIIN = 3.0 !

   Elevation above sea level (m)
   (ELEVIN)                             Default: 0.0     ! ELEVIN = .0 !

   Latitude (degrees) for met location
   (XLATIN)                             Default: -999.   ! XLATIN = -999.0 !

   Longitude (degrees) for met location
   (XLONIN)                             Default: -999.   ! XLONIN = -999.0 !

Specialized information for interpreting single-point Met data files -----

   Anemometer height (m) (Used only if METFM = 2,3)
   (ANEMHT)                             Default: 10.     ! ANEMHT = 10.0 !

   Form of lateral turbulance data in PROFILE.DAT file
   (Used only if METFM = 4 or MTURBVW = 1 or 3)
   (ISIGMAV)                            Default: 1       ! ISIGMAV =  1  !
       0 = read sigma-theta
       1 = read sigma-v

   Choice of mixing heights (Used only if METFM = 4)
   (IMIXCTDM)                           Default: 0       ! IMIXCTDM =  0  !
       0 = read PREDICTED mixing heights
       1 = read OBSERVED mixing heights

Maximum length of a slug (met. grid units)
(XMXLEN)                                Default: 1.0     ! XMXLEN = 1.0 !

Maximum travel distance of a puff/slug (in
grid units) during one sampling step
(XSAMLEN)                               Default: 1.0     ! XSAMLEN = 1.0 !

Maximum Number of slugs/puffs release from
one source during one time step
(MXNEW)                                 Default: 99      ! MXNEW =  99   !

Maximum Number of sampling steps for
one puff/slug during one time step
(MXSAM)                                 Default: 99      ! MXSAM =  99   !

Number of iterations used when computing
the transport wind for a sampling step
that includes gradual rise (for CALMET
and PROFILE winds)
(NCOUNT)                                Default: 2       ! NCOUNT =  2   !
```

```
Minimum sigma y for a new puff/slug (m)
(SYMIN)                                   Default: 1.0    ! SYMIN = 1.0  !

Minimum sigma z for a new puff/slug (m)
(SZMIN)                                   Default: 1.0    ! SZMIN = 1.0  !

Default minimum turbulence velocities sigma-v and sigma-w
for each stability class over land and over water (m/s).
(SVMIN(12) and SWMIN(12))

                ---------- LAND ----------        --------- WATER ----------
   Stab Class :  A    B    C    D    E    F         A    B    C    D    E    F
                 ---  ---  ---  ---  ---  ---       ---  ---  ---  ---  ---  ---
Default SVMIN : .50, .50, .50, .50, .50, .50,      .37, .37, .37, .37, .37, .37
Default SWMIN : .20, .12, .08, .06, .03, .016,     .20, .12, .08, .06, .03, .016

     ! SVMIN = 0.500, 0.500, 0.500, 0.500, 0.500, 0.500, 0.370, 0.370, 0.370, 0.370, 0.370, 0.370!
     ! SWMIN = 0.200, 0.120, 0.080, 0.060, 0.030, 0.016, 0.200, 0.120, 0.080, 0.060, 0.030, 0.016!

Divergence criterion for dw/dz across puff
used to initiate adjustment for horizontal
convergence (1/s)
Partial adjustment starts at CDIV(1), and
full adjustment is reached at CDIV(2)
(CDIV(2))                                 Default: 0.0,0.0  ! CDIV = .0, .0 !

Minimum wind speed (m/s) allowed for
non-calm conditions. Also used as minimum
speed returned when using power-law
extrapolation toward surface
(WSCALM)                                  Default: 0.5    ! WSCALM = .5 !

Maximum mixing height (m)
(XMAXZI)                                  Default: 3000.  ! XMAXZI = 3000.0 !

Minimum mixing height (m)
(XMINZI)                                  Default: 50.    ! XMINZI = 50.0 !

Default wind speed classes --
5 upper bounds (m/s) are entered;
the 6th class has no upper limit
(WSCAT(5))                      Default   :
                                ISC RURAL : 1.54, 3.09, 5.14, 8.23, 10.8 (10.8+)

                          Wind Speed Class :  1     2     3     4     5
                                              ---   ---   ---   ---   ---
                                  ! WSCAT = 1.54, 3.09, 5.14, 8.23, 10.80 !

Default wind speed profile power-law
exponents for stabilities 1-6
(PLX0(6))                       Default   : ISC RURAL values
                                ISC RURAL : .07, .07, .10, .15, .35, .55
                                ISC URBAN : .15, .15, .20, .25, .30, .30

                           Stability Class :  A     B     C     D     E     F
                                              ---   ---   ---   ---   ---   ---
                                  ! PLX0 = 0.07, 0.07, 0.10, 0.15, 0.35, 0.55 !

Default potential temperature gradient
for stable classes E, F (degK/m)
(PTG0(2))                       Default: 0.020, 0.035
                                   ! PTG0 = 0.020,   0.035 !

Default plume path coefficients for
each stability class (used when option
for partial plume height terrain adjustment
is selected -- MCTADJ=3)
(PPC(6))                   Stability Class :  A     B     C     D     E     F
                              Default  PPC : .50,  .50,  .50,  .50,  .35,  .35
                                             ---   ---   ---   ---   ---   ---
                                   !  PPC = 0.50, 0.50, 0.50, 0.50, 0.35, 0.35 !

Slug-to-puff transition criterion factor
equal to sigma-y/length of slug
(SL2PF)                                Default: 10.       ! SL2PF = 10.0 !
```

```
Puff-splitting control variables ------------------------

  VERTICAL SPLIT
  --------------

  Number of puffs that result every time a puff
  is split - nsplit=2 means that 1 puff splits
  into 2
  (NSPLIT)                          Default:   3        ! NSPLIT =  3  !

  Time(s) of a day when split puffs are eligible to
  be split once again; this is typically set once
  per day, around sunset before nocturnal shear develops.
  24 values: 0 is midnight (00:00) and 23 is 11 PM (23:00)
  0=do not re-split    1=eligible for re-split
  (IRESPLIT(24))                    Default:  Hour 17 = 1
  !  IRESPLIT = 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0 !

  Split is allowed only if last hour's mixing
  height (m) exceeds a minimum value
  (ZISPLIT)                         Default: 100.       ! ZISPLIT = 100.0 !

  Split is allowed only if ratio of last hour's
  mixing ht to the maximum mixing ht experienced
  by the puff is less than a maximum value (this
  postpones a split until a nocturnal layer develops)
  (ROLDMAX)                         Default: 0.25       ! ROLDMAX = 0.25 !


  HORIZONTAL SPLIT
  ----------------

  Number of puffs that result every time a puff
  is split - nsplith=5 means that 1 puff splits
  into 5
  (NSPLITH)                         Default:   5        ! NSPLITH =  5  !

  Minimum sigma-y (Grid Cells Units) of puff
  before it may be split
  (SYSPLITH)                        Default:  1.0       ! SYSPLITH = 1.0 !

  Minimum puff elongation rate (SYSPLITH/hr) due to
  wind shear, before it may be split
  (SHSPLITH)                        Default:  2.        ! SHSPLITH = 2.0 !

  Minimum concentration (g/m^3) of each
  species in puff before it may be split
  Enter array of NSPEC values; if a single value is
  entered, it will be used for ALL species
  (CNSPLITH)                        Default:  1.0E-07   ! CNSPLITH = 1.0E-07 !

Integration control variables ------------------------

  Fractional convergence criterion for numerical SLUG
  sampling integration
  (EPSSLUG)                         Default:   1.0e-04  ! EPSSLUG = 1.0E-04 !

  Fractional convergence criterion for numerical AREA
  source integration
  (EPSAREA)                         Default:   1.0e-06  ! EPSAREA = 1.0E-06 !

  Trajectory step-length (m) used for numerical rise
  integration
  (DSRISE)                          Default:   1.0      ! DSRISE = 1.0 !

!END!

-------------------------------------------------------------------------------

INPUT GROUPS: 13a, 13b, 13c, 13d -- Point source parameters
---------------------------------
```

```
---------------
Subgroup (13a)
---------------

     Number of point sources with
     parameters provided below      (NPT1)  No default  !  NPT1 =  1 !

     Units used for point source
     emissions below                (IPTU)  Default: 1  !  IPTU =   3  !
           1 =        g/s
           2 =       kg/hr
           3 =       lb/hr
           4 =     tons/yr
           5 =     Odour Unit * m**3/s  (vol. flux of odour compound)
           6 =     Odour Unit * m**3/min
           7 =     metric tons/yr

     Number of source-species
     combinations with variable
     emissions scaling factors
     provided below in (13d)        (NSPT1) Default: 0  !  NSPT1 = 0  !

     Number of point sources with
     variable emission parameters
     provided in external file      (NPT2)  No default  !  NPT2 =  0  !

     (If NPT2 > 0, these point
     source emissions are read from
     the file: PTEMARB.DAT)

!END!

---------------
Subgroup (13b)
---------------
                                    a
          POINT SOURCE: CONSTANT DATA
          ---------------------------
                                                                          b          c
  Source       X          Y        Stack     Base      Stack     Exit   Exit     Bldg.  Emission
   No.     Coordinate Coordinate Height Elevation Diameter  Vel.  Temp.    Dwash   Rates
             (km)       (km)       (m)       (m)       (m)   (m/s) (deg. K)
  ------   ---------- ---------- ------  ------    -------- ----- -------- ----- --------
**********   EMISSION RATES ARE IN LB/HR    **********SO2****SO4***NOX****HNO3**NO3**PM10

Project-Specific Source Input
--------

    a
     Data for each source are treated as a separate input subgroup
     and therefore must end with an input group terminator.

     SRCNAM  is a 12-character name for a source
             (No default)
     X       is an array holding the source data listed by the column headings
             (No default)
     SIGYZI  is an array holding the initial sigma-y and sigma-z (m)
             (Default: 0.,0.)
     FMFAC   is a vertical momentum flux factor (0. or 1.0) used to represent
             the effect of rain-caps or other physical configurations that
             reduce momentum rise associated with the actual exit velocity.
             (Default: 1.0  -- full momentum used)

    b
     0. = No building downwash modeled, 1. = downwash modeled
     NOTE: must be entered as a REAL number (i.e., with decimal point)

    c
     An emission rate must be entered for every pollutant modeled.
     Enter emission rate of zero for secondary pollutants that are
     modeled, but not emitted.  Units are specified by IPTU
     (e.g. 1 for g/s).

---------------
Subgroup (13c)
```

BUILDING DIMENSION DATA FOR SOURCES SUBJECT TO DOWNWASH

Source No.	Effective building width and height (in meters) every 10 degrees[a]
1	! SRCNAM = BLR2 !
1	! HEIGHT = 11.28, 11.28, 11.28, 11.28, 11.28, 11.28,
	11.28, 11.28, 11.28, 7.93, 7.93, 7.93,
	7.93, 7.93, 7.93, 11.28, 11.28, 11.28,
	11.28, 11.28, 11.28, 11.28, 11.28, 11.28,
	11.28, 11.28, 11.28, 7.93, 7.93, 7.93,
	7.93, 7.93, 7.93, 11.28, 11.28, 11.28 !
1	! WIDTH = 45.44, 44.94, 43.07, 42.54, 44.67, 45.45,
	44.85, 42.89, 39.62, 26.50, 21.73, 16.30,
	13.98, 19.63, 24.68, 38.82, 42.34, 44.57,
	45.44, 44.94, 43.07, 42.54, 44.67, 45.45,
	44.85, 42.89, 39.62, 26.50, 21.73, 16.30,
	13.98, 19.63, 24.68, 38.82, 42.34, 44.57 !
1	! LENGTH = 35.15, 29.61, 23.18, 21.80, 28.39, 34.13,
	38.82, 42.34, 44.57, 36.22, 36.50, 35.67,
	35.03, 36.30, 36.47, 44.85, 42.89, 39.62,
	35.15, 29.61, 23.18, 21.80, 28.39, 34.13,
	38.82, 42.34, 44.57, 36.22, 36.50, 35.67,
	35.03, 36.30, 36.47, 44.85, 42.89, 39.62 !
1	! XBADJ = -42.73, -41.87, -39.73, -39.27, -41.93, -43.32,
	-43.39, -42.14, -39.62, -19.16, -19.34, -18.93,
	-18.59, -19.17, -19.16, -7.22, -2.31, 2.68,
	7.58, 12.25, 16.55, 17.47, 13.54, 9.19,
	4.57, -0.19, -4.95, -17.06, -17.16, -16.74,
	-16.44, -17.13, -17.30, -37.63, -40.58, -42.30 !
1	! YBADJ = 13.16, 8.60, 3.77, -1.18, -6.08, -10.81,
	-15.20, -19.14, -22.49, 0.34, 0.15, -0.04,
	-0.23, -0.41, -0.58, -23.98, -20.97, -17.33,
	-13.16, -8.60, -3.77, 1.18, 6.08, 10.81,
	15.20, 19.14, 22.49, -0.34, -0.15, 0.04,
	0.23, 0.41, 0.58, 23.98, 20.97, 17.33 !

!END!

---

[a] Each pair of width and height values is treated as a separate input subgroup and therefore must end with an input group terminator.

Subgroup (13d)

POINT SOURCE: VARIABLE EMISSIONS DATA[a]

Use this subgroup to describe temporal variations in the emission rates given in 13b. Factors entered multiply the rates in 13b. Skip sources here that have constant emissions. For more elaborate variation in source parameters, use PTEMARB.DAT and NPT2 > 0.

IVARY determines the type of variation, and is source-specific:
(IVARY) Default: 0

0 =	Constant	
1 =	Diurnal cycle	(24 scaling factors: hours 1-24)
2 =	Monthly cycle	(12 scaling factors: months 1-12)
3 =	Hour & Season	(4 groups of 24 hourly scaling factors, where first group is DEC-JAN-FEB)
4 =	Speed & Stab.	(6 groups of 6 scaling factors, where first group is Stability Class A, and the speed classes have upper bounds (m/s) defined in Group 12
5 =	Temperature	(12 scaling factors, where temperature classes have upper bounds (C) of: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 50+)

---

a
Data for each species are treated as a separate input subgroup
and therefore must end with an input group terminator.

INPUT GROUPS: 14a, 14b, 14c, 14d -- Area source parameters

Subgroup (14a)

Number of polygon area sources with
parameters specified below (NAR1) No default ! NAR1 = 0 !

Units used for area source
emissions below (IARU) Default: 1 ! IARU = 1 !

1 = g/m**2/s
2 = kg/m**2/hr
3 = lb/m**2/hr
4 = tons/m**2/yr
5 = Odour Unit * m/s (vol. flux/m**2 of odour compound)
6 = Odour Unit * m/min
7 = metric tons/m**2/yr

Number of source-species
combinations with variable
emissions scaling factors
provided below in (14d) (NSAR1) Default: 0 ! NSAR1 = 0 !

Number of buoyant polygon area sources
with variable location and emission
parameters (NAR2) No default ! NAR2 = 0 !
(If NAR2 > 0, ALL parameter data for
these sources are read from the file: BAEMARB.DAT)

!END!

Subgroup (14b)

---

a
AREA SOURCE: CONSTANT DATA

b

Source No.	Effect. Height (m)	Base Elevation (m)	Initial Sigma z (m)	Emission Rates
-------	------	------	--------	---------

---

a
Data for each source are treated as a separate input subgroup
and therefore must end with an input group terminator.
b
An emission rate must be entered for every pollutant modeled.
Enter emission rate of zero for secondary pollutants that are
modeled, but not emitted. Units are specified by IARU
(e.g. 1 for g/m**2/s).

Subgroup (14c)

COORDINATES (UTM-km) FOR EACH VERTEX(4) OF EACH POLYGON

Source a

No. Ordered list of X followed by list of Y, grouped by source

---

a
Data for each source are treated as a separate input subgroup
and therefore must end with an input group terminator.

Subgroup (14d)

---

a
AREA SOURCE: VARIABLE EMISSIONS DATA

Use this subgroup to describe temporal variations in the emission rates given in 14b. Factors entered multiply the rates in 14b. Skip sources here that have constant emissions. For more elaborate variation in source parameters, use BAEMARB.DAT and NAR2 > 0.

IVARY determines the type of variation, and is source-specific:
(IVARY) Default: 0

0 =	Constant	
1 =	Diurnal cycle	(24 scaling factors: hours 1-24)
2 =	Monthly cycle	(12 scaling factors: months 1-12)
3 =	Hour & Season	(4 groups of 24 hourly scaling factors, where first group is DEC-JAN-FEB)
4 =	Speed & Stab.	(6 groups of 6 scaling factors, where first group is Stability Class A, and the speed classes have upper bounds (m/s) defined in Group 12
5 =	Temperature	(12 scaling factors, where temperature classes have upper bounds (C) of: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 50+)

---

a
Data for each species are treated as a separate input subgroup
and therefore must end with an input group terminator.

INPUT GROUPS: 15a, 15b, 15c -- Line source parameters

Subgroup (15a)

Number of buoyant line sources with variable location and emission parameters (NLN2) No default ! NLN2 = 0 !

(If NLN2 > 0, ALL parameter data for these sources are read from the file: LNEMARB.DAT)

Number of buoyant line sources (NLINES) No default ! NLINES = 0 !

Units used for line source emissions below (ILNU) Default: 1 ! ILNU = 1 !

1 =	g/s
2 =	kg/hr
3 =	lb/hr
4 =	tons/yr
5 =	Odour Unit * m**3/s (vol. flux of odour compound)
6 =	Odour Unit * m**3/min
7 =	metric tons/yr

Number of source-species

combinations with variable
emissions scaling factors
provided below in (15c) (NSLN1) Default: 0 ! NSLN1 = 0 !

Maximum number of segments used to model
each line (MXNSEG) Default: 7 ! MXNSEG = 7 !

The following variables are required only if NLINES > 0. They are
used in the buoyant line source plume rise calculations.

Number of distances at which transitional rise is computed	Default: 6	! NLRISE = 6 !
Average building length (XL)	No default (in meters)	! XL = .0 !
Average building height (HBL)	No default (in meters)	! HBL = .0 !
Average building width (WBL)	No default (in meters)	! WBL = .0 !
Average line source width (WML)	No default (in meters)	! WML = .0 !
Average separation between buildings (DXL)	No default (in meters)	! DXL = .0 !
Average buoyancy parameter (FPRIMEL)	No default (in m**4/s**3)	! FPRIMEL = .0 !

!END!

Subgroup (15b)

BUOYANT LINE SOURCE: CONSTANT DATA

Source No.	Beg. X Coordinate (km)	Beg. Y Coordinate (km)	End. X Coordinate (km)	End. Y Coordinate (km)	Release Height (m)	Base Elevation (m)	Emission Rates[a]

---

[a] Data for each source are treated as a separate input subgroup and therefore must end with an input group terminator.

[b] An emission rate must be entered for every pollutant modeled. Enter emission rate of zero for secondary pollutants that are modeled, but not emitted. Units are specified by ILNTU (e.g. 1 for g/s).

Subgroup (15c)

BUOYANT LINE SOURCE: VARIABLE EMISSIONS DATA[a]

Use this subgroup to describe temporal variations in the emission rates given in 15b. Factors entered multiply the rates in 15b. Skip sources here that have constant emissions.

IVARY determines the type of variation, and is source-specific:
(IVARY) Default: 0

- 0 = Constant
- 1 = Diurnal cycle (24 scaling factors: hours 1-24)
- 2 = Monthly cycle (12 scaling factors: months 1-12)
- 3 = Hour & Season (4 groups of 24 hourly scaling factors, where first group is DEC-JAN-FEB)

```
          4 =       Speed & Stab. (6 groups of 6 scaling factors, where
                                   first group is Stability Class A,
                                   and the speed classes have upper
                                   bounds (m/s) defined in Group 12
          5 =       Temperature   (12 scaling factors, where temperature
                                   classes have upper bounds (C) of:
                                   0, 5, 10, 15, 20, 25, 30, 35, 40,
                                   45, 50, 50+)
```

---

a
Data for each species are treated as a separate input subgroup and therefore must end with an input group terminator.

INPUT GROUPS: 16a, 16b, 16c -- Volume source parameters

Subgroup (16a)

Number of volume sources with parameters provided in 16b,c (NVL1) — No default ! NVL1 = 0 !

Units used for volume source emissions below in 16b (IVLU) — Default: 1 ! IVLU = 1 !

1 = g/s
2 = kg/hr
3 = lb/hr
4 = tons/yr
5 = Odour Unit * m**3/s (vol. flux of odour compound)
6 = Odour Unit * m**3/min
7 = metric tons/yr

Number of source-species combinations with variable emissions scaling factors provided below in (16c) (NSVL1) — Default: 0 ! NSVL1 = 0 !

Number of volume sources with variable location and emission parameters (NVL2) — No default ! NVL2 = 0 !

(If NVL2 > 0, ALL parameter data for these sources are read from the VOLEMARB.DAT file(s))

!END!

Subgroup (16b)

VOLUME SOURCE: CONSTANT DATA [a]

X UTM Coordinate (km)	Y UTM Coordinate (km)	Effect. Height (m)	Base Elevation (m)	Initial Sigma y (m)	Initial Sigma z (m)	Emission Rates [b]

---

a
Data for each source are treated as a separate input subgroup and therefore must end with an input group terminator.

b
An emission rate must be entered for every pollutant modeled. Enter emission rate of zero for secondary pollutants that are

modeled, but not emitted. Units are specified by IVLU
(e.g. 1 for g/s).

Subgroup (16c)

VOLUME SOURCE: VARIABLE EMISSIONS DATA[a]

Use this subgroup to describe temporal variations in the emission rates given in 16b. Factors entered multiply the rates in 16b. Skip sources here that have constant emissions. For more elaborate variation in source parameters, use VOLEMARB.DAT and NVL2 > 0.

IVARY determines the type of variation, and is source-specific:
(IVARY) Default: 0

0 =	Constant	
1 =	Diurnal cycle	(24 scaling factors: hours 1-24)
2 =	Monthly cycle	(12 scaling factors: months 1-12)
3 =	Hour & Season	(4 groups of 24 hourly scaling factors, where first group is DEC-JAN-FEB)
4 =	Speed & Stab.	(6 groups of 6 scaling factors, where first group is Stability Class A, and the speed classes have upper bounds (m/s) defined in Group 12
5 =	Temperature	(12 scaling factors, where temperature classes have upper bounds (C) of: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 50+)

---

[a] Data for each species are treated as a separate input subgroup and therefore must end with an input group terminator.

INPUT GROUPS: 17a & 17b -- Non-gridded (discrete) receptor information
---

Subgroup (17a)

Number of non-gridded receptors (NREC) No default ! NREC = 744 !

!END!

Subgroup (17b)

NON-GRIDDED (DISCRETE) RECEPTOR DATA[a]

Receptor No.	X Coordinate (km)	Y Coordinate (km)	Ground Elevation (m)	Height Above Ground (m)[b]

RECEPTORS OBTAINED FROM THE NPS/FWS EXTRACTION PROGRAM
ALL RECEPTORS ARE LCC (KM)

PROJECT-SPECIFIC CLASS I AREA RECEPTORS

[a] Data for each receptor are treated as a separate input subgroup and therefore must end with an input group terminator.

[b] Receptor height above ground is optional. If no value is entered, the receptor is placed on the ground.

APPENDIX B

APPLICATION FOR AIR PERMIT – LONG FORM

Department of Environmental Protection

Division of Air Resource Management

APPLICATION FOR AIR PERMIT - LONG FORM

I. APPLICATION INFORMATION

Air Construction Permit – Use this form to apply for an air construction permit at a facility operating under a federally enforceable state air operation permit (FESOP) or Title V air permit. Also use this form to apply for an air construction permit:

- For a proposed project subject to prevention of significant deterioration (PSD) review, nonattainment area (NAA) new source review, or maximum achievable control technology (MACT) review; or
- Where the applicant proposes to assume a restriction on the potential emissions of one or more pollutants to escape a federal program requirement such as PSD review, NAA new source review, Title V, or MACT; or
- Where the applicant proposes to establish, revise, or renew a plantwide applicability limit (PAL).

Air Operation Permit – Use this form to apply for:

- an initial federally enforceable state air operation permit (FESOP); or
- an initial/revised/renewal Title V air operation permit.

Air Construction Permit & Title V Air Operation Permit (Concurrent Processing Option) – Use this form to apply for both an air construction permit and a revised or renewal Title V air operation permit incorporating the proposed project.

To ensure accuracy, please see form instructions.

Identification of Facility

1. Facility Owner/Company Name: **Mosaic Fertilizer, LLC.**
2. Site Name: **Riverview Plant**
3. Facility Identification Number: **0570008**
4. Facility Location...:
   Street Address or Other Locator: **8813 U.S. Highway 41 South**
   City: **Riverview** County: **FL** Zip Code: **33569**
5. Relocatable Facility? ☐ Yes ☒ No
6. Existing Title V Permitted Facility? ☒ Yes ☐ No

Application Contact

1. Application Contact Name: **Jeff Stewart, Environmental Superintendent**
2. Application Contact Mailing Address...
   Organization/Firm: **Mosaic Fertilizer, LLC**
   Street Address: **8813 U.S. Highway 41 South**
   City: **Riverview** State: **FL** Zip Code: **33569**
3. Application Contact Telephone Numbers...
   Telephone: (**813**) **671- 6369** ext. Fax: (**813**) **671- 6149**
4. Application Contact Email Address: **jeff.stewart@mosaicco.com**

Application Processing Information (DEP Use)

1. Date of Receipt of Application: 8/11/08
2. Project Number(s): 0570008-060-AC
3. PSD Number (if applicable):
4. Siting Number (if applicable):

FACILITY INFORMATION

Purpose of Application

This application for air permit is submitted to obtain: (Check one)

Air Construction Permit

☒ Air construction permit.

☐ Air construction permit to establish, revise, or renew a plantwide applicability limit (PAL).

☐ Air construction permit to establish, revise, or renew a plantwide applicability limit (PAL), and separate air construction permit to authorize construction or modification of one or more emissions units covered by the PAL.

Air Operation Permit

☐ Initial Title V air operation permit.

☐ Title V air operation permit revision.

☐ Title V air operation permit renewal.

☐ Initial federally enforceable state air operation permit (FESOP) where professional engineer (PE) certification is required.

☐ Initial federally enforceable state air operation permit (FESOP) where professional engineer (PE) certification is not required.

Air Construction Permit and Revised/Renewal Title V Air Operation Permit (Concurrent Processing)

☐ Air construction permit and Title V permit revision, incorporating the proposed project.

☐ Air construction permit and Title V permit renewal, incorporating the proposed project.

Note: By checking one of the above two boxes, you, the applicant, are requesting concurrent processing pursuant to Rule 62-213.405, F.A.C. In such case, you must also check the following box:

☐ I hereby request that the department waive the processing time requirements of the air construction permit to accommodate the processing time frames of the Title V air operation permit.

Application Comment

This application is to allow for upgrades to Nos. 7, 8, and 9 Sulfuric Acid Plants and implement lower emission limits for the purpose of obtaining a BART exemption for the BART-eligible emissions units at the Mosaic Riverview facility.

FACILITY INFORMATION

Scope of Application

Emissions Unit ID Number	Description of Emissions Unit	Air Permit Type	Air Permit Proc. Fee
004	No. 7 Sulfuric Acid Plant	AC1F	
005	No. 8 Sulfuric Acid Plant		
006	No. 9 Sulfuric Acid Plant		

Application Processing Fee

Check one: ☐ Attached - Amount: $_____ ☒ Not Applicable

FACILITY INFORMATION

Owner/Authorized Representative Statement

Complete if applying for an air construction permit or an initial FESOP.

1. Owner/Authorized Representative Name :
   Jeff Stewart, Environmental Superintendent
2. Owner/Authorized Representative Mailing Address...
   Organization/Firm: **Mosaic Fertilizer, LLC.**
   Street Address: **8813 U.S. Highway 41 South**
   City: **Riverview** State: **FL** Zip Code: **33569**
3. Owner/Authorized Representative Telephone Numbers...
   Telephone: **(813) 671-6369** ext. Fax: **(813) 671-6149**
4. Owner/Authorized Representative Email Address: **Jeff.Stewart@mosaicco.com**
5. Owner/Authorized Representative Statement:

   I, the undersigned, am the owner or authorized representative of the facility addressed in this air permit application. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made in this application are true, accurate and complete and that, to the best of my knowledge, any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. The air pollutant emissions units and air pollution control equipment described in this application will be operated and maintained so as to comply with all applicable standards for control of air pollutant emissions found in the statutes of the State of Florida and rules of the Department of Environmental Protection and revisions thereof and all other requirements identified in this application to which the facility is subject. I understand that a permit, if granted by the department, cannot be transferred without authorization from the department, and I will promptly notify the department upon sale or legal transfer of the facility or any permitted emissions unit.

   Jeffrey M. Stewart
   Signature

   8/6/2008
   Date

Application Responsible Official Certification

Complete if applying for an initial/revised/renewal Title V permit or concurrent processing of an air construction permit and a revised/renewal Title V permit. If there are multiple responsible officials, the "application responsible official" need not be the "primary responsible official."

1. Application Responsible Official Name:

2. Application Responsible Official Qualification (Check one or more of the following options, as applicable):
   - ☐ For a corporation, the president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or a duly authorized representative of such person if the representative is responsible for the overall operation of one or more manufacturing, production, or operating facilities applying for or subject to a permit under Chapter 62-213, F.A.C.
   - ☐ For a partnership or sole proprietorship, a general partner or the proprietor, respectively.
   - ☐ For a municipality, county, state, federal, or other public agency, either a principal executive officer or ranking elected official.
   - ☐ The designated representative at an Acid Rain source.

3. Application Responsible Official Mailing Address...
   Organization/Firm:
   Street Address:
   City: State: Zip Code:

4. Application Responsible Official Telephone Numbers...
   Telephone: ( ) - ext. Fax: ( ) -

5. Application Responsible Official Email Address:

6. Application Responsible Official Certification:

   I, the undersigned, am a responsible official of the Title V source addressed in this air permit application. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made in this application are true, accurate and complete and that, to the best of my knowledge, any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. The air pollutant emissions units and air pollution control equipment described in this application will be operated and maintained so as to comply with all applicable standards for control of air pollutant emissions found in the statutes of the State of Florida and rules of the Department of Environmental Protection and revisions thereof and all other applicable requirements identified in this application to which the Title V source is subject. I understand that a permit, if granted by the department, cannot be transferred without authorization from the department, and I will promptly notify the department upon sale or legal transfer of the facility or any permitted emissions unit. Finally, I certify that the facility and each emissions unit are in compliance with all applicable requirements to which they are subject, except as identified in compliance plan(s) submitted with this application.

   Signature Date

FACILITY INFORMATION

Professional Engineer Certification

1. Professional Engineer Name: **David A. Buff**
   Registration Number: **19011**
2. Professional Engineer Mailing Address...
   Organization/Firm: **Golder Associates Inc.****
   Street Address: **6241 NW 23rd Street, Suite 500**
   City: **Gainesville** State: **FL** Zip Code: **32653**
3. Professional Engineer Telephone Numbers...
   Telephone: **(352) 336-5600** ext.**545** Fax: **(352) 336-6603**
4. Professional Engineer Email Address: **dbuff@golder.com**
5. Professional Engineer Statement:

I, the undersigned, hereby certify, except as particularly noted herein, that:*

(1) To the best of my knowledge, there is reasonable assurance that the air pollutant emissions unit(s) and the air pollution control equipment described in this application for air permit, when properly operated and maintained, will comply with all applicable standards for control of air pollutant emissions found in the Florida Statutes and rules of the Department of Environmental Protection; and

(2) To the best of my knowledge, any emission estimates reported or relied on in this application are true, accurate, and complete and are either based upon reasonable techniques available for calculating emissions or, for emission estimates of hazardous air pollutants not regulated for an emissions unit addressed in this application, based solely upon the materials, information and calculations submitted with this application.

(3) If the purpose of this application is to obtain a Title V air operation permit (check here ☐, if so), I further certify that each emissions unit described in this application for air permit, when properly operated and maintained, will comply with the applicable requirements identified in this application to which the unit is subject, except those emissions units for which a compliance plan and schedule is submitted with this application.

(4) If the purpose of this application is to obtain an air construction permit (check here ☒, if so) or concurrently process and obtain an air construction permit and a Title V air operation permit revision or renewal for one or more proposed new or modified emissions units (check here ☐, if so), I further certify that the engineering features of each such emissions unit described in this application have been designed or examined by me or individuals under my direct supervision and found to be in conformity with sound engineering principles applicable to the control of emissions of the air pollutants characterized in this application.

(5) If the purpose of this application is to obtain an initial air operation permit or operation permit revision or renewal for one or more newly constructed or modified emissions units (check here ☐, if so), I further certify that, with the exception of any changes detailed as part of this application, each such emissions unit has been constructed or modified in substantial accordance with the information given in the corresponding application for air construction permit and with all provisions contained in such permit.

STATE OF FLORIDA PROFESSIONAL ENGINEER DAVID A. BUFF LIC. NO. 19011

David A. Buff
Signature (seal)

8/8/08
Date

* Attach any exception to certification statement.
** Board of Professional Engineers Certificate of Authorization #00001670

III. EMISSIONS UNIT INFORMATION

Title V Air Operation Permit Application - For Title V air operation permitting only, emissions units are classified as regulated, unregulated, or insignificant. If this is an application for an initial, revised or renewal Title V air operation permit, a separate Emissions Unit Information Section (including subsections A through I as required) must be completed for each regulated and unregulated emissions unit addressed in this application. Some of the subsections comprising the Emissions Unit Information Section of the form are optional for unregulated emissions units. Each such subsection is appropriately marked. Insignificant emissions units are required to be listed at Section II, Subsection C.

Air Construction Permit or FESOP Application - For air construction permitting or federally enforceable state air operation permitting, emissions units are classified as either subject to air permitting or exempt from air permitting. The concept of an "unregulated emissions unit" does not apply. If this is an application for an air construction permit or FESOP, a separate Emissions Unit Information Section (including subsections A through I as required) must be completed for each emissions unit subject to air permitting addressed in this application for air permit. Emissions units exempt from air permitting are required to be listed at Section II, Subsection C.

Air Construction Permit and Revised/Renewal Title V Air Operation Permit Application – Where this application is used to apply for both an air construction permit and a revised or renewal Title V air operation permit, each emissions unit is classified as either subject to air permitting or exempt from air permitting for air construction permitting purposes, and as regulated, unregulated, or insignificant for Title V air operation permitting purposes. A separate Emissions Unit Information Section (including subsections A through I as required) must be completed for each emissions unit addressed in this application that is subject to air construction permitting and for each such emissions unit that is a regulated or unregulated unit for purposes of Title V permitting. (An emissions unit may be exempt from air construction permitting but still be classified as an unregulated unit for Title V purposes.) Emissions units classified as insignificant for Title V purposes are required to be listed at Section II, Subsection C.

If submitting the application form in hard copy, the number of this Emissions Unit Information Section and the total number of Emissions Unit Information Sections submitted as part of this application must be indicated in the space provided at the top of each page.

A. GENERAL EMISSIONS UNIT INFORMATION

Title V Air Operation Permit Emissions Unit Classification

1. Regulated or Unregulated Emissions Unit? (Check one, if applying for an initial, revised or renewal Title V air operation permit. Skip this item if applying for an air construction permit or FESOP only.)

☐ The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit.

☐ The emissions unit addressed in this Emissions Unit Information Section is an unregulated emissions unit.

Emissions Unit Description and Status

1. Type of Emissions Unit Addressed in this Section: (Check one)

☒ This Emissions Unit Information Section addresses, as a single emissions unit, a single process or production unit, or activity, which produces one or more air pollutants and which has at least one definable emission point (stack or vent).

☐ This Emissions Unit Information Section addresses, as a single emissions unit, a group of process or production units and activities which has at least one definable emission point (stack or vent) but may also produce fugitive emissions.

☐ This Emissions Unit Information Section addresses, as a single emissions unit, one or more process or production units and activities which produce fugitive emissions only.

2. Description of Emissions Unit Addressed in this Section:
No. 7 Sulfuric Acid Plant (SAP)

3. Emissions Unit Identification Number: **004**

4. Emissions Unit Status Code:	5. Commence Construction Date:	6. Initial Startup Date:	7. Emissions Unit Major Group SIC Code:
A			**28**

8. Federal Program Applicability: (Check all that apply)

☐ Acid Rain Unit

☐ CAIR Unit

☐ Hg Budget Unit

9. Package Unit:
Manufacturer: Model Number:

10. Generator Nameplate Rating:

11. Emissions Unit Comment:
Proposed emissions limits for No. 7 SAP to meet the Best Available Retrofit Technology (BART) exemption criteria.

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL, FUGITIVE, AND ACTUAL EMISSIONS

(Optional for unregulated emissions units.)

Complete a Subsection F1 for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V operation permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

Potential, Estimated Fugitive, and Baseline & Projected Actual Emissions

1. Pollutant Emitted: **SO_2**	2. Total Percent Efficiency of Control:
3. Potential Emissions: **400** lb/hour **1,752** tons/year	4. Synthetically Limited? ☐ Yes ☒ No
5. Range of Estimated Fugitive Emissions (as applicable): to tons/year	
6. Emission Factor: **400 lb/hr, 24-hr daily average** Reference: **Requested Limit**	7. Emissions Method Code: **0**
8.a. Baseline Actual Emissions (if required): tons/year	8.b. Baseline 24-month Period: From: To:
9.a. Projected Actual Emissions (if required): tons/year	9.b. Projected Monitoring Period: ☐ 5 years ☐ 10 years
10. Calculation of Emissions: **Annual Emissions = 400 lb/hr x 8,760 hrs/yr / 2,000 lb/ton = 1,752 TPY**	
11. Potential, Fugitive, and Actual Emissions Comment:	

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete Subsection F2 if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: **OTHER**	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units: **400 lb/hr, 24-hr average**	4. Equivalent Allowable Emissions: **400** lb/hour **1,752** tons/year
5. Method of Compliance: **Continuous Emission Monitoring System for SO_2**	
6. Allowable Emissions Comment (Description of Operating Method): **Allowable emissions based on 24-hour daily average, in order to meet BART exemption criteria.**	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL, FUGITIVE, AND ACTUAL EMISSIONS

(Optional for unregulated emissions units.)

Complete a Subsection F1 for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V operation permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

Potential, Estimated Fugitive, and Baseline & Projected Actual Emissions

1. Pollutant Emitted: **SAM**	2. Total Percent Efficiency of Control:
3. Potential Emissions: **6.7** lb/hour **29.3** tons/year	4. Synthetically Limited? ☐ Yes ☒ No
5. Range of Estimated Fugitive Emissions (as applicable): to tons/year	
6. Emission Factor: **6.7 lb/hr** Reference: **Requested Limit**	7. Emissions Method Code: **0**
8.a. Baseline Actual Emissions (if required): tons/year	8.b. Baseline 24-month Period: From: To:
9.a. Projected Actual Emissions (if required): tons/year	9.b. Projected Monitoring Period: ☐ 5 years ☐ 10 years
10. Calculation of Emissions: **6.7 lb/hr x 8,760 hrs/yr / 2,000 lb/ton = 29.3 TPY**	
11. Potential, Fugitive, and Actual Emissions Comment:	

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete Subsection F2 if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: **OTHER**	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units: **6.7 lb/hr**	4. Equivalent Allowable Emissions: **6.7** lb/hour **29.3** tons/year
5. Method of Compliance: **EPA Methods 6 or 6C**	
6. Allowable Emissions Comment (Description of Operating Method): **Allowable emissions in order to meet BART exemption criteria.**	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

III. EMISSIONS UNIT INFORMATION

Title V Air Operation Permit Application - For Title V air operation permitting only, emissions units are classified as regulated, unregulated, or insignificant. If this is an application for an initial, revised or renewal Title V air operation permit, a separate Emissions Unit Information Section (including subsections A through I as required) must be completed for each regulated and unregulated emissions unit addressed in this application. Some of the subsections comprising the Emissions Unit Information Section of the form are optional for unregulated emissions units. Each such subsection is appropriately marked. Insignificant emissions units are required to be listed at Section II, Subsection C.

Air Construction Permit or FESOP Application - For air construction permitting or federally enforceable state air operation permitting, emissions units are classified as either subject to air permitting or exempt from air permitting. The concept of an "unregulated emissions unit" does not apply. If this is an application for an air construction permit or FESOP, a separate Emissions Unit Information Section (including subsections A through I as required) must be completed for each emissions unit subject to air permitting addressed in this application for air permit. Emissions units exempt from air permitting are required to be listed at Section II, Subsection C.

Air Construction Permit and Revised/Renewal Title V Air Operation Permit Application – Where this application is used to apply for both an air construction permit and a revised or renewal Title V air operation permit, each emissions unit is classified as either subject to air permitting or exempt from air permitting for air construction permitting purposes, and as regulated, unregulated, or insignificant for Title V air operation permitting purposes. A separate Emissions Unit Information Section (including subsections A through I as required) must be completed for each emissions unit addressed in this application that is subject to air construction permitting and for each such emissions unit that is a regulated or unregulated unit for purposes of Title V permitting. (An emissions unit may be exempt from air construction permitting but still be classified as an unregulated unit for Title V purposes.) Emissions units classified as insignificant for Title V purposes are required to be listed at Section II, Subsection C.

If submitting the application form in hard copy, the number of this Emissions Unit Information Section and the total number of Emissions Unit Information Sections submitted as part of this application must be indicated in the space provided at the top of each page.

A. GENERAL EMISSIONS UNIT INFORMATION

Title V Air Operation Permit Emissions Unit Classification

1. Regulated or Unregulated Emissions Unit? (Check one, if applying for an initial, revised or renewal Title V air operation permit. Skip this item if applying for an air construction permit or FESOP only.)

☐ The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit.

☐ The emissions unit addressed in this Emissions Unit Information Section is an unregulated emissions unit.

Emissions Unit Description and Status

1. Type of Emissions Unit Addressed in this Section: (Check one)

☒ This Emissions Unit Information Section addresses, as a single emissions unit, a single process or production unit, or activity, which produces one or more air pollutants and which has at least one definable emission point (stack or vent).

☐ This Emissions Unit Information Section addresses, as a single emissions unit, a group of process or production units and activities which has at least one definable emission point (stack or vent) but may also produce fugitive emissions.

☐ This Emissions Unit Information Section addresses, as a single emissions unit, one or more process or production units and activities which produce fugitive emissions only.

2. Description of Emissions Unit Addressed in this Section:
No. 8 Sulfuric Acid Plant (SAP)

3. Emissions Unit Identification Number: **005**

4. Emissions Unit Status Code:	5. Commence Construction Date:	6. Initial Startup Date:	7. Emissions Unit Major Group SIC Code:
A			**28**

8. Federal Program Applicability: (Check all that apply)

☐ Acid Rain Unit

☐ CAIR Unit

☐ Hg Budget Unit

9. Package Unit:
Manufacturer: Model Number:

10. Generator Nameplate Rating:

11. Emissions Unit Comment:
Proposed emissions limits for No. 8 SAP to meet BART exemption criteria.

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL, FUGITIVE, AND ACTUAL EMISSIONS

(Optional for unregulated emissions units.)

Complete a Subsection F1 for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V operation permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

Potential, Estimated Fugitive, and Baseline & Projected Actual Emissions

1. Pollutant Emitted: **SO_2**	2. Total Percent Efficiency of Control:
3. Potential Emissions: **315** lb/hour **1,379.7** tons/year	4. Synthetically Limited? ☐ Yes ☒ No
5. Range of Estimated Fugitive Emissions (as applicable): to tons/year	
6. Emission Factor: **315 lb/hr, 24-hr daily average** Reference: **Requested Limit**	7. Emissions Method Code: **0**
8.a. Baseline Actual Emissions (if required): tons/year	8.b. Baseline 24-month Period: From: To:
9.a. Projected Actual Emissions (if required): tons/year	9.b. Projected Monitoring Period: ☐ .5 years ☐ 10 years
10. Calculation of Emissions: **Annual Emissions = 315 lb/hr x 8,760 hrs/yr / 2,000 lb/ton = 1,379.7 TPY**	
11. Potential, Fugitive, and Actual Emissions Comment:	

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete Subsection F2 if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: **OTHER**	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units: **315 lb/hr, 24-hr average**	4. Equivalent Allowable Emissions: **315** lb/hour **1,379.7** tons/year
5. Method of Compliance: **Continuous Emission Monitoring System for SO_2**	
6. Allowable Emissions Comment (Description of Operating Method): **Allowable emissions based on 24-hour daily average, in order to meet BART exemption criteria.**	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL, FUGITIVE, AND ACTUAL EMISSIONS

(Optional for unregulated emissions units.)

Complete a Subsection F1 for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V operation permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

Potential, Estimated Fugitive, and Baseline & Projected Actual Emissions

1. Pollutant Emitted: **SAM**	2. Total Percent Efficiency of Control:
3. Potential Emissions: **5.6** lb/hour **24.5** tons/year	4. Synthetically Limited? ☐ Yes ☒ No
5. Range of Estimated Fugitive Emissions (as applicable): to tons/year	
6. Emission Factor: **5.6 lb/hr** Reference: **Requested Limit**	7. Emissions Method Code: **0**
8.a. Baseline Actual Emissions (if required): tons/year	8.b. Baseline 24-month Period: From: To:
9.a. Projected Actual Emissions (if required): tons/year	9.b. Projected Monitoring Period: ☐ 5 years ☐ 10 years
10. Calculation of Emissions: **5.6 lb/hr x 8,760 hrs/yr / 2,000 lb/ton = 24.5 TPY**	
11. Potential, Fugitive, and Actual Emissions Comment:	

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete Subsection F2 if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions **1** of **1**

1. Basis for Allowable Emissions Code: **OTHER**	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units: **5.6 lb/hr**	4. Equivalent Allowable Emissions: **5.6** lb/hour **24.5** tons/year
5. Method of Compliance: **EPA Methods 6 or 6C**	
6. Allowable Emissions Comment (Description of Operating Method): **Allowable emissions in order to meet BART exemption criteria.**	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

III. EMISSIONS UNIT INFORMATION

Title V Air Operation Permit Application - For Title V air operation permitting only, emissions units are classified as regulated, unregulated, or insignificant. If this is an application for an initial, revised or renewal Title V air operation permit, a separate Emissions Unit Information Section (including subsections A through I as required) must be completed for each regulated and unregulated emissions unit addressed in this application. Some of the subsections comprising the Emissions Unit Information Section of the form are optional for unregulated emissions units. Each such subsection is appropriately marked. Insignificant emissions units are required to be listed at Section II, Subsection C.

Air Construction Permit or FESOP Application - For air construction permitting or federally enforceable state air operation permitting, emissions units are classified as either subject to air permitting or exempt from air permitting. The concept of an "unregulated emissions unit" does not apply. If this is an application for an air construction permit or FESOP, a separate Emissions Unit Information Section (including subsections A through I as required) must be completed for each emissions unit subject to air permitting addressed in this application for air permit. Emissions units exempt from air permitting are required to be listed at Section II, Subsection C.

Air Construction Permit and Revised/Renewal Title V Air Operation Permit Application – Where this application is used to apply for both an air construction permit and a revised or renewal Title V air operation permit, each emissions unit is classified as either subject to air permitting or exempt from air permitting for air construction permitting purposes, and as regulated, unregulated, or insignificant for Title V air operation permitting purposes. A separate Emissions Unit Information Section (including subsections A through I as required) must be completed for each emissions unit addressed in this application that is subject to air construction permitting and for each such emissions unit that is a regulated or unregulated unit for purposes of Title V permitting. (An emissions unit may be exempt from air construction permitting but still be classified as an unregulated unit for Title V purposes.) Emissions units classified as insignificant for Title V purposes are required to be listed at Section II, Subsection C.

If submitting the application form in hard copy, the number of this Emissions Unit Information Section and the total number of Emissions Unit Information Sections submitted as part of this application must be indicated in the space provided at the top of each page.

A. GENERAL EMISSIONS UNIT INFORMATION

Title V Air Operation Permit Emissions Unit Classification

1. Regulated or Unregulated Emissions Unit? (Check one, if applying for an initial, revised or renewal Title V air operation permit. Skip this item if applying for an air construction permit or FESOP only.)

   ☒ The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit.

   ☐ The emissions unit addressed in this Emissions Unit Information Section is an unregulated emissions unit.

Emissions Unit Description and Status

1. Type of Emissions Unit Addressed in this Section: (Check one)

   ☒ This Emissions Unit Information Section addresses, as a single emissions unit, a single process or production unit, or activity, which produces one or more air pollutants and which has at least one definable emission point (stack or vent).

   ☐ This Emissions Unit Information Section addresses, as a single emissions unit, a group of process or production units and activities which has at least one definable emission point (stack or vent) but may also produce fugitive emissions.

   ☐ This Emissions Unit Information Section addresses, as a single emissions unit, one or more process or production units and activities which produce fugitive emissions only.

2. Description of Emissions Unit Addressed in this Section:
   No. 9 Sulfuric Acid Plant (SAP)

3. Emissions Unit Identification Number: **006**

4. Emissions Unit Status Code:	5. Commence Construction Date:	6. Initial Startup Date:	7. Emissions Unit Major Group SIC Code:
A			**28**

8. Federal Program Applicability: (Check all that apply)

   ☐ Acid Rain Unit

   ☐ CAIR Unit

   ☐ Hg Budget Unit

9. Package Unit:
   Manufacturer: Model Number:

10. Generator Nameplate Rating:

11. Emissions Unit Comment:
    Proposed emissions limits for No. 9 SAP to meet BART exemption criteria.

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL, FUGITIVE, AND ACTUAL EMISSIONS

(Optional for unregulated emissions units.)

Complete a Subsection F1 for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V operation permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

Potential, Estimated Fugitive, and Baseline & Projected Actual Emissions

1. Pollutant Emitted: **SO_2**	2. Total Percent Efficiency of Control:
3. Potential Emissions: **425** lb/hour **1,861.5** tons/year	4. Synthetically Limited? ☐ Yes ☒ No
5. Range of Estimated Fugitive Emissions (as applicable): to tons/year	
6. Emission Factor: **425 lb/hr, 24-hr daily average** Reference: **Requested Limit**	7. Emissions Method Code: **0**
8.a. Baseline Actual Emissions (if required): tons/year	8.b. Baseline 24-month Period: From: To:
9.a. Projected Actual Emissions (if required): tons/year	9.b. Projected Monitoring Period: ☐ 5 years ☐ 10 years

10. Calculation of Emissions:
Annual Emissions = 425 lb/hr x 8,760 hrs/yr / 2,000 lb/ton = 1,861.5 TPY

11. Potential, Fugitive, and Actual Emissions Comment:

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete Subsection F2 if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions **1** of **1**

1. Basis for Allowable Emissions Code: **OTHER**	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units: **425 lb/hr, 24-hr average**	4. Equivalent Allowable Emissions: **425** lb/hour **1,861.5** tons/year
5. Method of Compliance: **Continuous Emission Monitoring System for SO_2**	
6. Allowable Emissions Comment (Description of Operating Method): **Allowable emissions based on 24-hour daily average, in order to meet BART exemption criteria.**	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL, FUGITIVE, AND ACTUAL EMISSIONS

(Optional for unregulated emissions units.)

Complete a Subsection F1 for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V operation permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

Potential, Estimated Fugitive, and Baseline & Projected Actual Emissions

1. Pollutant Emitted: **SAM**	2. Total Percent Efficiency of Control:
3. Potential Emissions: **7.1** lb/hour **31.1** tons/year	4. Synthetically Limited? ☐ Yes ☒ No
5. Range of Estimated Fugitive Emissions (as applicable): to tons/year	
6. Emission Factor: **7.1 lb/hr** Reference: **Requested Limit**	7. Emissions Method Code: **0**
8.a. Baseline Actual Emissions (if required): tons/year	8.b. Baseline 24-month Period: From: To:
9.a. Projected Actual Emissions (if required): tons/year	9.b. Projected Monitoring Period: ☐ 5 years ☐ 10 years
10. Calculation of Emissions: **7.1 lb/hr x 8,760 hrs/yr / 2,000 lb/ton = 31.1 TPY**	
11. Potential, Fugitive, and Actual Emissions Comment:	

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete Subsection F2 if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: **OTHER**	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units: **7.1 lb/hr**	4. Equivalent Allowable Emissions: **7.1** lb/hour **31.1** tons/year
5. Method of Compliance: **EPA Methods 6 or 6C**	
6. Allowable Emissions Comment (Description of Operating Method): **Allowable emissions in order to meet BART exemption criteria.**	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

APPENDIX C

CATALYST SUPPLIER STUDY

HALDOR TOPSOE, INC.

Catalyst Division
17629 El Camino Real, Suite 300 • Houston, Texas 77058-3051
Phone: (281) 228-5000 • Fax: (281) 228-5109

e-mail

Date: May 2, 2008

To: Doug Thomas
Doug.Thomas@mosaicco.com

From: Patrick Polk
Phone No: (281) 228-5145
Fax No: (281) 228-5109
e-mail wpp@topsoe.com

Re: Modeling for Riverview and 3 New Wales plants

Doug,

I have investigated the expected performance of the Riverview plants and New Wales 01, 02 and 03 plants using all standard vanadium catalyst to reduce emissions to the 2.8 to 3.0 #/ton range. I used the same catalyst activities and temperature approach to equilibrium limitations for these calculations as I did for the larger cesium catalyst study. The catalyst activities used were:

1st bed – 65%
2nd bed – 85%
3rd bed – 85%
4th bed - 95%

The temperature approach to equilibrium was limited for each bed to 25, 20, 20 and 15°C, respectively.

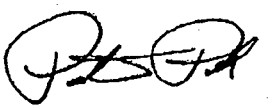
2.8 #/ton emissions require a conversion rate of 99.78%. For each plant I started with generic converter bed inlet temperatures of 420, 440, 440, and 415°C, respectively. If 99.78% conversion was achieved at these temperatures, I did not attempt to optimize the temperatures further. If 99.78% conversion was not initially obtained, I optimized the converter inlet temperatures until 99.78% conversion was obtained or the converter was optimized given the approach to equilibrium constraints.

It was possible to operate at maximum rate and an 11.5% SO_2 gas strength in all of the plants except New Wales 03 and Riverview #8. For the New Wales 03 plant it was necessary to reduce the gas strength to 11.3% in order to achieve the desired conversion. For the Riverview #8 plant it is not possible with the existing converter. However, since this converter will be replaced, it can be designed for a sufficient catalyst loading.

These calculations are based on the expected performance at the end of a 2 year turnaround cycle. The initial performance clean after a turnaround should be better than predicted. Please note that these are based on operating at an 11.5% gas strength. In order to operate at a higher gas strength, the catalyst loadings will need to be increased.

Sincerely,

HALDOR TOPSOE, INC.



Patrick Polk
Account Manager
Sulfuric Acid Catalyst & WSA Technology

Mosaic - Riverview #7

Maximum vanadium catalyst loadings

3200 STPD

11.5% SO2

65% activity 1st bed

85% activity 2nd bed

85% activity 3rd bed

95% activity 4th bed

** Temperature approach to equilibrium limited to 25, 20, 20 & 15C **

Haldor Topsoe GIPS Calculation File :

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Made by : wpp

SUMMARY Summary for Reactor Calculation

for Sulfur Dioxide Oxidation

Mosaic - Riverview #7

Maximum vanadium catalyst loadings

3200 Production (short TPD), as monohydrate.
239 SO2 in stack gas (ppm by moles).

Gas analysis (mole%)	Inlet first pass	Outlet last pass
Sulfur Dioxide	11.50	0.02
Sulfur Trioxide	0.00	0.78
Oxygen	9.45	4.45
Nitrogen	79.05	94.75
Temperature (deg.F)	788.00	822.47
Pressure (psia)	21.31	14.83
Flow (SCFM,60deg.F)	149816.	124990.

Temperature and Conversion Profile

Pass no.	1	2	3	4	Total
Cat. volume (liters) VK, 12 mm Daisy	118276.	134400.	195609.	198670.	646955.
Cat. pass area (sq.ft)	1413.72	1413.72	1413.72	1413.72	
SO3/H2SO4 removed after each pass (SCFM)	0.	0.	16227.	0.	
Inlet temp. (deg.F)	788.00	824.00	824.00	779.00	
Outlet temp. (deg.F)	1150.11	970.22	879.25	822.47	
Temp. rise (deg.F)	362.11	146.22	55.25	43.47	607.06
Outlet temperature approach (deg.F)	44.98	55.44	36.00	27.00	
Total conversion (%)	60.72	85.11	94.28	99.83	
SO2 Bed Conversion(%)	60.72	62.08	61.57	96.99	
Catalyst bed pressure drop (in WG)	4.0	4.7	7.0	6.1	21.9

Job 82031 Mon, 28 Apr 2008

Mosaic - Riverview #8

Maximum vanadium catalyst loadings

2900 STPD

11.5% SO2

65% activity 1st bed

85% activity 2nd bed

85% activity 3rd bed

95% activity 4th bed

** Temperature approach to equilibrium limited to 25, 20, 20 & 15C **

Haldor Topsoe GIPS Calculation File :

C:/Ginp/535794x.out

Made by : wpp

SUMMARY

Summary for Reactor Calculation

for Sulfur Dioxide Oxidation

Mosaic - Riverview #8

Maximum vanadium catalyst loadings

2900 Production (short TPD), as monohydrate.
375 SO2 in stack gas (ppm by moles).

Gas analysis (mole%)	Inlet first pass	Outlet last pass
Sulfur Dioxide	11.50	0.04
Sulfur Trioxide	0.00	0.95
Oxygen	9.45	4.44
Nitrogen	79.05	94.56
Temperature (deg.F)	833.00	843.30
Pressure (psia)	21.31	15.22
Flow (SCFM,60deg.F)	135876.	113585.

Temperature and Conversion Profile

Pass no.	1	2	3	4	Total
Cat. volume (liters) VK, 12 mm Daisy	65800.	102100.	143700.	156720.	468320.
Cat. pass area (sq.ft)	894.62	934.82	1870.32	934.82	
SO3/H2SO4 removed after each pass (SCFM)	0.	0.	14499.	0.	
Inlet temp. (deg.F)	833.00	830.00	835.00	790.00	
Outlet temp. (deg.F)	1146.44	1009.36	896.38	843.30	
Temp. rise (deg.F)	313.44	179.36	61.38	53.30	607.49
Outlet temperature approach (deg.F)	96.59	36.00	40.46	27.00	
Total conversion (%)	52.68	82.68	92.88	99.73	
SO2 Bed Conversion(%)	52.68	63.39	58.91	96.21	
Catalyst bed pressure drop (in WG)	6.8	9.5	2.1	12.3	30.8

Job 82031 Mon, 28 Apr 2008

Mosaic - Riverview #9

Maximum vanadium catalyst loading

3400 STPD

11.5% SO2

65% activity 1st bed

85% activity 2nd bed

85% activity 3rd bed

95% activity 4th bed

** Temperature approach to equilibrium limited to 25, 20, 20 & 15C **

Haldor Topsoe GIPS Calculation File :

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Made by : wpp

SUMMARY

Summary for Reactor Calculation

for Sulfur Dioxide Oxidation

Mosaic - Riverview #9

Maximum vanadium catalyst loading

3401 Production (short TPD), as monohydrate.
263 SO2 in stack gas (ppm by moles).

Gas analysis (mole%)	Inlet first pass	Outlet last pass
Sulfur Dioxide	11.50	0.03
Sulfur Trioxide	0.00	0.83
Oxygen	9.45	4.45
Nitrogen	79.05	94.70
Temperature (deg.F)	788.00	825.33
Pressure (psia)	21.31	15.03
Flow (SCFM,60deg.F)	159222.	132910.

Temperature and Conversion Profile

Pass no.	1	2	3	4	Total
Cat. volume (liters) VK, 12 mm Daisy	123900.	130900.	199900.	208071.	662771.
Cat. pass area (sq.ft)	1651.75	1651.75	1651.75	1651.54	
SO3/H2SO4 removed after each pass (SCFM)	0.	0.	17174.	0.	
Inlet temp. (deg.F)	788.00	824.00	824.00	779.00	
Outlet temp. (deg.F)	1145.12	969.42	882.90	825.33	
Temp. rise (deg.F)	357.12	145.42	58.90	46.33	607.78
Outlet temperature approach (deg.F)	55.23	65.06	39.17	27.00	
Total conversion (%)	59.86	84.11	93.89	99.81	
SO2 Bed Conversion(%)	59.86	60.41	61.54	96.91	
Catalyst bed pressure drop (in WG)	3.1	3.3	5.2	4.7	16.3

file -

Golder Associates Inc.

6241 NW 23rd Street, Suite 500
Gainesville, FL 32653-1500
Telephone (352) 336-5600
Fax (352) 336-6603

Golder Associates

TRANSMITTAL LETTER

To: Scott Sheplak
FDEP Tallahassee

Date: August 8, 2008
Project No.: 0637643-0500

Sent by: sl

- ☐ Mail
- ☐ Air Freight
- ☐ Hand Carried
- ☐ UPS
- ☒ Federal Express

Per: Dave Buff

Quantity	Item	Description
4	Bound Copies	BART Exemption Analysis for Mosaic Fertilizer, LLC

cc: Diana Lee, Hillsborough County EPC (1 Copy)
Jeff Stewart, Mosaic Fertilizer, LLC (2 Copies)

Y:\Projects\2006\0637643 Mosaic Riverview BART\4.2 Reports\EXEMPTION\FINAL\T080808_643.docx

KOFAX

SEPARATOR

APPLICATION