DEQ
Montana Department
of Environmental Quality

December 17, 2015

Gary Hebener - CEO
Montana Advanced Biofuels, LLC
P.O. Box 2996
Great Falls, Montana  59403

Dear Mr. Hebener:

Montana Air Quality Permit #4620-01 is deemed final as of December 17, 2015, by the Department of Environmental Quality (Department). This permit is for an ethanol manufacturing facility. All conditions of the Department's Decision remain the same. Enclosed is a copy of your permit with the final date indicated.

For the Department,

Julie A Merkel

Julie A. Merkel
Permitting Services Section Supervisor
Air Quality Bureau
(406) 444-3626

Ed Warner

Ed Warner
Lead Engineer – Permitting Services Section
Air Quality Bureau
(406) 444-2467

JM:EW
Enclosure

Montana Department of Environmental Quality
Permitting and Compliance Division

# Montana Air Quality Permit #4620-01

Montana Advanced Biofuels, LLC
P.O. Box 2996
Great Falls, Montana  59403

December 17, 2015

# MONTANA AIR QUALITY PERMIT

Issued To: Montana Advanced Biofuels, LLC
P.O. Box 2996
Great Falls, MT 59403-2996

MAQP: #4620-01
Application Complete: 11/06/2015
Preliminary Determination Issued: 11/13/2015
Department's Decision Issued: 12/01/2015
Permit Final: 12/17/2015
AFS #:013-0041

A Montana Air Quality Permit (MAQP), with conditions, is hereby granted to Montana Advanced Biofuels, LLC (MAB), pursuant to Sections 75-2-204 and 211 of the Montana Code Annotated (MCA), as amended, and Administrative Rules of Montana (ARM) 17.8.740, *et seq*., as amended, for the following:

## SECTION I: Permitted Facilities

### A. Permitted Equipment

MAB proposes to construct and operate a 126 million gallon per year fuel grade ethanol (ethyl alcohol) manufacturing facility. Barley and wheat are to be the primary raw materials. The plant will produce distiller's dried grains and solubles (DDGS) for animal feed and wheat gluten as by-products of the alcohol manufacturing process. A complete list of permitted equipment is contained in the Permit Analysis.

### B. Plant Location

The facility will be located in Section 3, Township 20 North, Range 4 East, in Cascade County, Montana.

### C. Current Permit Action

On October 5, 2015, the Montana Department of Environmental Quality – Air Quality Bureau (Department) received correspondence from Bison Engineering, Inc. (Bison) on behalf of MAB. The letter provided a review of the Best Available Control Technology (BACT) analysis in support of renewing the 3-year window from permit issuance for beginning construction as provided in Section III.H of the MAQP. The letter addressed each of the BACT determinations from MAQP #4620-00 and described how they are still valid and appropriate based on current technology and economic conditions. No changes were proposed to the facility equipment, operating processes, pollution control technologies, or emission limits. The MAQP is being reissued as #4620-01 in order to reauthorize the construction of the proposed MAB facility. The 3-year construction window will begin again upon final issuance of MAQP #4620-01.

## SECTION II: Conditions and Limitations

### A. Operation and Emission Limitations

1. MAB shall not cause or authorize emissions to be discharged into the outdoor atmosphere from any sources installed after November 23, 1968, that exhibit an opacity of 20% or greater averaged over 6 consecutive minutes (ARM 17.8.304).

2. MAB may not cause or authorize the production, handling, transportation, or storage of any material unless reasonable precautions are taken to control emissions of airborne particulate matter. Such emissions shall not exhibit an opacity of 20% or greater averaged over 6 consecutive minutes (ARM 17.8.308).

3. MAB shall not cause or authorize the use of any street, road, or parking lot without taking reasonable precautions, such as flushing paved sources with water, to control emissions of airborne particulate matter (ARM 17.8.308).

4. MAB shall treat all unpaved portions of the haul roads, access roads, parking lots, or general plant area with water and/or chemical dust suppressant as necessary to maintain compliance with the reasonable precautions limitation in Section II.A.3 (ARM 17.8.749).

5. The maximum amount of grain received and processed shall not exceed 2,028,600 tons during any rolling 12-month time period (ARM 17.8.749).

6. All grain receiving, handling, and scalping/cleaning areas; products storage/handling areas; biochar/ash loadout; and bin vent areas shall be fully enclosed (ARM 17.8.752).

7. MAB shall install, operate, and maintain a wet electrostatic precipitator (ESP) for each of the two biomass gasifier/afterburner thermal oxidizer/heat recovery steam generator systems (Biomass Energy Systems (BES)) (ARM 17.8.752).

8. MAB shall utilize low nitrogen oxides ($NO_x$) burners (LNB) and flue gas recirculation (FGR) in the thermal oxidizer portion of each of the two BES trains (ARM 17.8.752).

9. MAB shall install an ammonia injection system within each of the BES trains for $NO_x$ reduction (ARM 17.8.752).

10. MAB shall use only syngas created from the two biomass gasifiers, natural gas, and/or biogas produced from the biomethanator as fuel in the BES (ARM 17.8.752).

11. Emissions from each of the two BES train wet ESPs shall not exceed the following limits:

    a. Particulate matter (PM) with an aerodynamic diameter of 10 microns or less ($PM_{10}$), including condensable PM, shall not exceed 2.72 lb/hr and 0.01 lb/MMBtu (ARM 17.8.752).

   b. PM with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$), including condensable PM, shall not exceed 2.72 lb/hr and 0.01 lb/MMBtu (ARM 17.8.752).

   c. $NO_x$ shall not exceed 23.90 lb/hr on an hourly basis (ARM 17.8.749) and 0.084 lb/MMBtu of fuel burned on a 30-day rolling average (ARM 17.8.752).

   d. Carbon monoxide (CO) shall not exceed 21.64 lb/hr and 0.08 lb/MMBtu of fuel burned (ARM 17.8.752).

   e. Volatile organic compounds (VOC) shall not exceed 5.37 lb/hr and 0.02 lb/MMBtu of fuel burned (ARM 17.8.752).

12. MAB shall utilize LNB in each of the two gluten ring dryers (ARM 17.8.752).

13. MAB shall use only natural gas and/or biogas produced from the biomethanator as fuel in the gluten ring dryers (ARM 17.8.752).

14. MAB shall operate a fabric filter baghouse on the exhaust of each of the two gluten ring dryers (ARM 17.8.752).

15. Emissions from each of the two gluten ring dryers (measured downstream of the baghouses) shall not exceed the following limits (ARM 17.8.752):

    a. $PM_{10}$, including condensable PM, shall not exceed 0.98 lb/hr.

    b. $PM_{2.5}$, including condensable PM, shall not exceed 0.28 lb/hr.

    c. $NO_x$ shall not exceed 0.81 lb/hr.

    d. CO shall not exceed 2.00 lb/hr.

    e. VOC shall not exceed 6.80 lb/hr.

16. MAB shall install, operate, and maintain two regenerative thermal oxidizers (RTO) for the six steam tube dryers with three steam tube dryer exhausts routed to each RTO (ARM 17.8.752).

17. MAB shall use only natural gas and/or biogas produced from the biomethanator as fuel in the RTOs (ARM 17.8.752).

18. Emissions from each of the RTOs for the steam tube dryers shall not exceed the following limits (ARM 17.8.752):

    a. $PM_{10}$ including condensable PM, shall not exceed 5.65 lb/hr.

    b. $PM_{2.5,}$ including condensable PM, shall not exceed 5.65 lb/hr.

    c. $NO_x$ shall not exceed 0.72 lb/hr.

d. CO shall not exceed 3.60 lb/hr.

e. VOC shall not exceed 6.17 lb/hr.

f. Sulfur dioxide ($SO_2$) shall not exceed 4.41 lb/hr.

19. The DDGS Cooling Drum exhaust shall route to the steam tube dryers as makeup process air when both the DDGS Cooling Drum and RTOs are operating. The times when the DDGS Cooling Drum exhaust bypasses the steam tube dryers and exhausts directly to the atmosphere shall occur no more than 500 hours per year (ARM 17.8.749).

20. The entire exhaust streams from the two BES wet ESPs and the two steam tube dryer RTOs shall be combined downstream of their respective pollution control devices and exhausted to the atmosphere from a single stack, referred to as the Megastack (ARM 17.8.749).

21. The emission release height of the Megastack shall be at least 150 feet from ground level (ARM 17.8.749).

22. The emissions from the Megastack shall not exceed the following limits (ARM 17.8.749):

a. $PM_{10}$ including condensable PM, shall not exceed 16.74 lb/hr.

b. $PM_{2.5,}$ including condensable PM, shall not exceed 16.74 lb/hr.

c. $NO_x$ shall not exceed 49.24 lb/hr.

d. CO shall not exceed 50.48 lb/hr.

e. VOC shall not exceed 23.08 lb/hr.

f. $SO_2$ shall not exceed 11.17 lb/hr.

23. MAB shall install, operate, and maintain fabric filter baghouses or bin vents on each of the emitting points identified in the following table. Filterable $PM_{10}$ and $PM_{2.5}$ emissions shall not exceed the limits presented in the table (ARM 17.8.752).

| Source ID | Emission Source | $PM_{10}$ Emission Factor (gr/dscf) | $PM_{2.5}$ Emission Factor (gr/dscf) |
|---|---|---|---|
| S10 | Grain Unloading | 0.004 | 0.001 |
| S21 | Mill A Barley Cleaning | 0.004 | 0.001 |
| S22 | Mill B Barley Cleaning | 0.004 | 0.001 |
| S23 | Mill C Barley Cleaning | 0.004 | 0.001 |
| S24 | Mill D Barley Cleaning | 0.004 | 0.001 |

| Source ID | Emission Source | $PM_{10}$ Emission Factor (gr/dscf) | $PM_{2.5}$ Emission Factor (gr/dscf) |
|---|---|---|---|
| S25 | Mill A Barley Sifter | 0.004 | 0.001 |
| S26 | Mill B Barley Sifter | 0.004 | 0.001 |
| S27 | Mill C Barley Sifter | 0.004 | 0.001 |
| S28 | Mill D Barley Sifter | 0.004 | 0.001 |
| S30 | Raw Wheat Cleaning | 0.004 | 0.001 |
| S31 | Raw Wheat Cleaning | 0.004 | 0.001 |
| S32 | Wheat Sifter Side 1 | 0.004 | 0.001 |
| S33 | Wheat Sifter Side 2 | 0.004 | 0.001 |
| S40 | Wheat Storage Bin | 0.005 | 0.001 |
| S41 | Gluten Bin Vent | 0.005 | 0.001 |
| S42 | Wheat Starch Bin | 0.005 | 0.001 |
| S43 | Wheat Gluten Packaging | 0.004 | 0.001 |
| S72 | DDGS Cooler | 0.0045 | 0.001 |
| S73 | DDGS Loading | 0.004 | 0.001 |
| S82 | Bran Loadout/Storage | 0.004 | 0.001 |
| S95 | Ash Receiver Bin | 0.005 | 0.001 |
| S96 | Ash Receiver Bin | 0.005 | 0.001 |
| S97 | Ash Loadout Bin | 0.005 | 0.001 |

24. MAB shall install, operate, and maintain a wet scrubber ethanol recovery system on the fermentation system. VOC emissions shall not exceed 10.79 lb/hr (ARM 17.8.752).

25. MAB shall implement a leak detection and repair (LDAR) program for fugitive VOC emission sources including but not limited to valves, flanges, compressors, and pumps that do not operate in vacuum service. The LDAR shall incorporate all of the requirements of 40 CFR 60, Subpart VVa – *Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006* (ARM 17.8.752, ARM 17.8.340, and 40 CFR 60, Subpart VVa).

26. MAB shall install, operate, and maintain a vapor recovery system with a flare on both the truck and railcar ethanol loadout systems to control VOC emissions (ARM 17.8.752).

27. MAB shall install, operate, and maintain high efficiency drift eliminators with the cooling towers to control PM emissions (ARM 17.8.752).

28. The non-emergency operation of the diesel firewater pump engine shall not exceed 52 hours per rolling 12-month time period (ARM 17.8.749).

29. MAB shall comply with all applicable standards and limitations, and the reporting, recordkeeping and notification requirements contained in 40 CFR 60, Subpart Kb – *Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984* (ARM 17.8.340, ARM 17.8.752, and 40 CFR 60, Subpart Kb).

30. MAB shall comply with all applicable standards and limitations, and the reporting, recordkeeping and notification requirements contained in 40 CFR 60, Subpart VVa – *Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006* (ARM 17.8.340, ARM 17.8.752, and 40 CFR 60, Subpart VVa).

31. MAB shall comply with all applicable standards and limitations, and the reporting, recordkeeping and notification requirements contained in 40 CFR 60, Subpart Db – *Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units* (ARM 17.8.340 and 40 CFR 60, Subpart Db).

32. MAB shall comply with all applicable standards and limitations, and the reporting, recordkeeping and notification requirements contained in 40 CFR 60, Subpart IIII – *Standards of Performance for Stationary Compression Ignition Internal Combustion Engines* and 40 CFR 63, Subpart ZZZZ, *National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines*, for any applicable diesel engine (ARM 17.8.340; 40 CFR 60, Subpart IIII; ARM 17.8.342 and 40 CFR 63, Subpart ZZZZ).

33. MAB shall limit the total natural gas fuel consumption at the facility to not exceed $1.55 * 10^9$ standard cubic feet during any rolling 12-month time period. The natural gas fuel consumption shall be measured with a gas meter or meters that must account for all natural gas combusted at the facility (ARM 17.8.749).

34. MAB shall limit the total amount of wheat and barley bran that is processed in the gasifiers to not exceed 299,300 tons during any rolling 12-month time period (ARM 17.8.749).

B. Testing Requirements

1. Compliance with the limits in Section II.A.11 for the BES (S91 and S92) shall be verified with an initial performance source test conducted within 60 days of achieving the maximum production rate at which the facility will be operated but not later than 180 days after initial startup. MAB shall conduct performance source testing for $NO_x$ and CO, concurrently. Emissions shall be sampled downstream from the wet ESPs and upstream from the junction with the Megastack at a location that satisfies 40 CFR 60, Appendix A, Test Method 1 requirements, or at another location as approved by the Department. After the initial source tests, testing shall continue on an every 2-year basis or according to another testing/monitoring schedule as approved by the Department. MAB may use $NO_x$ testing in conjunction with the Relative Accuracy Test completed for certification of the continuous emissions monitoring system (CEMS) as a compliance test if maximum achievable process rates are maintained (ARM 17.8.105, ARM 17.8.749, 40 CFR Part 60.8, and 40 CFR 60, Subpart Db).

2. Compliance with the $PM_{10}$, $PM_{2.5}$, and VOC limits in Section II.A.15 for the gluten ring dryers (S51 and S52) shall be verified with an initial source test conducted within 60 days of achieving the maximum production rate at which the facility will be operated but not later than 180 days after initial startup. MAB may elect to perform a single initial source test for $PM_{10}$ and $PM_{2.5}$ on either S51 or S52 to represent compliance for both stacks. VOC testing will be required on both stacks. After the initial source tests, testing for VOC shall continue on an every 5-year basis or according to another testing/monitoring schedule as approved by the Department (ARM 17.8.105 and ARM 17.8.749).

3. Compliance with the $PM_{10}$, $PM_{2.5}$, VOC, and $SO_2$ limits in Section II.A.18 for the steam tube dryers (S70 and S71) shall be verified with an initial source test conducted within 60 days of achieving the maximum production rate at which the facility will be operated but not later than 180 days after initial startup. Emissions shall be sampled downstream from the RTOs and upstream from the junction with the Megastack at a location that satisfies 40 CFR 60, Appendix A, Test Method 1 requirements, or at another location as approved by the Department. After the initial source test, testing for VOC shall continue on an annual basis or according to another testing/monitoring schedule as approved by the Department (ARM 17.8.105 and ARM 17.8.749).

4. Compliance with the emission limits in Section II.A.22 for the Megastack shall be verified by complying with testing requirements for the BES (Section II.B.1) and steam tube dryers (Section II.B.3), or by another scenario as approved by the Department (ARM 17.8.105 and ARM 17.8.749).

5. Compliance with the $PM_{10}$ and $PM_{2.5}$ limits for the sources in Section II.A.23 shall be verified with an initial source test conducted within 60 days of achieving the maximum production rate at which the facility will be operated but not later than 180 days after initial startup. MAB may test one baghouse from each group of similarly sized baghouses to represent compliance with that group of similarly sized baghouses. The proposed representative baghouses are S10, S21, S32, and S43. MAB may select different representative baghouses with Department approval (ARM 17.8.105 and ARM 17.8.749).

6. Compliance with the VOC limit in Section II.A.24 for the fermentation system (S60) shall be verified with an initial source test conducted within 60 days of achieving the maximum production rate at which the facility will be operated but not later than 180 days after initial startup. VOC testing should be based on the best approximation of all of the kinds and amounts of actual VOC emitted on a mass basis and not based on a surrogate such as carbon or propane. The EPA has developed a testing protocol called the Midwest Scaling Protocol that uses existing EPA test methods with additional calculation procedures for approximating actual mass VOC emissions. The source test protocol should describe how the VOC testing would account for all of the kinds and amounts of actual VOC emitted on a mass basis. After the initial source test, testing for VOC shall continue on an annual basis or according to another testing/monitoring schedule as approved by the Department (ARM 17.8.105 and ARM 17.8.749).

7. All compliance source tests shall conform to the requirements of the Montana Source Test Protocol and Procedures Manual (ARM 17.8.106).

8. The Department may require further testing (ARM 17.8.105).

C. Operational Reporting Requirements

1. MAB shall supply the Department with annual production information for all emission points, as required by the Department in the annual emission inventory request. The request will include, but is not limited to, all sources of emissions identified in the emission inventory contained in the permit analysis.

   Production information shall be gathered on a calendar-year basis and submitted to the Department by the date required in the emission inventory request. Information shall be in the units required by the Department. This information may be used to calculate operating fees, based on actual emissions from the facility, and/or to verify compliance with permit limitations (ARM 17.8.505). MAB shall submit the following information annually as requested by the Department; the information may be submitted along with the annual emission inventory (ARM 17.8.505).

   a. Amount of grain processed by the facility
   b. Amount of ethanol produced by the facility
   c. Amount of DDGS produced by the facility

2. MAB shall notify the Department of any construction or improvement project conducted, pursuant to ARM 17.8.745, that would include ***the addition of a new emissions unit***, change in control equipment, stack height, stack diameter, stack flow, stack gas temperature, source location, or fuel specifications, or would result in an increase in source capacity above its permitted operation. The notice must be submitted to the Department, in writing, 10 days prior to startup or use of the proposed de minimis change, or as soon as reasonably practicable in the event of an unanticipated circumstance causing the de minimis change, and must include the information requested in ARM 17.8.745(l)(d) (ARM 17.8.745).

3. All records compiled in accordance with this permit must be maintained by MAB as a permanent business record for at least 5 years following the date of the measurement, must be available at the plant site for inspection by the Department, and must be submitted to the Department upon request (ARM 17.8.749).

4. MAB shall document, by month, the hours that the DDGS Cooling Drum is operating with its exhaust bypassing the steam tube dryers. By the 25th day of each month, MAB shall total the hours for the previous month. The monthly information will be used to verify compliance with the rolling 12-month limitation in Section II.A.19. The information for each of the previous months shall be submitted along with the annual emission inventory (ARM 17.8.749).

5. MAB shall document, by month, the non-emergency hours of operation of the diesel firewater pump engine. By the 25th day of each month, MAB shall total the hours for the previous month. The monthly information will be used to verify compliance with the rolling 12-month limitation in Section II.A.28. The information for each of the previous months shall be submitted along with the annual emission inventory (ARM 17.8.749).

6. MAB shall document, by month, the total natural gas fuel consumption at the facility. By the 25th day of each month, MAB shall total the volume of natural gas at standard conditions for the previous month. The monthly information will be used to verify compliance with the rolling 12-month limitation in Section II.A.33. The information for each of the previous months shall be submitted along with the annual emission inventory (ARM 17.8.749).

7. MAB shall document, by month, the total weight of wheat and barley bran that is processed in the gasifiers at the facility. By the 25th day of each month, MAB shall total the weight of wheat and barley bran that is processed in the gasifiers for the previous month. The monthly information will be used to verify compliance with the rolling 12-month limitation in Section II.A.34. The information for each of the previous months shall be submitted along with the annual emission inventory (ARM 17.8.749).

D. Continuous Emissions Monitoring Systems

MAB shall install, calibrate, maintain, and operate CEMS for the BES trains for measuring $NO_x$ emissions as specified in 40 CFR 60, Subpart Db – *Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units*. This CEMS shall conform to 40 CFR Part 60, Appendix B, Performance Specification 2. MAB may operate a single CEMS located in the Megastack to account for emissions from each of the two BES trains (ARM 17.8.340 and 40 CFR 60, Subpart Db).

E. Notification

MAB shall provide the Department with written notification of the following dates within the specified time periods (ARM 17.8.749):

1. Commencement of construction of the facility within 30 days after commencement of construction.

2. Actual start-up date of the facility within 15 days after the actual start up.

3. All compliance tests, as required by the Montana Source Test Protocol and Procedures Manual.

## SECTION III: General Conditions

A. Inspection – MAB shall allow the Department's representatives access to the source at all reasonable times for the purpose of making inspections or surveys, collecting samples, obtaining data, auditing any monitoring equipment (CEMS, CERMS) or observing any monitoring or testing, and otherwise conducting all necessary functions related to this permit.

B. Waiver – The permit and the terms, conditions, and matters stated herein shall be deemed accepted if MAB fails to appeal as indicated below.

C. Compliance with Statutes and Regulations – Nothing in this permit shall be construed as relieving MAB of the responsibility for complying with any applicable federal or Montana statute, rule, or standard, except as specifically provided in ARM 17.8.740, *et seq*. (ARM 17.8.756).

D. Enforcement – Violations of limitations, conditions and requirements contained herein may constitute grounds for permit revocation, penalties, or other enforcement action as specified in Section 75-2-401, *et seq*., MCA.

E. Appeals – Any person or persons jointly or severally adversely affected by the Department's decision may request, within 30 days after the Department renders its decision, upon affidavit setting forth the grounds therefor, a hearing before the Board of Environmental Review (Board). A hearing shall be held under the provisions of the Montana Administrative Procedures Act. The filing of a request for a hearing does not stay the Department's decision, unless the Board issues a stay upon receipt of a petition and a finding that a stay is appropriate under Section 75-2-211(11)(b), MCA. The issuance of a stay on a permit by the Board postpones the effective date of the Department's decision until conclusion of the hearing and issuance of a final decision by the Board. If a stay is not issued by the Board, the Department's decision on the application is final 16 days after the Department's decision is made.

F. Permit Inspection – As required by ARM 17.8.755, Inspection of Permit, a copy of the air quality permit shall be made available for inspection by the Department at the location of the source.

G. Permit Fee – Pursuant to Section 75-2-220, MCA, failure to pay the annual operation fee by MAB may be grounds for revocation of this permit, as required by that section and rules adopted thereunder by the Board.

H. Duration of Permit – Construction or installation must begin or contractual obligations entered into that would constitute substantial loss within 3 years of permit issuance and proceed with due diligence until the project is complete or the permit shall expire (ARM 17.8.762).

## INSTRUCTIONS FOR COMPLETING EXCESS EMISSION REPORTS (EER)

PART 1 Complete as shown. Report total time during the reporting period in hours. The determination of plant operating time (in hours) includes time during unit startup, shutdown, malfunctions, or whenever pollutants of any magnitude are generated, regardless of unit condition or operating load.

Excess emissions include all time periods when emissions, as measured by the CEMS, exceed any applicable emission standard for any applicable time period.

Percent of time in compliance is to be determined as: (1 – (total hours of excess emissions during reporting period / total hours of CEMS availability during reporting period)) x 100.

PART 2 Complete as shown. Report total time the point source operated during the reporting period in hours. The determination of point source operating time includes time during unit startup, shutdown, malfunctions, or whenever pollutants (of any magnitude) are generated, regardless of unit condition or operating load.

Percent of time CEMS was available during point source operation is to be determined as: (1–(CEMS downtime in hours during the reporting period* /total hours of point source operation during reporting period)) x 100.

* All time required for calibration and to perform preventative maintenance must be included in the CEMS downtime.

PART 3 Complete a separate sheet for each pollutant control device. Be specific when identifying control equipment operating parameters. For example: number of TR units, energizers for electrostatic precipitators (ESP); pressure drop and effluent temperature for baghouses; and bypass flows and pH levels for scrubbers. For the initial EER, include a diagram or schematic for each piece of control equipment.

PART 4 Use Table I as a guideline to report all excess emissions. Complete a separate sheet for each monitor. Sequential numbering of each excess emission is recommended. For each excess emission, indicate: 1) time and duration, 2) nature and cause, and 3) action taken to correct the condition of excess emissions. Do not use computer reason codes for corrective actions or nature and cause; rather, be specific in the explanation. If no excess emissions occur during the quarter, it must be so stated.

PART 5 Use Table II as a guideline to report all CEM system upsets or malfunctions. Complete a separate sheet for each monitor. List the time, duration, nature and extent of problems, as well as the action taken to return the CEM system to proper operation. Do not use reason codes for nature, extent or corrective actions. Include normal calibrations and maintenance as prescribed by the monitor manufacturer. Do not include zero and span checks.

PART 6 Complete a separate sheet for each pollutant control device. Use Table III as a guideline to report operating status of control equipment during the excess emission. Follow the number sequence as recommended for excess emissions reporting. Report operating parameters consistent with Part 3, Subpart e.

PART 7 Complete a separate sheet for each monitor. Use Table IV as a guideline to summarize excess emissions and monitor availability.

PART 8 Have the person in charge of the overall system and reporting certify the validity of the report by signing in Part 8.

## EXCESS EMISSIONS REPORT

**PART 1**

a. Emission Reporting Period ____________________

b. Report Date ____________________

c. Person Completing Report ____________________

d. Plant Name ____________________

e. Plant Location ____________________

f. Person Responsible for Review and Integrity of Report ____________________

g. Mailing Address for 1.f. ____________________

h. Phone Number of 1.f. ____________________

i. Total Time in Reporting Period ____________________

j. Total Time Plant Operated During Quarter ____________________

k. Permitted Allowable Emission Rates: Opacity ____________________

SO2 ____________ NOx ____________ TRS ____________

l. Percent of Time Out of Compliance: Opacity ____________________

SO2 ____________ NOx ____________ TRS ____________

m. Amount of Product Produced During Reporting Period ____________________

n. Amount of Fuel Used During Reporting Period ____________________

**PART 2 – Monitor Information (Complete for each monitor).**

a. Monitor Type (circle one): Opacity SO2 NOx O2 CO2 TRS Flow

b. Manufacturer ____________________

c. Model No. ____________________

d. Serial No. ____________________

e. Automatic Calibration Value: Zero ____________ Span ____________

f. Date of Last Monitor Performance Test ____________________

g. Percent of Time Monitor Available:

  1) During reporting period ______________________________

  2) During plant operation ______________________________

h. Monitor Repairs or Replaced Components Which Affected or Altered Calibration Values ___

______________________________

i. Conversion Factor (f-Factor, etc.) ______________________________

j. Location of monitor (e.g. control equipment outlet)______________________________

**PART 3 - Parameter Monitor of Process and Control Equipment. (Complete one sheet for each pollutant.)**

a. Pollutant (circle one): Opacity SO2 NOx TRS

b. Type of Control Equipment ______________________________

c. Control Equipment Operating Parameters (i.e., delta P, scrubber water flow rate, primary and secondary amps, spark rate)______________________________

______________________________

d. Date of Control Equipment Performance Test ______________________________

e. Control Equipment Operating Parameter During Performance Test ____________________

______________________________

______________________________

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**PART 4 – Excess Emission (by Pollutant)**

Use Table I: Complete table as per instructions. Complete one sheet for each monitor.

**PART 5 – Continuous Monitoring System Operation Failures**

Use Table II: Complete table as per instructions. Complete one sheet for each monitor.

## PART 6 – Control Equipment Operation During Excess Emissions

Use Table III: Complete as per instructions. Complete one sheet for each pollutant control device.

## PART 7 – Excess Emissions and CEMS performance Summary Report

Use Table IV: Complete one sheet for each monitor.

## PART 8 – Certification for Report Integrity, by person in 1.f.

THIS IS TO CERTIFY THAT, TO THE BEST OF MY KNOWLEDGE, THE INFORMATION PROVIDED IN THE ABOVE REPORT IS COMPLETE AND ACCURATE.

SIGNATURE ______________________________________________

NAME __________________________________________________

TITLE __________________________________________________

DATE __________________________________________________

# TABLE I

# EXCESS EMISSIONS

| Date | Time | | | Magnitude | Explanation/Corrective Action |
|---|---|---|---|---|---|
| | From | To | Duration | | |
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# TABLE II

## CONTINUOUS MONITORING SYSTEM OPERATION FAILURES

| Date | Time | | | Problem/Corrective Action |
|---|---|---|---|---|
| | From | To | Duration | |
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# TABLE III

## CONTROL EQUIPMENT OPERATION DURING EXCESS EMISSIONS

| Date | Time | | | Operating Parameters | Corrective Action |
|---|---|---|---|---|---|
| | From | To | Duration | | |
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# TABLE IV

## EXCESS EMISSIONS AND CEMS PERFORMANCE SUMMARY REPORT

Pollutant (circle one): SO2 NOx TRS H2S CO Opacity

Monitor ID ______________________________________________________________

| Emission data summary [1] | CEMS performance summary [1] |
|---|---|
| 1. Duration of excess emissions in reporting period due to:<br>a. Startup/shutdown<br>b. Control equipment problems<br>c. Process problems<br>d. Other known causes<br>e. Unknown causes<br>2. Total duration of excess emissions<br>3. $\frac{\text{Total duration of excess emissions}}{\text{Total time CEM operated}} \times 100 =$ | 1. CEMS[2] downtime in reporting due to:<br>a. Monitor equipment malfunctions<br>b. Non-monitor equipment malfunctions<br>c. Quality assurance calibration<br>d. Other known causes<br>e. Unknown causes<br>2. Total CEMS downtime<br>3. $\frac{\text{Total CEMS downtime}}{\text{Total time source emitted}} \times 100 =$ |
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[1] For opacity, record all times in minutes. For gases, record all times in hours. Fractions are acceptable (e.g., 4.06 hours).

[2] CEMS downtime shall be regarded as any time CEMS is not measuring emissions.

# Montana Air Quality Permit (MAQP) Analysis
# Montana Advanced Biofuels, LLC
# MAQP #4620-01

## I. Introduction/Process Description

Montana Advanced Biofuels, LLC (MAB) proposes to construct and operates a 126 million gallon per year (MMgal/yr) fuel grade ethanol (ethyl alcohol) manufacturing facility. The facility would be located in Section 3, Township 20 North, Range 4 East, in Cascade County, Montana.

### A. Permitted Equipment

| ID# | Source |
|---|---|
| S10 | Grain Receiving/Storage Baghouse |
| S21 | Barley Cleaning Baghouse |
| S22 | Barley Cleaning Baghouse |
| S23 | Barley Cleaning Baghouse |
| S24 | Barley Cleaning Baghouse |
| S25 | Barley Sifter Baghouse |
| S26 | Barley Sifter Baghouse |
| S27 | Barley Sifter Baghouse |
| S28 | Barley Sifter Baghouse |
| S30 | Raw Wheat Cleaning Baghouse |
| S31 | Raw Wheat Cleaning Baghouse |
| S32 | Wheat Mill Sifter Baghouse |
| S33 | Wheat Mill Sifter Baghouse |
| S40 | Wheat Storage Bin Vent Filter |
| S41 | Gluten Bin Vent Filter |
| S42 | Wheat Starch Tank Bin Vent Filter |
| S43 | Gluten Packaging Baghouse |
| S51 | Gluten Ring Dryer A Baghouse |
| S52 | Gluten Ring Dryer B Baghouse |
| S60 | $CO_2$ Scrubber |
| S69 | Fire Water Pump (52 hr/yr) |
| S70* | ST Dryer/RTO #1 (routes to Megastack) |
| S71* | ST Dryer/RTO #2 (routes to Megastack) |
| S72* | DDGS Cooling Baghouse |
| S73 | DDGS Loadout Baghouse |
| S82 | Bran Storage Baghouse |
| S91* | Wet EP/HRSG Stack 1 (routes to Megastack) |
| S92* | Wet EP/HRSG Stack 2 (routes to Megastack) |
| S95 | Ash Receiver Bin Vent Filter |
| S96 | Ash Receiver Bin Vent Filter |
| S97 | Ash Loadout Bin Vent Filter |
| F61 | Gasoline Denaturant Tank |

| ID# | Source |
|---|---|
| F62 | 200 Proof Ethanol Storage Tank #1 |
| F63 | 200 Proof Ethanol Storage Tank #2 |
| F64 | Denatured Ethanol Storage Tank #1 |
| F65 | Denatured Ethanol Storage Tank #2 |
| F66 | Railcar Loadout Flare |
| F67 | Truck Loadout Flare |
| F68 | Fuel Additive Tank |
| F75 | Cooling Tower |
| F77 | Biomethanator Flare |

NOTES:

* These emitting points are routed into a single stack referred to as the Mega Stack before exhausting to the atmosphere.

## B. Source Description

The MAB facility would produce up to 126 MMgal/yr of fuel grade ethanol. Barley and wheat are to be the primary raw materials. The plant will produce distiller's dried grains and solubles (DDGS) for animal feed as a by-product of the alcohol manufacturing process. Wheat gluten would also be separated from the raw wheat for sale as a food product.

MAB will receive grain (primarily barley and wheat) by truck and/or rail. Emission control of the grain unloading operations (pit and transfer) will be by baghouse. The milled grain will be mechanically conveyed from receiving pit(s) to grain storage. From storage the grain will be conveyed mechanically to a day storage bins for processing. The barley and wheat grain will then be dry milled separately with the products (flour and husk/bran/midds) conveyed to storage bins. Emission control for grain milling and transfer will be by high efficiency baghouse.

The separated husk/bran and wheat midds will be conveyed to two separate gasifiers (5 million British thermal units per hour (MMBtu/hr) startup using natural gas). Gasification is a process that heats and converts carbon based feedstocks into a combustible fuel called biogas, or syngas, which can serve the same purpose as natural gas. The main components of biogas are hydrogen, carbon monoxide (CO), and carbon dioxide ($CO_2$). The gasifiers are each capable of creating 230 MMBtu/hr of biogas that is combusted immediately downstream of the gasifier in an afterburner thermal oxidizer (ATO). The heat generated by this oxidation is directed to a separate heat recovery steam generator (HRSG). The ATO serves the same function as a classical burner in a package boiler, except that the equipment precedes the HRSG and therefore is not a "boiler". The ATO's exhaust heat is utilized to make steam and water in the HRSG. Due to concern for the availability of sufficient bran for gasification into biogas, up to 50 MMBtu/hr of natural gas per ATO could be used to supplement the heat demanded by the plant's steam processes. The gasifier/ATO/HRSG train is often referred to as the Biomass Energy System (BES) throughout this permit. Each BES train will exhaust to a wet electrostatic precipitator (ESP) to control sulfur dioxide ($SO_2$) and particulate matter (PM) emissions.

The milled wheat flour will be conveyed to the wheat gluten recovery process and wheat gluten dryers. The two wheat gluten ring dryers operate using 20 MMBtu/hr natural gas burners to heat contact air to remove moisture from process wheat gluten. The gluten ring dryers will exhaust to individual baghouses for pollution control. The waste wheat starch slurry (starch water) will be piped to the slurry tank where it will be mixed with milled barley. In the slurry mixer, the starch water and barley powder are mixed with recycled process water from the cook water tank. This wheat/barley starch slurry is then cooked in order to liquefy and breakdown the starch into sugars. After cooking, the slurry is then cooled with non contact water and conveyed to fermenter process vessels where the fermentation process, along with added yeast, converts the sugars to ethanol and $CO_2$. The fermentation process produces fermented mash called beer. The beer is pumped from the fermenters to the beer well. The beer well is a process vessel that provides a continuous flow of beer slurry to the distillation column. The $CO_2$ from the fermenters and beer well passes through a high efficiency countercurrent water scrubber in order to remove residual amounts of ethanol and other volatile organic compounds (VOC) before being vented to the atmosphere. The water from the scrubber is then pumped to the cook water tank to be recycled into the process.

The beer contains approximately 10% ethanol in addition to non-fermentable wheat/barley solids. The ethanol is separated from the beer by distillation and subsequently leaves the distillation section as 190-proof ethanol where it is stored in an internal floating roof tank. The 190-proof ethanol, at this point, contains residual water. Therefore, the 190-proof ethanol then passes through a molecular sieve in order to remove any remaining water, thereby producing 200-proof ethanol to be stored in an internal floating roof tank. The 200 proof ethanol is then mixed with a denaturant (natural gasoline or unleaded gasoline) and stored in either of two internal floating roof tanks for truck or rail loadout. Emission control from truck and railcar load out is by a high efficiency flare system. The vapors from various equipment (slurry tank, cook water tank, yeast tank, condensers, liquefaction tank, thin stillage, whole stillage, and syrup tank) is vented to the atmosphere and the centrate tank and CIP screen are ventilated to either of two Regenerative Thermal Oxidizers (RTO) for emission control. The plant has two ethanol production lines so that half of the plant can be taken down for maintenance while the other half of the plant remains in production. This design serves to maximize production while minimizing down time for maintenance.

The distillation process removes the ethanol from the beer, non-fermentable solids, and water. The residue mash (whole stillage) leaving distillation is transferred from the base of the distillation column to the whole stillage processing area. The whole stillage then passes through a centrifuge process to remove the majority of water. The underflow from the centrifuge is called wet distillers grains (WDGS). At this point, the WDGS can be handled in 3 ways as follows:

- The WDGS commonly called wet cake (approximately 65% water) can be loaded directly to customer trucks as high quality feed. It can be stored on a pad (typically for 2 to 3 days) until final sale.

- The WDGS can be partially dried to produce a product called modified wet distillers grains (MWDGS) (approximately 50% moisture). MWDGS can be stored for longer periods than wet cake.

- The wet cake can be dried to approximately 10% moisture to produce DDGS which can be stored for very long periods of time. DDGS upon leaving the dryers must be cooled prior to storage and loadout. DDGS cooling and loadout is ventilated to a high efficiency baghouse for PM emission control.

  Note: WDGS, MDGS, and DDGS are also commonly called "barley meal."

The WDGS drying process is carried out in a series of six steam tube dryers with three dryers each exhausting to one of two RTOs for emission control. The emissions from the DDGS Cooling System are controlled by a high efficiency baghouse collection system. The DDGS Cooling System baghouse exhaust will serve as makeup air for the steam tube dryers and then pass through the RTOs. This practice would serve as additional PM, PM with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$), PM with an aerodynamic diameter of 10 microns or less ($PM_{10}$), and VOC control for this exhaust stream. During times when the STD RTOs are not operating, the DDGS Cooling System exhausts directly to the atmosphere. This condition cannot occur for more than 500 hours during any 12-month rolling period.

The overflow from the centrifuges, called thin stillage, enters an evaporator to reduce water content. The concentrated stream from the evaporator is mixed with the centrifuge underflow stream (or added later) before entering the dryers. The water stream from the evaporators goes to the methanator. The methanator is an anaerobic biological water treatment system that converts organic material into fuel gas (primarily methane) which supplements the biogas from the gasifier to the two ATO/HRSG trains or the combustion gas used in the two RTOs. When both the ATOs and RTOs are not in operation, the biogas is routed to the methanator high efficiency emergency flare system. The clean water from the methanator is recycled to the cook water tank for reuse in the process. No contact process water is discharged to the environment. Only non-contact water, e.g. clean cooling tower, may be discharged to the city's publicly owned treatment works.

The plant also has a water cooling tower constructed in modules that serves the various fermentation process cooling needs.

MAB would be capable of loading denatured ethanol into either railcar tanks or tanker trucks. Both the rail and truck loadout racks are designed and operated to collect loadout emissions and route them to their own dedicated flares.

The primary source of emissions from the facility would come from the Megastack. The Megastack would exhaust emissions from both of the BES trains as well as both of the steam tube dryer/RTO trains. This permit contains emission limits for the individual sources that exhaust through the Megastack, as well as limits for the Megastack itself that are equivalent to the sum of the emission limits of its components. Compliance with the Megastack emission limits would be demonstrated by complying with each of the individual source emission limits that exhaust to the Megastack. The permit conditions are crafted in such a way to allow for possible scenario of testing emissions from the Megastack to infer compliance with its individual source components. Such a scenario has not yet been approved by the Department and would be a topic of future discussion.

## C. Permit History

On March 23, 2012, the Department issued **MAQP #4620-00** for the construction and operation of a 126 MMgal/yr fuel grade ethanol (ethyl alcohol) manufacturing facility. This facility was not a listed source and the facility's PTE was below 250 tons per year of any pollutant (excluding fugitive emissions) with the exception of the combined mass of greenhouse gases (GHG). Effective on July 20, 2011, the US EPA deferred the applicability of PSD permitting requirements to carbon dioxide ($CO_2$) emissions from biogenic stationary sources for a period of three years (Docket #EPA-HQ-OAR-2011-0083, 76 FR 43490). This had an impact on the review of the MAB application. The $CO_2$ emissions at MAB that would be impacted by this biogenic source exemption were from the syngas combustion and the ethanol fermentation process. The potential combined carbon dioxide equivalent ($CO_2e$) emissions from all sources operating continuously at maximum capacity at MAB, excluding the deferred $CO_2$ contributions, could have exceeded the PSD major source threshold at that time of 100,000 tons per year. MAB requested a federally enforceable permit condition on facility-wide natural gas consumption that would restrict the maximum potential $CO_2e$ emissions to a level falling below 100,000 tons per year. In order for GHG emissions to become a pollutant subject to regulation at that time, the combined mass of GHGs must have exceeded 250 tons per year and the $CO_2e$ must have exceeded 100,000 tons per year. Based on this deferral and federally enforceable permit limitations, the facility's maximum potential $CO_2e$ emissions were less than the PSD thresholds for becoming a pollutant subject to regulation. Therefore, this facility was not a major stationary source and not subject to PSD permitting.

## D. Current Permit Action

On October 5, 2015, the Department received correspondence from Bison Engineering, Inc. (Bison) on behalf of MAB. The letter provided a review of the Best Available Control Technology (BACT) analysis in support of renewing the 3-year window from permit issuance for beginning construction as provided in Section III.H of the MAQP. The letter addressed each of the BACT determinations from MAQP #4620-00 and described how they are still valid and appropriate based on current technology and economic conditions. No changes were proposed to the facility equipment, operating processes, pollution control technologies, or emission limits. In an October 14, 2015 correspondence, the Department informed MAB that it intended to reissue MAQP #4620 as an administrative amendment in accordance with Administrative Rules of Montana (ARM) 17.8.764 because there were no proposed increases in potential emissions. On October 30, 2015, the Department provided correspondence to MAB describing that MAQP #4620 could not be reissued as an administrative amendment because the establishment of BACT conditions must include the opportunity for public review. Therefore, the Department required MAB to provide the additional components necessary for a complete MAQP modification application in order to reissue the permit granting the authority to construct the facility. The 3-year construction window will begin again upon a final issuance of this permit revision. **MAQP #4620-01** replaces MAQP #4620-00.

### E. Response to Public Comments

| Person/Group Commenting | Permit Reference | Comment | Department Response |
|---|---|---|---|
| | | No comments received | |

### F. Additional Information

Additional information, such as applicable rules and regulations, BACT/Reasonably Available Control Technology (RACT) determinations, air quality impacts, and environmental assessments, is included in the analysis associated with each change to the permit.

## II. Applicable Rules and Regulations

The following are partial explanations of some applicable rules and regulations that apply to the facility. The complete rules are stated in the Administrative Rules of Montana (ARM) and are available, upon request, from the Department of Environmental Quality (Department). Upon request, the Department will provide references for location of complete copies of all applicable rules and regulations or copies where appropriate.

### A. ARM 17.8, Subchapter 1 – General Provisions, including but not limited to:

1. ARM 17.8.101 Definitions. This rule includes a list of applicable definitions used in this chapter, unless indicated otherwise in a specific subchapter.

2. ARM 17.8.105 Testing Requirements. Any person or persons responsible for the emission of any air contaminant into the outdoor atmosphere shall, upon written request of the Department, provide the facilities and necessary equipment (including instruments and sensing devices) and shall conduct tests, emission or ambient, for such periods of time as may be necessary using methods approved by the Department.

3. ARM 17.8.106 Source Testing Protocol. The requirements of this rule apply to any emission source testing conducted by the Department, any source or other entity as required by any rule in this chapter, or any permit or order issued pursuant to this chapter, or the provisions of the Clean Air Act of Montana, 75-2-101, *et seq*., Montana Code Annotated (MCA).

   MAB shall comply with the requirements contained in the Montana Source Test Protocol and Procedures Manual, including, but not limited to, using the proper test methods and supplying the required reports. A copy of the Montana Source Test Protocol and Procedures Manual is available from the Department upon request.

4. ARM 17.8.110 Malfunctions. (2) The Department must be notified promptly by telephone whenever a malfunction occurs that can be expected to create emissions in excess of any applicable emission limitation or to continue for a period greater than 4 hours.

5. ARM 17.8.111 Circumvention. (1) No person shall cause or permit the installation or use of any device or any means that, without resulting in reduction of the total amount of air contaminant emitted, conceals or dilutes an emission of air contaminant that would otherwise violate an air pollution control regulation. (2) No equipment that may produce emissions shall be operated or maintained in such a manner as to create a public nuisance.

B. ARM 17.8, Subchapter 2 – Ambient Air Quality, including, but not limited to the following:

1. ARM 17.8.204 Ambient Air Monitoring. MAB is not currently required to perform ambient air monitoring.
2. ARM 17.8.210 Ambient Air Quality Standards for $SO_2$
3. ARM 17.8.211 Ambient Air Quality Standards for Nitrogen Dioxide ($NO_2$)
4. ARM 17.8.212 Ambient Air Quality Standards for Carbon Monoxide
5. ARM 17.8.213 Ambient Air Quality Standard for Ozone
6. ARM 17.8.214 Ambient Air Quality Standard for Hydrogen Sulfide
7. ARM 17.8.220 Ambient Air Quality Standard for Settled PM
8. ARM 17.8.221 Ambient Air Quality Standard for Visibility
9. ARM 17.8.222 Ambient Air Quality Standard for Lead. MAB is not a source of lead emissions.
10. ARM 17.8.223 Ambient Air Quality Standard for $PM_{10}$
11. ARM 17.8.230 Fluoride in Forage. MAB is not a source of fluoride emissions.

MAB must maintain compliance with the applicable ambient air quality standards.

C. ARM 17.8, Subchapter 3 – Emission Standards, including, but not limited to:

1. ARM 17.8.304 Visible Air Contaminants. This rule requires that no person may cause or authorize emissions to be discharged into the outdoor atmosphere from any source installed after November 23, 1968, that exhibit an opacity of 20% or greater averaged over 6 consecutive minutes.

2. ARM 17.8.308 Particulate Matter, Airborne. (1) This rule requires an opacity limitation of less than 20% for all fugitive emission sources and that reasonable precautions be taken to control emissions of airborne particulate matter. (2) Under this rule, MAB shall not cause or authorize the use of any street, road, or parking lot without taking reasonable precautions to control emissions of airborne particulate matter.

3. ARM 17.8.309 Particulate Matter, Fuel Burning Equipment. This rule requires that no person shall cause, allow, or permit to be discharged into the atmosphere particulate matter caused by the combustion of fuel in excess of the amount determined by this rule.

4. ARM 17.8.310 Particulate Matter, Industrial Process. This rule requires that no person shall cause, allow, or permit to be discharged into the atmosphere particulate matter in excess of the amount set forth in this rule.

5. ARM 17.8.316 Incinerators. This rule requires that no person may cause or authorize emissions to be discharged into the outdoor atmosphere from any incinerator, particulate matter in excess of 0.10 grains per standard cubic foot of dry flue gas, adjusted to 12% carbon dioxide and calculated as if no auxiliary fuel had been used. Further, no person shall cause or authorize to be discharged into the outdoor atmosphere from any incinerator emissions that exhibit an opacity of 10% or greater averaged over 6 consecutive minutes.

   While MAB is required to comply with the emission and opacity limitations specified in Section II.A of MAQP #4620-01, this particular rule does not apply to this facility because MAB has applied for and will operate under an MAQP in accordance with ARM 17.8.770 and MCA 75-2-215 for the RTOs and loadout flares.

6. ARM 17.8.322 Sulfur Oxide Emissions--Sulfur in Fuel. This rule requires that no person shall burn liquid, solid, or gaseous fuel in excess of the amount set forth in this rule.

7. ARM 17.8.324 Hydrocarbon Emissions--Petroleum Products. (3) No person shall load or permit the loading of gasoline into any stationary tank with a capacity of 250 gallons or more from any tank truck or trailer, except through a permanent submerged fill pipe, unless such tank is equipped with a vapor loss control device as described in (1) of this rule.

8. ARM 17.8.340 Standard of Performance for New Stationary Sources and Emission Guidelines for Existing Sources. This rule incorporates, by reference, 40 CFR Part 60, Standards of Performance for New Stationary Sources (NSPS). MAB is considered an NSPS affected facility under 40 CFR Part 60 and is subject to the requirements of the following subparts.

   a. 40 CFR 60, Subpart A – General Provisions apply to all equipment or facilities subject to an NSPS Subpart as listed below:

   b. 40 CFR 60, Subpart Db – Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units. This subpart applies to the proposed BES trains because they have the capability of firing fuels at a heat input rate of more than 100 MMBtu/hr.

   c. 40 CFR 60, Subpart Kb – Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 3, 1984. This subpart applies any storage tank with a capacity greater than or equal to 75 cubic meters ($m^3$) that is used to store volatile organic liquids. This includes the two 1.6 million gallon (MMgal) denatured ethanol storage tanks, the two 0.15 MMgal 200 proof ethanol storage tanks, and the 0.15 MMgal denaturant storage tank.

   d. 40 CFR 60, Subpart VVa – Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006. There are numerous connectors, pipes, pumps, and valves that would be subject to the applicable requirements of this subpart.

e. 40 CFR 60, Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines (CI ICE). Owners and operators of stationary CI ICE that commence construction after July 11, 2005, where the stationary CI ICE are manufactured after April 1, 2006, and are not fire pump engines, and owners and operators of stationary CI ICE that modify or reconstruct their stationary CI ICE after July 11, 2005, are subject to this subpart. Based on the information submitted by MAB, the fire water pump engine is subject to this subpart.

9. ARM 17.8.342 Emission Standards for Hazardous Air Pollutants for Source Categories. The source, as defined and applied in 40 CFR Part 63, shall comply with the requirements of 40 CFR Part 63, as listed below:

   a. 40 CFR 63, Subpart A – General Provisions apply to all equipment or facilities subject to an NESHAP Subpart as listed below:

   b. 40 CFR 63, Subpart ZZZZ - National Emissions Standards for Hazardous Air Pollutants (HAPs) for Stationary Reciprocating Internal Combustion Engines (RICE). An owner or operator of a stationary reciprocating internal combustion engine (RICE) at a major or area source of HAP emissions is subject to this rule except if the stationary RICE is being tested at a stationary RICE test cell/stand. An area source of HAP emissions is a source that is not a major source. Based on the information submitted by MAB, the fire water pump engine is subject to this subpart.

D. ARM 17.8, Subchapter 4 – Stack Height and Dispersion Techniques, including, but not limited to:

1. ARM 17.8.401 Definitions. This rule includes a list of definitions used in this chapter, unless indicated otherwise in a specific subchapter.

2. ARM 17.8.402 Requirements. MAB must demonstrate compliance with the ambient air quality standards with a stack height that does not exceed Good Engineering Practices (GEP). The proposed heights of the various stacks at MAB are below the allowable 65-meter GEP stack height.

E. ARM 17.8, Subchapter 5 – Air Quality Permit Application, Operation, and Open Burning Fees, including, but not limited to:

1. ARM 17.8.504 Air Quality Permit Application Fees. This rule requires that an applicant submit an air quality permit application fee concurrent with the submittal of an air quality permit application. A permit application is incomplete until the proper application fee is paid to the Department. MAB submitted the appropriate permit application fee for the current permit action.

2. ARM 17.8.505 Air Quality Operation Fees. An annual air quality operation fee must, as a condition of continued operation, be submitted to the Department by each source of air contaminants holding an air quality permit (excluding an open burning permit) issued by the Department. The air quality operation fee is based on the actual or estimated actual amount of air pollutants emitted during the previous calendar year.

An air quality operation fee is separate and distinct from an air quality permit application fee. The annual assessment and collection of the air quality operation fee, described above, shall take place on a calendar-year basis. The Department may insert into any final permit issued after the effective date of these rules, such conditions as may be necessary to require the payment of an air quality operation fee on a calendar-year basis, including provisions that prorate the required fee amount.

F. ARM 17.8, Subchapter 7 – Permit, Construction, and Operation of Air Contaminant Sources, including, but not limited to:

1. ARM 17.8.740 Definitions. This rule is a list of applicable definitions used in this chapter, unless indicated otherwise in a specific subchapter.

2. ARM 17.8.743 Montana Air Quality Permits--When Required. This rule requires a person to obtain an air quality permit or permit modification to construct, modify, or use any air contaminant sources that have the potential to emit (PTE) greater than 25 tons per year of any pollutant. MAB has a PTE greater than 25 tons per year of PM, $PM_{10}$, $PM_{2.5}$, $SO_2$, nitrogen oxides ($NO_x$), CO, and VOC; therefore, an air quality permit is required.

3. ARM 17.8.744 Montana Air Quality Permits--General Exclusions. This rule identifies the activities that are not subject to the Montana Air Quality Permit program.

4. ARM 17.8.745 Montana Air Quality Permits--Exclusion for De Minimis Changes. This rule identifies the de minimis changes at permitted facilities that do not require a permit under the Montana Air Quality Permit Program.

5. ARM 17.8.748 New or Modified Emitting Units--Permit Application Requirements. (1) This rule requires that a permit application be submitted prior to installation, modification, or use of a source. MAB submitted the required permit application for the current permit action. (7) This rule requires that the applicant notify the public by means of legal publication in a newspaper of general circulation in the area affected by the application for a permit. MAB submitted an affidavit of publication of public notice for the November 6, 2015 edition of the *Great Falls Tribute*, a newspaper of general circulation in the Town of Great Falls in Cascade County, as proof of compliance with the public notice requirements.

6. ARM 17.8.749 Conditions for Issuance or Denial of Permit. This rule requires that the permits issued by the Department must authorize the construction and operation of the facility or emitting unit subject to the conditions in the permit and the requirements of this subchapter. This rule also requires that the permit must contain any conditions necessary to assure compliance with the Federal Clean Air Act (FCAA), the Clean Air Act of Montana, and rules adopted under those acts.

7. ARM 17.8.752 Emission Control Requirements. This rule requires a source to install the maximum air pollution control capability that is technically practicable and economically feasible, except that Best Available Control Technology (BACT) shall be utilized. The required BACT analysis is included in Section III of this permit analysis.

8. ARM 17.8.755 Inspection of Permit. This rule requires that air quality permits shall be made available for inspection by the Department at the location of the source.

9. ARM 17.8.756 Compliance with Other Requirements. This rule states that nothing in the permit shall be construed as relieving MAB of the responsibility for complying with any applicable federal or Montana statute, rule, or standard, except as specifically provided in ARM 17.8.740, *et seq*.

10. ARM 17.8.759 Review of Permit Applications. This rule describes the Department's responsibilities for processing permit applications and making permit decisions on those permit applications that do not require the preparation of an environmental impact statement.

11. ARM 17.8.762 Duration of Permit. An air quality permit shall be valid until revoked or modified, as provided in this subchapter, except that a permit issued prior to construction of a new or modified source may contain a condition providing that the permit will expire unless construction is commenced within the time specified in the permit, which in no event may be less than 1 year after the permit is issued.

12. ARM 17.8.763 Revocation of Permit. An air quality permit may be revoked upon written request of the permittee, or for violations of any requirement of the Clean Air Act of Montana, rules adopted under the Clean Air Act of Montana, the FCAA, rules adopted under the FCAA, or any applicable requirement contained in the Montana State Implementation Plan (SIP).

13. ARM 17.8.764 Administrative Amendment to Permit. An air quality permit may be amended for changes in any applicable rules and standards adopted by the Board of Environmental Review (Board) or changed conditions of operation at a source or stack that do not result in an increase of emissions as a result of those changed conditions. The owner or operator of a facility may not increase the facility's emissions beyond permit limits unless the increase meets the criteria in ARM 17.8.745 for a de minimis change not requiring a permit, or unless the owner or operator applies for and receives another permit in accordance with ARM 17.8.748, ARM 17.8.749, ARM 17.8.752, ARM 17.8.755, and ARM 17.8.756, and with all applicable requirements in ARM Title 17, Chapter 8, Subchapters 8, 9, and 10.

14. ARM 17.8.765 Transfer of Permit. This rule states that an air quality permit may be transferred from one person to another if written notice of intent to transfer, including the names of the transferor and the transferee, is sent to the Department.

15. ARM 17.8.770 Additional Requirements for Incinerators. This rule specifies the additional information that must be submitted to the Department for incineration facilities subject to 75-2-215, Montana Code Annotated (MCA).

G. ARM 17.8, Subchapter 8 – Prevention of Significant Deterioration (PSD) of Air Quality, including, but not limited to:

1. ARM 17.8.801 Definitions. This rule is a list of applicable definitions used in this subchapter.

2. ARM 17.8.818 Review of Major Stationary Sources and Major Modifications--Source Applicability and Exemptions. The requirements contained in ARM 17.8.819 through ARM 17.8.827 shall apply to any major stationary source and any major modification, with respect to each pollutant subject to regulation under the FCAA that it would emit, except as this subchapter would otherwise allow.

This facility is not a listed source and the facility's PTE is below 250 tons per year of any pollutant (excluding fugitive emissions). Therefore, this facility is not a major stationary source and is not subject to PSD permitting at this time.

H. ARM 17.8, Subchapter 12 – Operating Permit Program Applicability, including, but not limited to:

1. ARM 17.8.1201 Definitions. (23) Major Source under Section 7412 of the FCAA is defined as any source having:

   a. PTE > 100 tons per year of any pollutant;

   b. PTE > 10 tons per year of any one HAP, PTE > 25 tons per year of a combination of all HAPs, or lesser quantity as the Department may establish by rule; or

   c. PTE > 70 tons per year of $PM_{10}$ in a serious $PM_{10}$ nonattainment area.

2. ARM 17.8.1204 Air Quality Operating Permit Program. (1) Title V of the FCAA amendments of 1990 requires that all sources, as defined in ARM 17.8.1204(1), obtain a Title V Operating Permit. In reviewing and issuing MAQP #4620-01 for MAB, the following conclusions were made:

   a. The facility's PTE is greater than 100 tons per year for PM, $PM_{10}$, $PM_{2.5}$, $NO_x$, CO, $SO_2$, and VOC.

   b. The facility's PTE is less than 10 tons per year for any one HAP and less than 25 tons per year for all HAPs.

   c. This source is not located in a serious $PM_{10}$ nonattainment area.

   d. This facility is subject to current NSPS.

      i. 40 CFR 60, Subpart A – General Provisions

      ii. 40 CFR 60, Subpart Db – Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units

      iii. 40 CFR 60, Subpart Kb – Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 3, 1984

iv. <u>40 CFR 60, Subpart VVa – Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006</u>

v. <u>40 CFR 60, Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines (CI ICE)</u>

e. This facility is subject to area source provisions of a current NESHAP.

i. <u>40 CFR 63, Subpart A – General Provisions</u>

ii. <u>40 CFR 63, Subpart ZZZZ - National Emissions Standards for HAPs for Stationary RICE</u>

f. This source is not a Title IV affected source, or a solid waste combustion unit.

g. This source is not an EPA designated Title V source.

Based on these facts, the Department determined that MAB would be a major source of emissions as defined under Title V. MAB would be required to apply for a Title V permit within 12 months of commencing operation.

I. MCA 75-2-103, Definitions provides, in part, as follows:

1. "Incinerator" means any single or multiple-chambered combustion device that burns combustible material, alone or with a supplemental fuel or catalytic combustion assistance, primarily for the purpose of removal, destruction, disposal, or volume reduction of all or any portion of the input material.

2. "Solid waste" means all putrescible and nonputrescible solid, semisolid, liquid, or gaseous wastes, including, but not limited to...air pollution control facilities…

J. MCA 75-2-215, Solid or Hazardous Waste Incineration - Additional permit requirements:

1. MCA 75-2-215 requires air quality permits for all new solid waste incinerators; therefore, SCS must obtain an air quality permit.

2. MCA 75-2-215 requires the applicant to provide, to the Department's satisfaction, a characterization and estimate of emissions and ambient concentrations of air pollutants, including hazardous air pollutants, from the incineration of solid waste. The information in the initial permit application fulfilled this requirement.

3. MCA 75-2-215 requires that the Department reach a determination that the projected emissions and ambient concentrations constitute a negligible risk to public health, safety, and welfare. The Department completed a health risk assessment, based on an emissions inventory and ambient air quality modeling, for this MAQP application. Based on the results of the emission inventory, modeling, and the health risk assessment, the Department determined that MAB complies with this requirement.

4. MCA 75-2-215 requires the application of pollution control equipment or procedures that meet or exceed BACT. The Department determined that the proposed incinerators (RTOs and loadout flares) are required as control devices for reducing emissions from much larger sources. The RTOs will be required to only burn natural gas or biogas to minimize their potential emissions. Operating the proposed incinerators according to the manufacturer-recommended operation procedures constitutes BACT.

## III. BACT Determination

A BACT determination is required for each new or modified source. MAB shall install on the new or modified source the maximum air pollution control capability which is technically practicable and economically feasible, except that BACT shall be utilized.

A BACT analysis was submitted by MAB in permit application #4620-00, addressing some available methods of controlling emissions from the facility. The Department reviewed these methods, as well as previous BACT determinations. Those control options were reviewed by the Department in order to make the BACT determinations in MAQP #4620-00. MAB provided a review of that BACT analysis in an October 5, 2015 permit application to verify its validity because 3 years had elapsed since the issuance of MAQP #4620-00 and construction had not yet commenced. The Department concurred with MAB's proposal that the previous BACT analysis was still relevant and current with today's permitting practices and environment. The BACT requirements for MAQP #4620-01 remain the same as determined in MAQP #4620-00.

The control options selected have controls and control costs comparable to other recently permitted similar sources and are capable of achieving the appropriate emission standards.

### A. Gasifier/Thermal Oxidizer/Heat Recovery Steam Generator

The MAB facility will generate most of the heat required for its processing using a custom-designed system. The design consists of two identical parallel systems of a wheat and barley bran gasifier that creates a biogas that is then combusted in an afterburner thermal oxidizer. The afterburner thermal oxidizer also uses natural gas as a supplemental fuel to provide for the facility's full heat load. A heat recovery steam generator uses the heat generated by the afterburner thermal oxidizer to create process steam that is used in plant operations. For convenience these parallel systems will be referred to singularly as the BES.

#### 1. BES: PM BACT

##### a. Identifying the Available Control Technologies

The Department considered the following potential control technologies for the BES PM BACT:

Baghouses or fabric filters are typically used to control total particulate emissions from facilities located. Baghouses remove dust from a gas stream by passing the stream through a porous fabric. Particles form a cake on the fabric that will act as the filtration device. This porous cake is occasionally removed by a pulsed jet of compressed air or by reversed air flow through the fabric. In both cases, the particles are collected in a hopper. Baghouses are highly efficient for controlling filterable PM, but are not designed to remove condensable PM. Exhaust temperatures must be maintained above the dew point of any condensable component in the stream to avoid condensation on the filter cake. Baghouses are subject to failure if they are not properly operated and maintained. Typical new baghouse design control efficiencies range from 99 to 99.9% in most applications according to EPA factsheet EPA-452/F-03-025.

Cyclones are used to collect large particulates using mechanical operations. Particles enter the cyclone suspended in a gas stream, which is forced into a vortex by the shape of the cyclone. The particles resist the change in direction of the gas and are moved radially outward to the outer wall of the cyclone. The gas stream continues to spiral in the conical tube downward. Particles are forced to the outer wall of the cyclone where they are caught in the laminar layer of air next to the wall and are carried downward by gravity to a hopper. Cyclone collectors can achieve acceptable performance in select situations, but are subject to failure if they are not properly operated and maintained. While cyclones can be designed with high control efficiencies for larger particles, they usually have diminishing efficiencies as particle size decreases. Higher efficiency cyclones also require higher pressure drops, which require higher energy costs to move the exhaust gas through the cyclone. The BACT analysis provided by MAB estimated a cyclone control efficiency of 67% for the BES application.

Dry Electrostatic Precipitator (ESP) technology is applicable to a variety of particulate matter sources. Dry ESPs use electrical forces to move particles out of the gas stream and onto collector plates. Particles are given an electric charge by forcing them to pass through a region of gaseous ions. Once the particles have been collected on the plates, they must be removed without re-entraining them into the gas stream. Particles are removed by knocking them loose from the plates and allowing the collected mass to slide into a hopper in a process referred to as rapping. ESP performance is influenced by particulate loading, particulate size distribution, particulate electrical resistivity, and precipitator voltage and current. ESPs show the highest control efficiencies with fine and course particles (less than 0.1 micrometer or greater than 10 micrometers). Typical new dry ESP design control efficiencies range from 99-99.9% according to EPA factsheet EPA-452/F-03-028.

Wet ESPs function using the same principles as dry ESPs but they use water or an aqueous solution to spray the collector plates and remove the accumulated particulate from them as the liquid flows over the collector plates. The contaminated water or aqueous solution is then collected for treatment. The use of the water or aqueous solution replaces the rapping mechanism used in dry ESPs. The continuous or intermittent washing with a liquid eliminates the reentrainment of particles due to rapping which dry ESPs are subject to. Wet ESPs facilitate the removal of condensable PM because the gas stream is conditioned to a relatively low temperature which promotes the condensation of acid gases to aerosol particles which are collected on the collector plates. Using an alkaline solution in the wet ESP can enhance acid gas condensation and collection. Some major disadvantages of wet ESPs are the complexity and cost of handling the wash water and waste disposal. Typical new wet ESP design control efficiencies range from 99-99.9% according to EPA factsheet EPA-452/F-03-030.

b. Eliminate Technically Infeasible Control Technologies

All of the control technologies are considered technically feasible for the BES.

c. Rank Remaining Technologies by Control Effectiveness

Based on the information provided in EPA fact sheets, all of the reviewed control technologies have design efficiency ranges from 99-99.9% with the exception of cyclones that have a lower expected efficiency. The BACT analysis provided by MAB ranked the control efficiencies of the technologies analyzed as follows:

| Technology | Estimated Control Efficiency |
|---|---|
| Wet ESP | 96% |
| Baghouse with specialty filters | 96% |
| Baghouse with membrane filters | 95% |
| Dry ESP | 93% |
| Wet Scrubber | 90% |
| Cyclonic Separators | 67% |

While the estimated control efficiency values differ from other published information, the Department concurs with the ranking of the control technologies based on estimated control efficiencies.

d. Evaluate Available Control Technologies

While some published information on baghouses, dry ESPs, and wet ESPs suggest that they are all capable of achieving an equivalent high level of control efficiency, they each have characteristics that affect their suitability to the proposed BES.

Fabric filter baghouses are susceptible to clogging or binding when moisture is present which severely increases the resistance to gas flow and reduces the control efficiency. Excessive gas cooling in baghouses serving combustion sources can cause water condensation in the dust cakes.

Dry and wet ESPs operate using the same basic principle of utilizing electrical charging to cause the migration of particles toward vertical collection plates. Particles remain on the collection plates until removed by rapping in the case of dry ESPs and by liquid rinsing in the case of wet ESPs. The rapping of the collection plates in dry ESPs can cause reentrainment of the particles into the exhaust stream. Wet ESPs are less susceptible to reentrainment issues because of the use of liquid to rinse the particles from the collection plates rather than the use of mechanical shaking. In addition, a wet ESP facilitates the removal of condensable PM because the gas stream temperature is conditioned to be relatively low which results in condensed aerosols that are collected on the charged surfaces.

MAB proposes the use of a wet ESP as BACT for each of the parallel systems that make up the BES. Not only does a wet ESP provide the best estimated control efficiency for PM (including condensable PM), there are collateral benefits such as incidental control of VOC, HAP, and $SO_x$. Direct PM in the BES exhaust is expected to be primarily $PM_{2.5}$, including condensable PM, because of its formation as a product of combustion. In the case of indirect $PM_{2.5}$ emissions, the Department relies on BACT performed on the precursor pollutants. No further evaluation is necessary because MAB has selected the top candidate as BACT. MAB proposes a limit of 2.72 lb/hr and 0.01 pounds per million British thermal units (lb/MMBtu) of fuel burned from each system. This limit is based on experience of the facility designers with similar applications and a wet ESP vendor guarantee.

e. Select BACT

The Department has determined that BACT for $PM_{10}$ and $PM_{2.5}$ including condensable PM control from the BES is a wet ESP for each of the parallel systems making up the BES with a limit of 2.72 lb/hr and 0.01 lb/MMBtu of fuel burned from each system.

2. BES: $NO_x$ BACT

a. Identifying the Available Control Technologies

The Department considered the following potential control technologies for the BES $NO_x$ BACT:

Flue Gas Recirculation (FGR) – In a FGR system, a portion of the flue gas is recycled from the stack to the burner windbox. Upon entering the windbox, the re-circulated gas is mixed with combustion air prior to being fed to the burner. The recycled flue gas consists of combustion products which act as inerts during combustion of the fuel/air mixture. FGR reduces $NO_x$ emissions by diluting the combustion gases to reduce combustion temperatures, thus suppressing the thermal $NO_x$ mechanism, and by lowering the oxygen concentration in the primary flame zone, thus reducing thermal $NO_x$ formation.

Selective Catalytic Reduction (SCR) – SCR is a post combustion gas treatment technique that uses a catalyst to reduce $NO_x$ and nitrogen dioxide ($NO_2$) to molecular nitrogen, water, and oxygen. Ammonia ($NH_3$) vaporized and injected into the flue gas upstream of the catalyst bed combines with $NO_x$ at the catalyst surface to form an ammonium salt intermediate. The ammonium salt intermediate then decomposes to produce elemental nitrogen and water. The catalyst lowers the temperature required for the chemical reaction between $NO_x$ and $NH_3$. Catalysts used for the $NO_x$ reduction include base metals, precious metals, and zeolites. Commonly, the catalyst of choice for the reaction is a mixture of titanium and vanadium oxides. An attribute common to all catalysts is the narrow “window” of acceptable system temperatures. At temperatures below 575 degrees Fahrenheit (ºF), the $NO_x$ reduction reaction will not proceed, while operation at temperatures exceeding 800 ºF will shorten catalyst life and can lead to the oxidation of $NH_3$ to either nitrogen oxides (thereby increasing

$NO_x$ emissions) or possibly generating explosive levels of ammonium nitrate in the exhaust gas stream. Other factors impacting the effectiveness of SCR include catalyst reactor design, operating temperature, type of fuel fired, sulfur content of the fuel, design of $NH_3$ injection system, and the potential for catalyst poisoning. EPA fact sheet EPA-452/F-03-032 states that SCR is capable of $NO_x$ reduction efficiencies in the range of 70% to 90%.

Selective Non-Catalytic Reduction Selective non-catalytic reduction (SNCR) – SNCR is a post-combustion technology that may be applied to combustion devices to reduce $NO_x$ emissions. The SNCR systems inject $NH_3$ or urea into combustion gases to reduce $NO_x$ emissions to nitrogen and water vapor. The $NH_3$/urea injection must take place when the gas is between 1600° and 2100° F. Higher temperatures will cause the reagent to oxidize creating more $NO_x$ and lower temperatures will result in significant reagent slip. The capital cost for SNCR controls are relatively low, however, it is challenging in practice to design and build a system that is reliable and effective. SNCR systems typically achieve 30 to 60% reduction in practice.

Low $NO_x$ Burners (LNBs) – A LNB reduces $NO_x$ by accomplishing the combustion process in stages. The two most common types of LNBs are staged air burners and staged fuel burners. Staging partially delays the combustion process, resulting in a cooler flame, which suppresses thermal $NO_x$ formation. $NO_x$ emission reductions of 40 to 85 percent have been observed with LNBs.

b. Eliminate Technically Infeasible Control Technologies

FGR and LNB technology are considered technically feasible for the BES application. SCR is theoretically feasible for application to the MAB BES trains, however, there is some risk that the exhaust stream would not be compatible with SCR control and would reduce catalyst effectiveness even with upstream PM control. SNCR is potentially feasible for the BES application. Because this facility would be unique in its use of syngas created from the wheat and bran feedstock, MAB does not have operations data to indicate whether exhaust gas temperature would be within the required 1600° and 2100° F range. Therefore, MAB has proposed that SNCR is not considered to be technically feasible for the purpose of this BACT analysis. As a contingency, MAB plans to install an $NH_3$ injection system in case additional control is required to achieve the emission limits. However, they do not know what level of control, if any, could be achieved by the system.

c. Rank Remaining Technologies by Control Effectiveness

The BACT supplied by MAB established the application of both LNB and FGR as the baseline case for the analysis and evaluated SCR for its potential to improve upon that basis.

d. Evaluate Available Control Technologies

The SCR requires that the exhaust temperature lie within a specific window for the necessary reduction reactions to occur. The SCR would also need to be located downstream of the wet ESP PM control device to minimize the catalyst poisoning. The use of water or aqueous solution in the wet ESP would cool the exhaust stream as it passes through it; therefore, the exhaust temperature would need to be reheated before the SCR which would require additional fuel for combustion that would result in additional pollutant emissions. The total estimated cost for installing an SCR on each of the BES trains would be approximately $8.8 million with estimated annual operating costs of $4.8 million. Based upon a control efficiency of 80%, the cost-effectiveness of the SCR system is $35,300 per ton of $NO_x$ removed.

SCR presents several potential adverse environmental impacts. First, unreacted ammonia in the flue gas (ammonia slip) and the products of side reactions between ammonia and other species present in the flue gas would be emitted to the atmosphere. Second, transportation storage, and handling of ammonia are potentially hazardous. Third, employing SCR on the BES may require the combustion of additional fuel to increase gas temperatures to acceptable levels. This combustion would increase $NO_x$ emissions as well as emissions of other criteria pollutants including CO and VOCs. Finally, disposal of spent catalysts from the SCR unit is a potential environmental hazard.

Although SCR has been employed as BACT for combustion processes in many applications, MAB proposed to eliminate it from consideration as BACT for $NO_x$ emissions from the BES. Economic impacts as well as concern of potential technical incompatibilities with the new system, potential environmental impacts, health and safety risks, and energy usage are factors used to establish the proposal. The Department agrees with MAB that SCR technology is inappropriate for controlling $NO_x$ in the BES.

SNCR is potentially infeasible due to the high temperatures required for the technology to work. However, the application materials did not provide adequate evidence that the exhaust gas temperatures would not be compatible with SNCR. Therefore, SNCR will remain a feasible control technology and MAB will be required to install an $NH_3$ injection system as part of BACT for $NO_x$ reduction. MAB has proposed LNB and FGR as BACT for controlling $NO_x$ emissions. MAB proposes a limit of 23.9 lb/hr and 0.084 lb/MMBtu of fuel burned from each system based on a 30-day rolling average. This limit is based on experience of the facility designers and a wet ESP vendor guarantee.

e. Select BACT

The Department has determined that BACT for $NO_x$ control from the BES is SNCR, LNB, and FGR with a limit of 23.9 lb/hr from each system (or 47.8 lb/hr from the two systems combined) and 0.084 lb/MMBtu of fuel burned. MAB proposed to comply with this limit based on a 30-day rolling average which is consistent with the required compliance demonstration of 40 CFR 60, Subpart Db – Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units on a lb/MMBtu basis. However, MAB used the lb/hr emission rate in its modeling demonstration with the 1-hour $NO_2$ ambient air quality standard to represent worse-case emissions. Therefore, MAB will be required to comply with the lb/hr emission limit on an hourly basis.

3. BES: CO and VOC BACT

a. Identifying the Available Control Technologies

CO and VOC emissions from the BES will result from incomplete combustion of organic constituents within the biogas and natural gas fuels. Because the CO and VOC are generated and controlled by similar mechanisms, they will be addressed together. The Department considered the following potential control technologies for the BES CO and VOC BACT:

Proper combustion practices can reduce VOC and CO by using a good burner design and burning natural gas and biogas. VOC and CO form as a result of incomplete combustion. Reduction of VOC and CO emissions can be accomplished by controlling the combination of system temperatures through operation at maximum loads, increasing oxygen concentrations, maximizing combustion residence time, and improving mixing of the fuel, exhaust gases, and combustion air. All of these techniques also generally increase $NO_x$ emissions. Modern combustion devices such as boilers are designed to maximize the residence time or the combustion gas, increase turbulence of mixing with combustion air, and maintain a steady combustion temperature throughout the combustion zone while keeping the flame temperature down.

Thermal oxidizers are refractory lined enclosures with one or more burners in which the waste gas stream is routed through a high temperature combustion zone where the waste gas stream is heated and the combustible materials are burned. An RTO is a heat recovery type thermal oxidizer that recovers the heat generated by the combustion of the VOC laden waste gas stream to assist in preheating the incoming exhaust gas. RTOs typically operate at 1200 to 2100 ºF, depending on the compounds in the waste gas stream being controlled. The residence time for a thermal oxidizer typically ranges from 0.5 to 2 seconds. With such high operating temperatures and long residence times, thermal oxidizers are capable of efficiently controlling VOC emissions from a variety of waste streams. EPA fact sheet EPA-425/F-03-021 states that typical RTO VOC design control efficiencies range from 95 to 99% but they do not reduce levels of CO.

A regenerative catalytic oxidizer (RCO) employs the same principles as a thermal oxidizer, but it uses a catalyst to lower the temperature required to effect complete oxidation. The catalyst in an RCO is prone to poisoning from PM entrained in the exhaust stream; therefore, it would be necessary to locate the RCO downstream from the wet ESP. EPA fact sheet EPA-425/F-03-021 states that typical RCO VOC design control efficiencies range from 90 to 99% and when using precious metal-based catalysts a CO destruction of more than 98%.

b. Eliminate Technically Infeasible Control Technologies

RCO technology is considered technically feasible for reducing CO emissions from the BES. Although RCO and RTO are theoretically capable of reducing VOC emissions, the maximum concentration of VOC in the BES exhaust (approximately 15 parts per million by volume, $ppm_v$) would be too low to allow for any significant reduction; and therefore, both would be considered to be technically infeasible as VOC BACT.

c. Rank Remaining Technologies by Control Effectiveness

Other than a baseline of proper system design and operation, no control technologies were determined to be technically feasible for controlling BES VOC emissions. Only the RCO was deemed technically feasible for reducing CO emissions.

d. Evaluate Available Control Technologies

MAB proposed to eliminate an RCO from BACT consideration for CO due to unacceptable energy, environmental, and economic impacts. The RCO would need to be installed downstream from the wet ESP to minimize the catalyst poisoning that can occur with particulate-laden gas streams. The exhaust temperature is expected to be approximately 240°F upon exiting the wet ESP. Therefore, the exhaust would require reheating to raise its temperature to the minimum required for RCO operation. This reheating would require additional gas combustion that would increase the levels of emissions and offset some of the control efficiency. There are also adverse environmental impacts from the handling of the spent catalyst. Many of the catalyst formulations are potentially toxic and subject to hazardous waste disposal regulations. The economic evaluation provided by MAB for an RCO installation showed a cost effectiveness of $13,200 per ton of CO removed.

The Department agrees with MAB that the RCO is inappropriate for CO control for the BES and it is therefore eliminated from consideration for BACT. MAB proposes that proper design and operation for CO and VOC control on the BES as BACT with a limit of 21.64 lb/hr and 0.076 lb/MMBtu of fuel burned from each system and VOC limit of 5.37 lb/hr and 0.019 lb/MMBtu of fuel burned from each system. This limit is based on experience of the facility designers.

e. Select BACT

The Department has determined that proper design and operation is BACT for VOC and CO control from the BES with a CO limit of 21.64 lb/hr and 0.076 lb/MMBtu of fuel burned from each system and VOC limit of 5.37 lb/hr and 0.019 lb/MMBtu of fuel burned from each system.

B. Gluten Ring Dryers

Two 20 MMBtu/hr Gluten Ring Dryers (GRD) will use heated contact air to remove moisture from processed wheat gluten. They will heat process air using natural gas combustion. Direct contact process air will entrain particles as it dries the gluten and result in PM emissions. While there will be some PM contribution from natural gas combustion, the majority of direct PM is expected to come from the entrainment of gluten particles in the contact air and therefore will be present as PM, $PM_{10}$, and $PM_{2.5}$. MAB has indicated that in their experience all the PM from properly operated equipment will be $PM_{10}$; therefore, PM is assumed equivalent to $PM_{10}$ in all calculations and proposed limits. $NO_x$, CO, VOC, and $SO_2$ emissions will result from natural gas combustion. Additional VOC emissions will result from drying the gluten.

1. GRD: PM BACT

Baghouse – as discussed in Section III.A.1 of this Permit Analysis, fabric filter baghouses offer a high level particulate control and have been used in many similar applications. MAB has proposed installing two baghouses, one per dryer, as BACT for the GRD. A baghouse represents the highest level of PM control; therefore, no further analysis is required. MAB has indicated that they have no source-specific data for $PM_{2.5}$ from the other ethanol facilities. Due to the lack of source-specific data on $PM_{2.5}$ emissions, the Department references EPA AP-42 Appendix B.2 where Table B.2-3 indicates that the baghouse control efficiency for particles between 2.5 and 10 microns is 99.5% and 99% for $PM_{2.5}$. AP-42, Chapter 9.9.1 "Grain Elevators", Table 9.9.1-1 states in footnote "g" that emission factors for uncontrolled $PM_{10}$ are scaled to $PM_{2.5}$ using a ratio of 17%. Using this generalized information regarding uncontrolled $PM_{10}$ to $PM_{2.5}$ size distribution for grain processing and fabric filter baghouse control efficiencies, the percent of controlled $PM_{10}$ emissions that is $PM_{2.5}$ could be described by the following equation:

$$\frac{PM_{2.5}}{PM_{10}} = \frac{(0.17) \times (1 - 0.99)}{(1 - 0.17) \times (1 - 0.995) + (0.17) \times (1 - 0.99)} = 29\%$$

The Department agrees that a baghouse is the most appropriate technology and is BACT for PM control from the GRD with a $PM/PM_{10}$ limit of 0.005 grains per dry standard cubic feet (gr/dscf) and 0.98 lb/hr per GRD. $PM_{2.5}$ limits would be 29% of the $PM/PM_{10}$ limit and equal to 0.28 lb/hr.

2. GRD: $NO_x$ BACT

a. Identifying the Available Control Technologies

The Department considered the following potential control technologies for the GRD $NO_x$ BACT: FGR, SCR, SNCR, and LNB. Descriptions of these $NO_x$ control technologies are found in Section III.A.2 of this Permit Analysis.

b. Eliminate Technically Infeasible Control Technologies

While control of $NO_x$ emissions using FGR techniques is theoretically possible for a dryer furnace, it is not technically feasible for application to a direct-contact dryer such as proposed for the MAB GRD. The dryer's exhaust will contain high levels of moisture that were evaporated from the drying gluten. Because the dryer's purpose is to remove moisture from the gluten, adding a moisture-laden air stream to the burner would reduce the dryer's effectiveness. To compensate, the dryer would require more dry air, which in turn would require more fuel combustion and result in increased pollutant emissions.

SNCR is not technically feasible for use with the MAB GRD. Because a temperature of 1600 to 2100° F is required for the reduction reaction to proceed, ammonia or urea would have to be injected within the burner. The dryers operate by bringing the hot combustion gases into direct contact with the DDGS. Effective operation of the SNCR would lead to some unreacted ammonia or urea in the process gas. These compounds would contaminate the gluten and make it unfit for its intended use as a food product.

c. Rank Remaining Technologies by Control Effectiveness

LNB is the only remaining control technology for $NO_x$ BACT for the GRD.

d. Evaluate Available Control Technologies

While SCR is technically feasible for use in the GRD, it presents several potential adverse environmental impacts. First, unreacted ammonia in the flue gas (ammonia slip) and the products of side reactions between ammonia and other species present in the flue gas will be emitted to the atmosphere. Second, transportation storage, and handling of ammonia are potentially hazardous. Third, employing SCR on the GRD system may require the combustion of additional fuel to increase gas temperatures to acceptable levels. This combustion will increase $NO_x$ emissions as well as emissions of other criteria pollutants including CO and VOCs. Finally, disposal of spent catalysts from the SCR unit is a potential environmental hazard. Although SCR has been employed as BACT for combustion processes in many applications, it is eliminated from consideration as BACT for $NO_x$ emissions from the GRD. Concern of potential technical incompatibilities with direct contact drying applications, potential environmental impacts, health and safety risks, and energy usage are factors used to establish the proposal.

The only remaining control technology is LNB. MAB has proposed using LNB as BACT in the GRD with a limit of 0.04 lb/MMBtu. This limit is based on experience of the facility designers with similar applications. A search of the RBLC indicated that this limit is consistent with other gluten drying operations.

e. Select BACT

The Department has determined that BACT for $NO_x$ control from the GRD is LNB with a limit of 0.8 lb/hr and 0.04 lb/MMBtu of fuel burned from each GRD.

3. GRD: CO BACT

a. Identifying the Available Control Technologies

CO emissions from the GRD will result from incomplete combustion of the natural gas. The Department considered the following potential control technologies for the GRD CO BACT:

Proper combustion practices can reduce CO by using a good burner design and burning natural gas. Reduction of CO emissions can be accomplished by controlling the combination of system temperatures through operation at maximum loads, increasing oxygen concentrations, maximizing combustion residence time, and improving mixing of the fuel, exhaust gases, and combustion air. All of these techniques also generally increase $NO_x$ emissions. Maximizing heating efficiency, and subsequently minimizing fuel usage, will also minimize CO formation.

Thermal oxidizers are refractory lined enclosures with one or more burners in which the waste gas stream is routed through a high temperature combustion zone where the waste gas stream is heated and the combustible materials are burned. An RCO uses a catalyst to lower the temperature required to effect complete oxidation. The catalyst in an RCO is prone to poisoning from PM entrained in the exhaust stream; therefore, it would be necessary to locate the RCO downstream from the baghouse. EPA fact sheet EPA-425/F-03-021 states that typical RCO CO design control efficiencies exceed 98% when using precious metal-based catalysts.

b. Eliminate Technically Infeasible Control Technologies

RCO technology is considered technically feasible for reducing CO emissions from the GRD; however, the maximum expected concentration of CO in the GRD exhaust (approximately 20 $ppm_v$) would be too low to allow for any significant reduction.

c. Rank Remaining Technologies by Control Effectiveness

An RCO was deemed technically feasible for reducing CO emissions; however, the low maximum expected uncontrolled concentration of CO in the exhaust means that any control effectiveness would be much lower than a typical RCO system.

d. Evaluate Available Control Technologies

MAB proposed to eliminate an RCO from BACT consideration for CO due to the expected maximum uncontrolled concentration of CO being less than an appropriate inlet minimum concentration for achieving adequate control efficiency.

The Department agrees with MAB that the RCO is inappropriate for CO control for the GRD and it is therefore eliminated from consideration for BACT. MAB proposes that proper design and operation for CO control on the GRD as BACT with a limit of 2.0 lb/hr and 0.10 lb/MMBtu of fuel burned from each system. This limit is based on experience of the facility designers with similar applications. A search of the RBLC indicated that this limit is consistent with other gluten drying operations.

e. Select BACT

The Department has determined that proper design and operation is BACT for CO control from the GRD with a CO limit of 2.0 lb/hr and 0.10 lb/MMBtu of fuel burned from each system.

4. GRD: $SO_2$ BACT

Uncontrolled $SO_2$ emissions are expected to be less than 10 TPY; therefore, reducing emissions by adding emissions control technologies would not be economically feasible. BACT for $SO_2$ will be proper design and operation of the GRD system.

## 5. GRD: VOC BACT

### a. Identifying the Available Control Technologies

VOC emissions from the GRD will result from incomplete combustion of the natural gas and due to evaporation of organic constituents in the moist gluten stream. The Department considered the following potential control technologies for the GRD VOC BACT:

Proper combustion practices can reduce VOC by using a good burner design and burning natural gas. Reduction of VOC emissions can be accomplished by controlling the combination of system temperatures through operation at maximum loads, increasing oxygen concentrations, maximizing combustion residence time, and improving mixing of the fuel, exhaust gases, and combustion air. All of these techniques also generally increase $NO_x$ emissions. Maximizing heating efficiency, and subsequently minimizing fuel usage, will also minimize VOC formation. Ensuring that process temperatures are no higher than necessary to accomplish the desired effect will limit evaporation of VOC. MAB has strong incentives to optimize process temperatures not only to reduce VOC emissions but also to reduce heating fuel costs and to protect the quality of its products.

Both RTO and RCO are potential control technologies for VOC emissions reduction from the GRD. The operating principle of these technologies for controlling VOC emissions is discussed in Section III.A.3.1 of this Permit Analysis. EPA fact sheet EPA-425/F-03-021 states that typical RTO VOC design control efficiencies range from 95 to 99% and RCO VOC control efficiencies range from 90 to 99%.

Wet scrubbers intended for VOC control are designed primarily for creating intimate contact to promote absorption of soluble compounds. Absorption scrubbers typically consist of a contact tower with high surface area material (mass transfer material) in the middle. A scrubbing liquid is sprayed down the tower covering the mass transfer material as waste gas is blown in the bottom of the tower, creating intimate contact between liquid and gas. The soluble gaseous compound(s) then dissolves in the scrubbing liquid. The scrubbing liquid is then removed from the bottom of the tower and treated. The two predominant types of absorption scrubbers are packed and plate towers. Packed towers are vertical vessels that are filled with a packing material such as raschig rings or "saddle" shaped pieces of material. This packing creates significant surface area for the liquid and gas to contact. Plate towers are vertical vessels with horizontal sieve plates in the middle. The scrubbing liquid is sent down the tower filling the plate and the gas passes through the plate holes generating contact with the scrubbing liquid. EPA fact sheet EPA-452/F-03-016 states that typical collection efficiency ranges from 50 to 95%.

Adsorption removes organic compounds from gaseous waste streams by passing the waste gas stream through a bed of adsorbent material contained in a contact vessel. Common adsorbent materials are activated carbon, zeolite, and engineered polymers. These micro-porous materials have large internal surface areas that selectively capture certain types of molecules due to nuclear attraction forces. As the adsorbent approaches saturation, it can be regenerated by changing temperature and/or pressure to promote desorption. This creates a concentrated pollutant stream that can be collected or treated with some other control technology such as thermal oxidation. Adsorption collection efficiency depends on several factors including a specific adsorbent's affinity for a given pollutant, pollutant concentration in the waste stream, humidity, and system temperature and pressure. EPA technical bulletin 456/F-99-004 states that a well-designed adsorber system can expect to achieve 95-98% control efficiency at input concentrations between 500 and 2000 ppm.

Refrigeration condensers are used to separate materials from gaseous streams by cooling and, in some cases, pressurizing a gas stream to cause some of the constituents to condense to liquid form. Condensers are designed to separate constituents based on the difference in dew points of the compounds that are targeted for separation. For example, a stream of benzene and oxygen could be separated by cooling the stream until the benzene condenses because oxygen (dew point -183 degrees Celsius (ºC) has a much lower dew point than benzene (dew point 80 ºC).

b. Eliminate Technically Infeasible Control Technologies

All emissions control technologies are more efficient at removing pollutants from high concentration waste streams than from low concentration streams. As the incoming pollutant concentration decreases, a point of diminishing return is reached whereby the cost required to remove each additional pollutant molecule increases exponentially. For example, a spray tower wet scrubber is typically used with input gaseous pollutant levels down to about 250 ppm. Typical adsorption systems are used with input concentrations down to about 500 ppm. Refrigeration condensers are also more efficient on emission streams containing high concentrations of VOC. The maximum uncontrolled VOC concentration in the GRD exhaust stream is estimated to be approximately 42 ppm. Therefore, wet scrubbers, adsorbers, and refrigeration condensers are considered technically infeasible to the GRD application.

An RCO requires that the exhaust stream be greater than 600 ºF for proper operation. The GRD exhaust temperature is expected to be about 150 ºF; therefore, the exhaust would need to be reheated most likely via natural gas duct burners to raise the temperature to the required level. An RTO utilizes duct burners to raise exhaust temperatures to above about 1200 ºF to facilitate the oxidation of the VOCs. This additional combustion would result in additional $NO_x$ and CO pollutants as well as increased fuel costs. The BACT supplied by MAB indicated a cost effectiveness of $27,700 per ton of VOC removed for an RCO and $68,800 per ton of VOC removed for an RTO. RCO and RTO technologies are also more efficient in applications with higher inlet concentrations than would be encountered in the GRD exhaust. These environmental and economic impacts justify elimination of an RCO and RTO from feasibility for the GRD application.

c. Rank Remaining Technologies by Control Effectiveness

The remaining available alternative is the baseline case of proper system design and operation.

d. Evaluate Available Control Technologies

MAB proposes proper design and operation for VOC control on the GRD as BACT with a limit of 6.80 lb/hr and 0.34 lb/MMBtu of fuel burned from each system. This limit is based on experience of the facility designers with similar applications. A search of the RBLC indicated that this limit is consistent with other gluten drying operations.

e. Select BACT

The Department has determined that proper design and operation is BACT for VOC control from the GRD with a limit of 6.80 lb/hr and 0.34 lb/MMBtu of fuel burned from each system.

## C. Steam Tube Dryers

Two Steam Tube Dryers (STD) will receive from the fermentation process wet barley meal, also called mash or wet distillers grains with solubles (WDGS), and dry it to produce an animal feed product with varying degrees of moisture depending on market requirements. Steam for the dryers will be supplied by the BES. The facility will route the exhaust air from the DDGS Cooler system as make-up process air for the STD. This exhaust air would pass through a baghouse prior to the STD to remove filterable PM. The drying WDGS will result in $SO_2$ and VOC emissions. Filterable particulate from the WDGS will become entrained in the process exhaust. MAB proposes an RTO for VOC control on each STD system which will result in $NO_x$ and CO emissions from natural gas combustion. The $NO_x$ and CO emissions generated by the RTO are considered an acceptable collateral environmental impact associated with controlling other pollutant emissions from a much larger source; therefore, no BACT analyses will be conducted for them.

### 1. STD: PM BACT

a. Identifying the Available Control Technologies

The STD would emit filterable PM as portions of the partially dried mash are entrained in the process exhaust and condensable PM as VOCs are released from the mash during heating. The Department considered the following PM control technologies: baghouse, cyclone, wet scrubber, ESP, and thermal oxidation. These technologies have been previously described in this BACT analysis with the exception of a wet scrubber for PM control. A wet scrubber for PM control uses water to impact, intercept, or diffuse a particulate in a waste gas stream. PM is accelerated and impacted onto a solid surface or into a liquid droplet through devices such as venturi and spray chamber. Wet slurry material is typically stored in an onsite wasted impoundment. EPA factsheet EPA-452/F-03-017 states that venturi wet scrubbers have PM collection efficiencies from 70-99%.

MAB is proposing to control STD VOC emissions using one RTO for each dryer. An RTO will have a collateral effect of reducing emissions of filterable and condensable PM via thermal oxidation. The majority of the particulate emissions are expected to be in the form of direct $PM_{2.5}$ which is composed of fine and condensable PM. In the case of indirect $PM_{2.5}$ emissions, the Department relies on BACT performed on the precursor pollutants.

b. Eliminate Technically Infeasible Control Technologies

Cyclones are primarily used for controlling coarse PM. While there are high efficiency cyclones designed to be effective for $PM_{10}$ and $PM_{2.5}$, these cyclones require higher pressure differentials which require higher energy costs to move the waste gas through the cyclone. EPA fact sheet EPA-452/F-03-005 states that high efficiency cyclones are 20 to 70% efficient for controlling $PM_{2.5}$. Cyclones are often used as "precleaners" for removing coarse PM prior to other downstream control devices. In the STD system, the inlet loading of coarse PM is not expected to be high enough to warrant a cyclone precleaner upstream of the RTO. Cyclones are not considered technically feasible for the STD system.

c. Rank Remaining Technologies by Control Effectiveness

Baghouses and ESPs are capable of collection efficiencies of 99.9% and represent the highest ranking control technologies based on their control effectiveness. Wet scrubbers follow with a maximum collection efficiency of 99%.

d. Evaluate Available Control Technologies

As discussed previously within this BACT analysis, ESP technology is implemented in both a dry and wet form. The MAB BACT analysis for the STD states that annual costs for a dry ESP would be on the same order as a fabric filter baghouse and would essentially provide the same level of performance. A wet ESP would provide additional control of condensable PM; therefore, the MAB BACT analysis examined a wet ESP and not a dry ESP. A wet ESP has environmental impacts because they require water and produce a contaminated water effluent that would require treatment. The cost effectiveness calculations performed by MAB indicate that a wet ESP would provide a cost efficiency of $30,100 per ton of PM removed. This cost does not include any waste water treatment costs; nor does it include an estimated cost for cooling the exhaust gas down to appropriate levels for proper wet ESP function.

Fabric filter baghouses do not have the environmental impacts associated with water treatment that a wet ESP does. They do require electrical power to operate but this energy impact is insignificant relative to facility-wide energy use. MAB provided a cost effectiveness calculation of $52,400 per ton of PM removed for the fabric filter baghouse.

A variety of wet scrubber types are available for controlling PM emissions. A typical minimum inlet concentration for effective PM control is 0.1 gr/dscf which is higher than the estimated uncontrolled PM concentration from the STD of 0.04 gr/dscf. All wet scrubbers require supply water and produce a liquid waste stream that requires treatment. All wet scrubber technologies also require electrical power for pumping and auxiliary equipment. MAB provided a cost effectiveness calculation based on a fiber bed wet scrubber which is on the low end of potential costs in the interest of identifying the wet scrubber with the lowest cost per ton of PM removed. The cost efficiency for this wet scrubber would be $37,800 per ton of PM removed. This cost does not include collection and treatment costs of the waste stream.

e. Select BACT

All of the available add-on control technologies evaluated for the STD would result in economic impacts above the industry norms. Additionally, the low concentration of particulate in the STD exhaust after exiting the RTO would significantly limit control efficiency of an additional dedicated PM control system. The Department has determined that BACT for PM control from the STD is proper design and operation of the RTO with a limit of 5.65 lb/hr and 0.14 lb/ton of dryer feed from each RTO.

2. STD: VOC BACT

a. Identifying the Available Control Technologies

VOC emissions from the STD will result from evaporation of organic compounds from the process material. In addition to proper design and operation, the Department considered the following potential control technologies for the STD VOC BACT: RTO, RCO, wet scrubber, adsorption, and refrigerated condensation. These VOC control technologies have been described previously in this BACT analysis.

b. Eliminate Technically Infeasible Control Technologies

All of the control alternatives are considered technically feasible for the purpose of this analysis.

c. Rank Remaining Technologies by Control Effectiveness

RTO and RCO technologies represent the highest level of control effectiveness with maximum design values ranging from 95-99% for an RTO and 90-99% for an RCO. Adsorbers can expect to achieve 95-98% control efficiency. Wet scrubber efficiencies have typical collection efficiencies ranging from 50-95%. EPA technical bulletin EPA456/R-01-004 states that mechanical compression refrigeration with the condenser chilled by way of a brine heat exchanger can expect control efficiencies from 50-90%.

d. Evaluate Available Control Technologies

MAB proposes to control VOC emissions from the STD by installing and operating two RTOs, one for each steam tube dryer. Because an RTO represents the highest control efficiency of the control technologies that were analyzed, no further evaluation is necessary. MAB proposes a minimum design control of 98%.

e. Select BACT

The Department has determined that BACT for VOC control from the STD is an RTO on each of the two STDs with a limit of 6.17 lb/hr and 0.164 lb/ton of dryer feed from each RTO.

3. STD: $SO_2$ BACT

a. Identifying the Available Control Technologies

$SO_2$ emissions from the STD will result from residual sulfuric acid in the wet barley meal evaporating in the STD and reacting with the heated process air to form $SO_2$. The Department considered the following potential control technologies for the STD $SO_2$ BACT:

While several $SO_2$ emission control systems are available, they all basically rely on the physical process of absorption. They all use contact of the $SO_2$-laden exhaust stream with a reagent that absorbs or chemically reacts with $SO_2$ to reduce its concentration in the exhaust. Several processes allow the recovery of a useful product such as sulfuric acid or gypsum while others create a waste stream that must be further treated or disposed of as formed.

Wet scrubbers operate by spraying a slurry of lime or limestone with excess water into the exhaust. The alkaline solution reacts with $SO_2$ to form insoluble sulfate salts that can be captured and treated for beneficial use or landfill disposal.

Semi-Dry absorbers work on the same principles at a wet scrubber but the sprayed slurry contains a minimal amount of water so that all the water evaporates in the exhaust stream. Some systems use no water at all. This leaves a dry particulate that can be collected by a PM control device and disposed of.

b. Eliminate Technically Infeasible Control Technologies

As with other pollution control devices, $SO_2$ control devices are most efficient at removing pollutants from high concentration waste streams than from low concentration streams. As the incoming pollutant concentration decreases, a point of diminishing return is reached whereby the cost required to remove each additional pollutant molecule increases exponentially. The expected uncontrolled level of $SO_2$ emissions in the STD exhaust stream is about 12 ppm. At this low input concentration, it is highly unlikely that that these control technologies could effectively reduce the emission levels even further. The collateral environmental, energy, and economic impacts associated with these controls would not be justified for the small amount of $SO_2$ that would be removed. MAB has proposed that the existing $SO_2$ control technologies are not technically feasible for use with the STD.

c. Rank Remaining Technologies by Control Effectiveness

The remaining available alternative is the baseline case of proper system design and operation.

d. Evaluate Available Control Technologies

MAB has proposed that the existing $SO_2$ control technologies are not technically feasible for use with the STD due to the expected maximum uncontrolled concentration of $SO_2$ being less than an appropriate inlet minimum concentration for achieving adequate control efficiency.

The Department agrees with MAB that $SO_2$ control technologies are not technically feasible for use with the STD based on the estimated emission levels. MAB proposes that proper design and operation for $SO_2$ control on the STD as BACT.

e. Select BACT

The Department has determined that proper design and operation is BACT for $SO_2$ control from the STD with a $SO_2$ limit of 4.41 lb/hr and 0.117 lb/ton of dryer feed from each STD.

D. Fuel for BES, GRD, and RTOs

MAB proposed the following fuels for use in the BES, GRD, and RTOs:

1. BES – biogas created from the biomass gasifiers (primarily CO and hydrogen), natural gas, and biogas produced from the biomethantor (primarily methane).
2. GRD – natural gas and biogas produced from the biomethantor (primarily methane).
3. RTO – natural gas and biogas produced from the biomethantor (primarily methane).

The Department did not require the analysis of alternate fuels because the proposed fuels are considered to be amongst the cleanest from an air emissions standpoint. MAB shall be restricted to using only the fuels proposed in their application materials.

E. Grain Processing and Handling

Grain processing and handling (GPH) operations include unloading from grain trucks to storage silos, milling, cleaning and sifting, and product packaging and loading. This section also addresses PM emissions from handling ash generated by the Biomass Gasifier that is part of the BES and the DDGS Cooling System emissions. PM emissions will be emitted from the handling and transfer of these materials. The following table lists the applicable grain and ash handling emissions sources.

| Source ID | Emission Source |
|---|---|
| S10 | Grain Unloading |
| S21 | Mill A Barley Cleaning |
| S22 | Mill B Barley Cleaning |
| S23 | Mill C Barley Cleaning |
| S24 | Mill D Barley Cleaning |
| S25 | Mill A Barley Sifter |
| S26 | Mill B Barley Sifter |
| S27 | Mill C Barley Sifter |
| S28 | Mill D Barley Sifter |
| S30 | Raw Wheat Cleaning |
| S31 | Raw Wheat Cleaning |
| S32 | Wheat Sifter Side 1 |
| S33 | Wheat Sifter Side 2 |
| S40 | Wheat Surge Bin |
| S41 | Gluten Bin Vent |
| S42 | Wheat Starch Bin |
| S43 | Wheat Gluten Packaging |
| S72 | DDGS Cooler |
| S73 | DDGS Loading |
| S82 | Bran Loadout/Storage |
| S95 | Ash Receiver Bin |
| S96 | Ash Receiver Bin |
| S97 | Ash Loading Bin |

1. GPH: PM BACT

Baghouses and bin vents offer a high level particulate control and have been used in many similar applications. MAB has proposed installing baghouses or bin vents as BACT for the GPH sources identified above. Baghouses are proposed for all of the sources except S40, S41, S42, S95, S96, and S97 for which a bin vent is proposed due to these sources being small in terms of throughput and they operate more intermittently. A baghouse or bin vent represents the highest level of PM control; therefore, no further analysis is required. MAB has proposed the following emission factors for permit limits on the GPH processes.

| Source ID | Emission Source | Emission Factor (gr/scf) |
|---|---|---|
| S10 | Grain Unloading | 0.004 |
| S21 | Mill A Barley Cleaning | 0.004 |
| S22 | Mill B Barley Cleaning | 0.004 |
| S23 | Mill C Barley Cleaning | 0.004 |
| S24 | Mill D Barley Cleaning | 0.004 |
| S25 | Mill A Barley Sifter | 0.004 |
| S26 | Mill B Barley Sifter | 0.004 |
| S27 | Mill C Barley Sifter | 0.004 |
| S28 | Mill D Barley Sifter | 0.004 |
| S30 | Raw Wheat Cleaning | 0.004 |
| S31 | Raw Wheat Cleaning | 0.004 |
| S32 | Wheat Sifter Side 1 | 0.004 |
| S33 | Wheat Sifter Side 2 | 0.004 |
| S40 | Wheat Surge Bin | 0.005 |
| S41 | Gluten Bin Vent | 0.005 |
| S42 | Wheat Starch Bin | 0.005 |
| S43 | Wheat Gluten Packaging | 0.004 |
| S72 | DDGS Cooler | 0.0045 |
| S73 | DDGS Loading | 0.004 |
| S82 | Bran Loadout/Storage | 0.004 |
| S95 | Ash Receiver Bin | 0.005 |
| S96 | Ash Receiver Bin | 0.005 |
| S97 | Ash Loading Bin | 0.005 |

The Department agrees that baghouses and bin vents represent the most appropriate technology and is BACT for PM control from the GPH processes with the emission factor limits as proposed by MAB. The MAB emission factors are presented as grains per standard cubic foot of exhaust flow (gr/scf). The industry norm for PM emission limits is to express this emission factor as gr/dscf; therefore, the Department will apply the proposed emission factors in units of gr/dscf. While predicted exhaust gas moisture content was provided for the gluten ring dryer exhaust, no other exhaust gas moisture content was presented for these sources in the Application materials. Exhaust temperatures and flows were provided in the Application materials. When the exhaust source is from a noncombustion process, the Department will assume a conservative estimate of 5% moisture content. A review of the RBLC indicates that these emission limits are consistent with other recently permitted similar sources. MAB has indicated that in their experience all the PM from properly operated equipment will be $PM_{10}$; therefore, PM is assumed equivalent to $PM_{10}$ in all calculations and proposed limits. As discussed in Section III.B.1 of this Permit Analysis, the percent of controlled $PM_{10}$ emissions that is $PM_{2.5}$ is assumed to be 29%.

## F. Fermentation System

The fermentation process is an aqueous, exothermic process that converts grain starch to ethanol and $CO_2$. $CO_2$ will be routed through a wet scrubber to remove and recover vapor phase ethanol. Fermentation system VOC emissions will represent ethanol that was not removed by the scrubber system. The system will also generate small amounts of condensable PM that will be controlled by the wet scrubber.

### 1. Fermentation System: VOC BACT

#### a. Identifying the Available Control Technologies

In addition to proper design and operation, the Department considered the following potential control technologies for the fermentation system VOC BACT: RTO, RCO, wet scrubber, adsorption, and refrigerated condensation. These VOC control technologies have been described previously in this BACT analysis.

#### b. Eliminate Technically Infeasible Control Technologies

Proper design and operation can minimize VOC emissions by ensuring that process temperatures and pressures are optimized to limit evaporation of the VOCs. MAB has strong incentive to optimize process conditions in the fermentation system because the VOC losses represent lost ethanol which reduces production and profit.

All of the potential control technologies are considered technically feasible for the project.

#### c. Rank Remaining Control Technologies by Control Effectiveness

RTO and RCO technologies represent the highest level of control effectiveness with maximum design values ranging from 95-99% for an RTO and 90-99% for an RCO. Adsorbers can expect to achieve 95-98% control efficiency. Wet scrubber efficiencies have typical collection efficiencies ranging from 50-95%. EPA technical bulletin EPA456/R-01-004 states that mechanical compression refrigeration with the condenser chilled by way of a brine heat exchanger can expect control efficiencies from 50-90%.

#### d. Evaluate Available Control Technologies

While RTO and RCO technologies may represent the theoretical maximum achievable control efficiency, they do not offer any potential for product recovery from the exhaust stream because the VOCs are destroyed via thermal or catalytic oxidation. The VOC emissions from the fermentation process represent lost ethanol which MAB has a strong incentive to recapture. Therefore, the RTO and RCO are eliminated from consideration. MAB proposes to install and operate a wet scrubber system with a minimum control efficiency of 98% for VOC control. The use of a wet scrubber would provide pollution control efficiency nearly equivalent to an RTO or RCO and also process benefit because the emissions entrained within the wet scrubber liquid can be recaptured and used rather than disposed of. No evaluation of adsorbers or refrigerated condensers is necessary because the proposed wet scrubber provides a greater control efficiency.

e. Select BACT

The Department has determined that BACT for VOC control from the fermentation process is a wet scrubber with a limit of 10.79 lb/hr and 750 lb/MMgal of processed ethanol.

G. Fugitive VOC Components

Fugitive VOC emissions can potentially occur in components not operating in vacuum service such as pumps, compressors, pressure relief devices, sampling connection systems, open-ended valves or lines, flanges, or other connectors. 40 CFR 60, Subpart VVa – *Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006* would apply to this facility. MAB proposes to implement a leak detection and repair (LDAR) program that incorporates all of the requirements of this subpart as BACT. The Department concurs that the LDAR program is BACT for fugitive VOC components.

H. Ethanol Loadout

MAB would loadout denatured ethanol into either railcar tanks or tanker trucks. Loadout VOC emissions come from the vapors that are displaced from empty railcar tanks and truck tanks during filling. Both the rail and truck loadout racks will be designed and operated to collect loadout emissions and route them to their own pollution control devices.

1. Ethanol Loadout: VOC BACT

a. Identifying the Available Control Technologies

The Department considered the following potential control technologies for the ethanol loadout: open flare, RTO, RCO, wet scrubber, adsorption, and refrigerated condensation. Open flares are another type of thermal oxidizer that is commonly used for VOC loadout operations as part of a vapor recovery system. EPA fact sheet EPA-452/F-03-019 states that a properly operated flare can achieve a destruction efficiency of 98% or greater depending upon an adequate heat content of the waste gas stream.

b. Eliminate Technically Infeasible Control Technologies

All of the control alternatives are considered technically feasible for the purpose of this analysis.

c. Rank Remaining Technologies by Control Effectiveness

RTO and RCO technologies represent the highest level of control effectiveness with maximum design values ranging from 95-99% for an RTO and 90-99% for an RCO. Flares can achieve efficiencies greater than 98%. Adsorbers can expect to achieve 95-98% control efficiency. Wet scrubber efficiencies have typical collection efficiencies ranging from 50-95%. Mechanical compression refrigeration with the condenser chilled by way of a brine heat exchanger can expect control efficiencies from 50-90%.

d. Evaluate Available Control Technologies

While RTOs and RCOs are technically capable of VOC control from the loadout emissions, flares are ideally suited for this type of intermittent operation because they can run continuously at a very low level when not in use and respond instantaneously when needed. Flares have been required for VOC control from loadout rack applications in many other recently permitted sources. MAB proposes to install and operate one flare each on the rail and truck loadout racks with a minimum control efficiency of 98%. Because use of a flare would be expected to be at least as effective as the other control alternatives, no further evaluation of alternatives is necessary.

e. Select BACT

The Department has determined that BACT for VOC emissions from ethanol loadout is a vapor recovery system with a flare on both the railcar and truck loadout systems as proposed by MAB.

## I. Storage Tanks

The MAB facility would include two tanks for storing pure ethanol, two for storing denatured ethanol, one for storing denaturant (gasoline), and one to store corrosion inhibitor. Storage tanks are potential sources of fugitive VOC emissions from the working and breathing losses of the volatile liquids held within. 40 CFR 60, Subpart Kb – *Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984* would apply to any storage tank at this facility with a storage capacity greater than 75 cubic meters (approximately 19,813 gallons). This would include the two tanks for storing pure ethanol, two for storing denatured ethanol, and one for storing denaturant. MAB proposes to install internal floating roof tanks on the two tanks for storing pure ethanol, two for storing denatured ethanol, and one for storing denaturant as BACT. The Department determined that installing internal floating roof tanks that meet the applicable requirements of 40 CFR 60, Subpart Kb is BACT for VOC control from the storage tanks. Proper design and maintenance is BACT for corrosion inhibitor tank.

## J. Cooling Tower

A water cooling tower will be installed at the MAB facility. The cooling tower will serve the facility's various distillation process and cooling needs. The cooling tower provides direct contact between the cooling water flow and air passing through the tower. Some of the cooling water becomes entrained in the air stream and is carried out of the tower as water droplets in liquid phase, a process known as “drift.” The drift loss is independent of water lost to evaporation. When the drift droplets evaporate, dissolved solids crystallize and create PM emissions. Factors that affect PM emission rates from wet cooling towers include: air and water flow patterns, the amount of total dissolved solids in the cooling cycle water, circulating water volumes, the number of cooling tower concentration cycles, and operation and maintenance practices.

The primary control technology for cooling towers is a drift eliminator. Drift eliminators work by intercepting as many water droplets as possible from the airflow leaving the cooling tower, thus minimizing PM emissions. They are designed to cause sudden directional changes to the air flow and the inertia of the water droplets causes them to impact the eliminator surfaces. The drift is then collected and returned to the cooling water flow. High efficiency drift eliminators can control the drift to less than 0.001% of the cooling tower circulating water flow. MAB proposes to incorporated high efficiency drift eliminators in the cooling tower design. The Department concurs that the drift eliminators are BACT for the cooling tower PM emissions.

### K. Handling and Processing Fugitive Emissions

There will be fugitive sources of particulate emissions which include the receiving, handling, and cleaning of grain; product storage and handling; biochar/ash loadout; and bin vents. These process emissions are considered fugitive because they are not reasonably captured and passed through a stack to the atmosphere. MAB has proposed enclosures for these sources as BACT for controlling PM. The Department concurs that enclosures are BACT for the handling and processing fugitive PM emissions.

## IV. Emission Inventory

| | **Fugitive and Nonfugitive Emissions (TPY)** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **PM** | **$PM_{10}$** | **$PM_{2.5}$** | **$NO_x$** | **CO** | **VOC** | **$SO_2$** | **HAP** |
| Materials processing and handling b/h | 52.97 | 52.97 | 15.36 | | | | | |
| Handling and processing fugitive | 19.20 | 8.69 | 3.46 | | | | | |
| DDGS Cooling Drum (@500 hours/yr)* | 0.18 | 0.18 | 0.05 | | | 0.94 | | 0.94 |
| Cooling tower | 3.29 | 3.29 | 3.29 | | | | | |
| Gasifier syngas & NG combustion (wet ESP) | 23.74 | 23.74 | 23.74 | 208.42 | 188.77 | 46.92 | 10.36 | 3.59 |
| Gluten ring dryers (baghouse) | 9.25 | 9.25 | 2.68 | 7.01 | 17.52 | 59.57 | 9.52 | 1.95 |
| ST Drying / RTOs | 49.45 | 49.45 | 49.45 | 6.31 | 31.54 | 54.06 | 38.57 | 2.82 |
| Firewater pump diesel engine (52 hr/yr) | 0.00 | 0.00 | 0.00 | 0.05 | 0.04 | 0.02 | 0.02 | |
| Fermentation ($CO_2$) scrubber | 0.35 | 0.35 | 0.35 | | | 47.25 | | 7.35 |
| LDAR | | | | | | 11.17 | | 1.56 |
| Biomethanator flare (@500 hours/yr) | | | | 0.15 | 0.63 | 0.09 | | |
| Paved Roads | 22.36 | 4.47 | 1.10 | | | | | |
| VOC vents (to atmosphere) | | | | | | 3.07 | | |
| Tanks | | | | | | 2.19 | | 0.06 |

| | Fugitive and Nonfugitive Emissions (TPY) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **PM** | **$PM_{10}$** | **$PM_{2.5}$** | **$NO_x$** | **CO** | **VOC** | **$SO_2$** | **HAP** |
| Product loadout flares | | | | 0.55 | 2.57 | 6.71 | | 2.31 |
| **Total Emissions** | **180.81** | **152.40** | **99.49** | **222.48** | **241.07** | **231.97** | **58.46** | **20.56** |

Footnotes:

* = Under normal operation the DDGS Cooling Drum exhausts to the steam tube dryers/RTOs and to the atmosphere via the Megastack.
b/h = baghouse
CO = carbon monoxide
HAPs = hazardous air pollutants, calculations are on file at the Department
hp = horsepower
lb = pound
N/A = not applicable
ND = no data available
$NO_X$ = oxides of nitrogen
PM = particulate matter
$PM_{10}$ = particulate matter with an aerodynamic diameter of 10 microns or less
$PM_{2.5}$ = particulate matter with an aerodynamic diameter of 2.5 microns or less
$SO_2$ = sulfur dioxide
TPH = tons per hour
TPY = tons per year
VOC = volatile organic compounds
yr = year

| | Nonfugitive Emissions (TPY) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Source** | **PM** | **$PM_{10}$** | **$PM_{2.5}$** | **$NO_x$** | **CO** | **VOC** | **$SO_2$** | **HAP** |
| Materials processing and handling b/h | 52.97 | 52.97 | 15.36 | | | | | |
| DDGS Cooling Drum (@500 hours/yr) | 0.18 | 0.18 | 0.05 | | | 0.94 | | 0.94 |
| gasifier syngas & NG combustion (wet ESP) | 23.74 | 23.74 | 23.74 | 208.42 | 188.77 | 46.92 | 10.36 | 3.59 |
| Gluten ring dryers (baghouse) | 9.25 | 9.25 | 2.68 | 7.01 | 17.52 | 59.57 | 9.52 | 1.95 |
| ST Drying / RTOs | 49.45 | 49.45 | 49.45 | 6.31 | 31.54 | 54.06 | 38.57 | 2.82 |
| Firewater pump diesel engine (52 hr/yr) | 0.00 | 0.00 | 0.00 | 0.05 | 0.04 | 0.02 | 0.02 | |
| Fermentation ($CO_2$) scrubber | 0.35 | 0.35 | 0.35 | | | 47.25 | | 7.35 |
| Biomethanator flare (@500 hours/yr) | | | | 0.15 | 0.63 | 0.09 | | |
| Product loadout flares | | | | 0.55 | 2.57 | 6.71 | | 2.31 |
| **Total Emissions** | **135.96** | **135.96** | **91.65** | **222.48** | **241.07** | **215.55** | **58.46** | **18.96** |

| **Emission Source** | **$CO_2e$ (TPY)** |
|---|---|
| Facility-wide Natural Gas Combustion | **93566$^a$** |
| Syngas Combustion | **5070$^b$** |
| Firewater pump diesel engine | **9** |
| Biomethanator flare | **0$^b$** |
| Product loadout flares | **1050** |
| Fermentation ($CO_2$) scrubber | **0$^b$** |
| **Total Emissions** | **99695** |

NOTES
$CO_2e$ = carbon dioxide equivalent
a $CO_2e$ calculations reflect the federally enforceable permit condition of limiting facility-wide natural gas combustion to 1.55 * $10^9$ cubic feet per year.
b $CO_2$ emissions deferred because it is a biogenic source.

Calculations

## Materials Processing and Handling Baghouse Emissions

Ps = Estimated typical barometric pressure of Great Falls = 26.62 in Hg
dscfm = dry standard cubic feet per minute
acfm = actual cubic feet per minute (application information)
M% = moisture content (assumed 5% for a non-combustion source unless other info provided)
Ts = stack temperature in degrees Rankine (application information)
dscfm = dry standard cubic feet per minute = acfm * (1 - M%) * (528/Ts) * Ps/29.92
PM = $PM_{10}$ based on application information
ratio of $PM_{2.5}$ to $PM_{10}$ = 0.29
gr/dscf = grains per dry standard cubic foot

| Source ID | Emission Source | Emission Factor (gr/dscf) | Moisture % | temp F | flow acfm | flow dscfm | PM/$PM_{10}$ lb/hr | PM/$PM_{10}$ TPY | $PM_{2.5}$ lb/hr | $PM_{2.5}$ TPY |
|---|---|---|---|---|---|---|---|---|---|---|
| S10 | Grain Unloading | 0.004 | 5 | 68 | 35000 | 29583 | 1.01 | 4.44 | 0.29 | 1.29 |
| S21 | Mill A Barley Cleaning | 0.004 | 5 | 100 | 25000 | 19923 | 0.68 | 2.99 | 0.20 | 0.87 |
| S22 | Mill B Barley Cleaning | 0.004 | 5 | 100 | 25000 | 19923 | 0.68 | 2.99 | 0.20 | 0.87 |
| S23 | Mill C Barley Cleaning | 0.004 | 5 | 100 | 25000 | 19923 | 0.68 | 2.99 | 0.20 | 0.87 |
| S24 | Mill D Barley Cleaning | 0.004 | 5 | 100 | 25000 | 19923 | 0.68 | 2.99 | 0.20 | 0.87 |
| S25 | Mill A Barley Sifter | 0.004 | 5 | 100 | 25000 | 19923 | 0.68 | 2.99 | 0.20 | 0.87 |
| S26 | Mill B Barley Sifter | 0.004 | 5 | 100 | 25000 | 19923 | 0.68 | 2.99 | 0.20 | 0.87 |
| S27 | Mill C Barley Sifter | 0.004 | 5 | 100 | 25000 | 19923 | 0.68 | 2.99 | 0.20 | 0.87 |
| S28 | Mill D Barley Sifter | 0.004 | 5 | 100 | 25000 | 19923 | 0.68 | 2.99 | 0.20 | 0.87 |
| S30 | Raw Wheat Cleaning | 0.004 | 5 | 100 | 25000 | 19923 | 0.68 | 2.99 | 0.20 | 0.87 |
| S31 | Raw Wheat Cleaning | 0.004 | 5 | 100 | 25000 | 19923 | 0.68 | 2.99 | 0.20 | 0.87 |
| S32 | Wheat Sifter Side 1 | 0.004 | 5 | 100 | 50000 | 39846 | 1.37 | 5.98 | 0.40 | 1.74 |
| S33 | Wheat Sifter Side 2 | 0.004 | 5 | 100 | 50000 | 39846 | 1.37 | 5.98 | 0.40 | 1.74 |

| Source ID | Emission Source | Emission Factor (gr/dscf) | Moisture % | temp F | flow acfm | flow dscfm | PM/$PM_{10}$ lb/hr | PM/$PM_{10}$ TPY | $PM_{2.5}$ lb/hr | $PM_{2.5}$ TPY |
|---|---|---|---|---|---|---|---|---|---|---|
| S40 | Wheat Surge Bin | 0.005 | 5 | 100 | 3000 | 2391 | 0.10 | 0.45 | 0.03 | 0.13 |
| S41 | Gluten Bin Vent | 0.005 | 5 | 100 | 3000 | 2391 | 0.10 | 0.45 | 0.03 | 0.13 |
| S42 | Wheat Starch Bin | 0.005 | 5 | 100 | 5000 | 3985 | 0.17 | 0.75 | 0.05 | 0.22 |
| S43 | Wheat Gluten Packaging | 0.004 | 5 | 68 | 10000 | 8452 | 0.29 | 1.27 | 0.08 | 0.37 |
| S73 | DDGS Loading | 0.004 | 5 | 68 | 8000 | 6762 | 0.23 | 1.02 | 0.07 | 0.29 |
| S82 | Bran Loadout/Storage | 0.004 | 5 | 68 | 5000 | 4226 | 0.14 | 0.63 | 0.04 | 0.18 |
| S51 | Gluten Ring Dryer A | 0.005 | 20 | 150 | 40000 | 24643 | 1.06 | 4.63 | 0.31 | 1.34 |
| S52 | Gluten Ring Dryer B | 0.005 | 20 | 150 | 40000 | 24643 | 1.06 | 4.63 | 0.31 | 1.34 |
| S95 | Ash Receiver Bin | 0.005 | 5 | 150 | 6000 | 4390 | 0.19 | 0.82 | 0.05 | 0.24 |
| S96 | Ash Receiver Bin | 0.005 | 5 | 150 | 6000 | 4390 | 0.19 | 0.82 | 0.05 | 0.24 |
| S97 | Ash Loading Bin | 0.005 | 5 | 120 | 3000 | 2308 | 0.10 | 0.43 | 0.03 | 0.13 |
| **Totals** | | | | | | | **12.09** | **52.97** | **3.51** | **15.36** |

## FUG01 - Grain Receiving

Maximum Process Rate = 2,028,600 TPY (Maximum plant process rate)
Maximum Hours of Operation = 8,760 hrs/yr

**Total PM Emissions:**
Emission Factor = 0.035 lb/ton (hopper truck grain receiving, AP 42, Table 9.9.1-1, 3/03)
Control Efficiency = 90% enclosure (90% based on supplied BACT for Grain Processing & Handling)
Calculation: (2,028,600 TPY) * (0.035 lb/ton) * (ton/2000 lb) * (1 - 90/100) = 3.55 TPY (controlled)

**Total $PM_{10}$ Emissions:**
Emission Factor = 0.0078 lb/ton (hopper truck grain receiving, AP 42, Table 9.9.1-1, 3/03)
Control Efficiency = 90% enclosure (90% based on supplied BACT for Grain Processing & Handling)
Calculation: (2,028,600 TPY) * (0.0078 lb/ton) * (ton/2000 lb) * (1 - 90/100) = 0.79 TPY (controlled)

**Total $PM_{2.5}$ Emissions:**
Emission Factor = 0.0013 lb/ton (hopper truck grain receiving, AP 42, Table 9.9.1-1, 3/03)
Control Efficiency = 90% enclosure (90% based on supplied BACT for Grain Processing & Handling)
Calculation: (2,028,600 TPY) * (0.0013 lb/ton) * (ton/2000 lb) * (1 - 90/100) = 0.13 TPY (controlled)

## FUG02 - Grain Handling

Maximum Process Rate = 2,028,600 TPY (Maximum plant process rate)
Maximum Hours of Operation = 8,760 hrs/yr

**Total PM Emissions:**
Emission Factor = 0.061 lb/ton (headhouse and grain handling, AP 42, Table 9.9.1-1, 3/03)
Control Efficiency = 90% enclosure (90% based on supplied BACT for Grain Processing & Handling)
Calculation: (2,028,600 TPY) * (0.061 lb/ton) * (ton/2000 lb) * (1 - 90/100) = 6.19 TPY (controlled)

**Total $PM_{10}$ Emissions:**
Emission Factor = 0.034 lb/ton (headhouse and grain handling, AP 42, Table 9.9.1-1, 3/03)
Control Efficiency = 90% enclosure (90% based on supplied BACT for Grain Processing & Handling)
Calculation: (2,028,600 TPY) * (0.034 lb/ton) * (ton/2000 lb) * (1 - 90/100) = 3.45 TPY (controlled)

**Total $PM_{2.5}$ Emissions:**
Emission Factor = 0.0058 lb/ton (headhouse and grain handling, AP 42, Table 9.9.1-1, 3/03)
Control Efficiency = 90% enclosure (90% based on supplied BACT for Grain Processing & Handling)
Calculation: (2,028,600 TPY) * (0.0058 lb/ton) * (ton/2000 lb) * (1 - 90/100) = 0.59 TPY (controlled)

## FUG03 - Grain Scalping/Cleaning

Maximum Process Rate = 2,028,600 TPY (Maximum plant process rate)
Maximum Hours of Operation = 8,760 hrs/yr

**Total PM Emissions:**
Emission Factor = 0.012 lb/ton (cleaning house separators, AP 42, Table 9.9.1-2, 3/03)
Control Efficiency = 90% enclosure (90% based on supplied BACT for Grain Processing & Handling)
Calculation: (2,028,600 TPY) * (0.012 lb/ton) * (ton/2000 lb) * (1 - 90/100) = 1.22 TPY (controlled)

**Total $PM_{10}$ Emissions:**
Emission Factor = 0.003 lb/ton (cleaning house separators, assume = 25% PM, AP 42, Table 9.9.1-2, 3/03)
Control Efficiency = 90% enclosure (90% based on supplied BACT for Grain Processing & Handling)
Calculation: (2,028,600 TPY) * (0.003 lb/ton) * (ton/2000 lb) * (1 - 90/100) = 0.30 TPY (controlled)

**Total $PM_{2.5}$ Emissions:**
Emission Factor = 0.0005 lb/ton (cleaning house separators, assume = 17% PM10, AP 42, Table 9.9.1-2, 3/03)
Control Efficiency = 90% enclosure (90% based on supplied BACT for Grain Processing & Handling)
Calculation: (2,028,600 TPY) * (0.0005 lb/ton) * (ton/2000 lb) * (1 - 90/100) = 0.05 TPY (controlled)

## FUG04 - Products Storage/Handling

Maximum Process Rate = 659,292 TPY (Maximum plant process rate)
Maximum Hours of Operation = 8,760 hrs/yr

**Total PM Emissions:**
Emission Factor = 0.061 lb/ton (headhouse and grain handling, AP 42, Table 9.9.1-1, 3/03)
Control Efficiency = 90% enclosure (90% based on supplied BACT for Grain Processing & Handling)
Calculation: (659,292 TPY) * (0.061 lb/ton) * (ton/2000 lb) * (1 - 90/100) = 2.01 TPY (controlled)

**Total $PM_{10}$ Emissions:**
Emission Factor = 0.034 lb/ton (headhouse and grain handling, AP 42, Table 9.9.1-1, 3/03)
Control Efficiency = 90% enclosure (90% based on supplied BACT for Grain Processing & Handling)
Calculation: (659,292 TPY) * (0.034 lb/ton) * (ton/2000 lb) * (1 - 90/100) = 1.12 TPY (controlled)

**Total $PM_{2.5}$ Emissions:**
Emission Factor = 0.0058 lb/ton (headhouse and grain handling, AP 42, Table 9.9.1-1, 3/03)
Control Efficiency = 90% enclosure (90% based on supplied BACT for Grain Processing & Handling)
Calculation: (659,292 TPY) * (0.0058 lb/ton) * (ton/2000 lb) * (1 - 90/100) = 0.19 TPY (controlled)

## FUG05 - Biochar/Ash Loadout

Maximum Process Rate = 101,430 TPY (Assumed to be 5% of gasified material (2,028,600 TPY))
Maximum Hours of Operation = 8,760 hrs/yr

**Total PM Emissions:**
Emission Factor = 0.73 lb/ton (Cement unloading as a surrogate, AP 42, Table 11.12-2, 6/06)
Control Efficiency = 90% enclosure (90% based on supplied BACT for Grain Processing & Handling)
Calculation: (101,430 TPY) * (0.73 lb/ton) * (ton/2000 lb) * (1 - 90/100) = 3.70 TPY (controlled)

**Total $PM_{10}$ Emissions:**
Emission Factor = 0.47 lb/ton (Cement unloading as a surrogate, AP 42, Table 11.12-2, 6/06)
Control Efficiency = 90% enclosure (90% based on supplied BACT for Grain Processing & Handling)
Calculation: (101,430 TPY) * (0.47 lb/ton) * (ton/2000 lb) * (1 - 90/100) = 2.38 TPY (controlled)

**Total $PM_{2.5}$ Emissions:**
Emission Factor = 0.47 lb/ton (Cement unloading as a surrogate, AP 42, Table 11.12-2, 6/06)
Control Efficiency = 90% enclosure (90% based on supplied BACT for Grain Processing & Handling)
Calculation: (101,430 TPY) * (0.47 lb/ton) * (ton/2000 lb) * (1 - 90/100) = 2.38 TPY (controlled)

## FUG06 - Bin Vents

Maximum Process Rate = 2,028,600 TPY (Maximum plant process rate)
Maximum Hours of Operation = 8,760 hrs/yr

**Total PM Emissions:**

Emission Factor = 0.025 lb/ton (Storage bin (vent), AP 42, Table 9.9.1-1, 3/03)
Control Efficiency = 90% enclosure (90% based on supplied BACT for Grain Processing & Handling)
Calculation: (2,028,600 TPY) * (0.025 lb/ton) * (ton/2000 lb) * (1 - 90/100) = 2.54 TPY (controlled)

**Total $PM_{10}$ Emissions:**

Emission Factor = 0.0063 lb/ton (Storage bin (vent), AP 42, Table 9.9.1-1, 3/03)
Control Efficiency = 90% enclosure (90% based on supplied BACT for Grain Processing & Handling)
Calculation: (2,028,600 TPY) * (0.0063 lb/ton) * (ton/2000 lb) * (1 - 90/100) = 0.64 TPY (controlled)

**Total $PM_{2.5}$ Emissions:**

Emission Factor = 0.0011 lb/ton (Storage bin (vent), AP 42, Table 9.9.1-1, 3/03)
Control Efficiency = 90% enclosure (90% based on supplied BACT for Grain Processing & Handling)
Calculation: (2,028,600 TPY) * (0.0011 lb/ton) * (ton/2000 lb) * (1 - 90/100) = 0.11 TPY (controlled)

Handling and Processing Fugitive Emissions Totals
PM = 19.20 TPY
$PM_{10}$ = 8.69 TPY
$PM_{2.5}$ = 3.46 TPY

## S72 - DDGS Cooler Emissions

Maximum Process Rate = 659,292 TPY (Maximum plant process rate, restricted from 80 ton/hr)
Maximum Hours of Operation = 500 hrs/yr (During times when the STD RTOs are not functioning)
Stack Flow = 25000 acfm (application info)
Stack Temp (Ts) = 130 °F (application info)
Stack Moisture (M%) = 5% (application info)
dscfm = [acfm * (1 - M%) * (528/Ts) * Ps/29.92] = [25000 * (1 - 0.05) * (528/590) * 26.62/29.92] = 18,910 dscfm (calculation)

**Total PM Emissions:**

Emission Factor = 0.0045 gr/dscf (BACT)
Calculation: (0.0045 gr/dscf) * (18,910 dscfm) * (1 lb / 7000 gr) * (60 min/hr) = 0.73 lb/hr
Calculation: (0.73 lb/hr) * (500 hrs/yr) * (0.0005 ton/lb) = 0.18 TPY

**Total $PM_{10}$ Emissions:**

Emission Factor = 0.0045 gr/dscf (BACT, assume PM=PM10)
Calculation: (0.0045 gr/dscf) * (18,910 dscfm) * (1 lb / 7000 gr) * (60 min/hr) = 0.73 lb/hr
Calculation: (0.73 lb/hr) * (500 hrs/yr) * (0.0005 ton/lb) = 0.18 TPY

**Total $PM_{2.5}$ Emissions:**

Emission Factor = 0.0013 gr/dscf (BACT, assume controlled PM2.5 = 29% of controlled PM10)
Calculation: (0.0013 gr/dscf) * (18,910 dscfm) * (1 lb / 7000 gr) * (60 min/hr) = 0.21 lb/hr
Calculation: (0.21 lb/hr) * (500 hrs/yr) * (0.0005 ton/lb) = 0.05 TPY

**VOC Emissions:**

Emission Factor = 0.05 lb/ton (BACT, based on ICM test data)

Calculation: (0.05 lb/ton) * (659,292 TPY) * (1 yr / 8760 hr) = 3.76 lb/hr

Calculation: (3.76 lb/hr) * (500 hrs/yr) * (0.0005 ton/lb) = 0.94 TPY

## F75 - Cooling Tower

-

Maximum Process Rate = 3,000,000 gal/hr (Maximum circulation rate)

Maximum Process Rate = 8.34 lb/gal (Water density)

Maximum TDS = 3,000 ppm (Maximum total dissolved solids (TDS))

Control Efficiency = 0.001 % drift loss (BACT/Vendor guarantee for drift eliminator)

Maximum Hours of Operation = 8,760 hrs/yr

**Total PM/$PM_{10}$/$PM_{2.5}$ Emissions (assume all PM < 2.5 um):**

Calculation: (3,000,000 gal/hr) * (8760 hrs/yr) * (8.34 lb/gal) * (3000 ppm / 1e6 ppm) = 657,525,600 lb/yr (uncontrolled)

Control Efficiency = 99.999% (BACT/Vendor guarantee for drift eliminator)

Calculation: (657,525,600 lb/yr) * (1 - 99.999/100) * (ton/2000 lb) = 3.29 TPY (controlled)

## S91 & S92 - BES

### Syngas Combustion

Maximum Process Rate = 460 MMBtu/hr (Maximum capacity of 2x230 MMBtu from gasifiers)
Maximum Hours of Operation = 8,760 hrs/yr

**Filterable & Condensable PM/$PM_{10}$/$PM_{2.5}$ Emissions:**
Emission Factor = 0.01 lb/MMBtu (Application Information)
Calculation: (460 MMBtu/hr) * (8760 hrs/yr) * (0.01 lb/MMBtu) * (ton/2000 lb) = 20.15 TPY

**CO Emissions:**
Emission Factor = 0.074 lb/MMBtu (Application Information)
Calculation: (460 MMBtu/hr) * (8760 hrs/yr) * (0.074 lb/MMBtu) * (ton/2000 lb) = 149.10 TPY

**$NO_x$ Emissions:**
Emission Factor = 0.08 lb/MMBtu (Application Information)
Calculation: (460 MMBtu/hr) * (8760 hrs/yr) * (0.08 lb/MMBtu) * (ton/2000 lb) = 161.18 TPY

**$SO_2$ Emissions:**
Emission Factor = 0.005 lb/MMBtu (Application Information)
Calculation: (460 MMBtu/hr) * (8760 hrs/yr) * (0.005 lb/MMBtu) * (ton/2000 lb) = 10.07 TPY

**VOC Emissions:**
Emission Factor = 0.022 lb/MMBtu (Application Information)
Calculation: (460 MMBtu/hr) * (8760 hrs/yr) * (0.022 lb/MMBtu) * (ton/2000 lb) = 44.33 TPY

### Natural Gas Combustion from BES

Maximum Process Rate = 110 MMBtu/hr (Maximum capacity of 2x50 MMBtu afterburners and 2x5 MMBtu startup burners)

Natural Gas heat content = 1,020 Btu/cf (Btu content of natural gas)
Maximum Process Rate = 0.10784 10^6 cf/hr = (110 MMBtu/hr / 1020 Btu/scf)
Maximum Hours of Operation = 8,760 hrs/yr

**Filterable PM Emissions:**
Emission Factor = 1.9 lb/10^6 cf (AP 42, Table 1.4-2, all PM<1um, 7/98)
Calculation: (0.10784 10^6 cf/hr) * (8760 hrs/yr) * (1.9 lb/10^6 cf) * (ton/2000 lb) = 0.90 TPY

**Filterable $PM_{10}$ Emissions:**
Emission Factor = 1.9 lb/10^6 cf (AP 42, Table 1.4-2, all PM<1um, 7/98)
Calculation: (0.10784 10^6 cf/hr) * (8760 hrs/yr) * (1.9 lb/10^6 cf) * (ton/2000 lb) = 0.90 TPY

**Filterable $PM_{2.5}$ Emissions:**
Emission Factor = 1.9 lb/10^6 cf (AP 42, Table 1.4-2, all PM<1um, 7/98)
Calculation: (0.10784 10^6 cf/hr) * (8760 hrs/yr) * (1.9 lb/10^6 cf) * (ton/2000 lb) = 0.90 TPY

**Condensable $PM_{2.5}$ Emissions:**
Emission Factor = 5.7 lb/10^6 cf (AP 42, Table 1.4-2, 7/98)
Calculation: (0.10784 10^6 cf/hr) * (8760 hrs/yr) * (5.7 lb/10^6 cf) * (ton/2000 lb) = 2.69 TPY

**CO Emissions:**
Emission Factor = 84 lb/10^6 cf (AP 42, Table 1.4-1, Small Boilers < 100 MMBtu/hr, 7/98)
Calculation: (0.10784 10^6 cf/hr) * (8760 hrs/yr) * (84 lb/10^6 cf) * (ton/2000 lb) = 39.68 TPY

**$NO_x$ Emissions:**
Emission Factor = 100 lb/10^6 cf (AP 42, Table 1.4-1, Small Boilers < 100 MMBtu/hr, 7/98)
Calculation: (0.10784 10^6 cf/hr) * (8760 hrs/yr) * (100 lb/10^6 cf) * (ton/2000 lb) = 47.24 TPY

**$SO_2$ Emissions:**
Emission Factor = 0.6 lb/10^6 cf (AP 42, Table 1.4-2, 7/98)
Calculation: (0.10784 10^6 cf/hr) * (8760 hrs/yr) * (0.6 lb/10^6 cf) * (ton/2000 lb) = 0.28 TPY

**VOC Emissions:**
Emission Factor = 5.5 lb/10^6 cf (AP 42, Table 1.4-2, 7/98)
Calculation: (0.10784 10^6 cf/hr) * (8760 hrs/yr) * (5.5 lb/10^6 cf) * (ton/2000 lb) = 2.60 TPY

## S51 & S52 Gluten Ring Dryers

Natural Gas Combustion
Maximum Process Rate = 40 MMBtu/hr (Maximum capacity of 2x20 MMBtu burners)
Maximum Hours of Operation = 8,760 hrs/yr

**Filterable PM Emissions:**
**Filterable $PM_{10}$ Emissions:**
**Filterable $PM_{2.5}$ Emissions:**
**Condensable $PM_{2.5}$ Emissions:**
See Matls Proc and Handling bh

**CO Emissions:**
Emission Factor = 0.1 lb/MMBtu (BACT)
Calculation: (40 MMBtu/hr) * (8760 hrs/yr) * (0.1 lb/MMBtu) * (ton/2000 lb) = 17.52 TPY

**$NO_x$ Emissions:**
Emission Factor = 0.04 lb/MMBtu (BACT)
Calculation: (40 MMBtu/hr) * (8760 hrs/yr) * (0.04 lb/MMBtu) * (ton/2000 lb) = 7.01 TPY

**$SO_2$ Emissions:**
Emission Factor = 0.45 lb/ton (BACT)
Calculation: (42,315 TPY) * (0.45 lb/ton) * (ton/2000 lb) = 9.52 TPY

**VOC Emissions:**
Emission Factor = 0.34 lb/MMBtu (BACT)
Calculation: (40 MMBtu/hr) * (8760 hrs/yr) * (0.34 lb/MMBtu) * (ton/2000 lb) = 59.57 TPY

## S70 & S71 Steam Tube Dryers w/ RTO

### Natural Gas Combustion

Maximum Process Rate = 36 MMBtu/hr (RTO Maximum capacity of 2x18 MMBtu burners)
Syngas heat content = 1,020 Btu/cf (Btu content of natural gas)
Maximum Process Rate = 0.03529 10^6 cf/hr (Supplied information, 1.0 MMBtu/hr capacity, 1020 Btu/scf)
Maximum Process Rate = 659,292 TPY (Maximum plant process rate, restricted from 80 ton/hr)
Maximum Hours of Operation = 8,760 hrs/yr

**Total $PM/PM_{10}/PM_{2.5}$ Emissions:**
Emission Factor = 11.29 lb/hr (BACT, RTO vendor guarantee)
Calculation: (8760 hrs/yr) * (11.29 lb/hr) * (ton/2000 lb) = 49.45 TPY

**CO Emissions:**
Emission Factor = 0.2 lb/MMBtu (BACT)
Calculation: (36 MMBtu/hr) * (8760 hrs/yr)* (0.2 lb/MMBtu) * (ton/2000 lb) = 31.54 TPY

**$NO_x$ Emissions:**
Emission Factor = 1.44 lb/hr (BACT, RTO vendor guarantee)
Calculation: (8760 hrs/yr) * (1.44 lb/hr) * (ton/2000 lb) = 6.31 TPY

**$SO_2$ Emissions:**
Emission Factor = 0.117 lb/ton (BACT)
Calculation: (659,292 TPY) * (0.117 lb/ton) * (ton/2000 lb) = 38.57 TPY

**VOC Emissions:**
Emission Factor = 0.164 lb/ton (BACT)
Calculation: (659292 TPY) * (0.164 lb/ton) * (ton/2000 lb) = 54.06 TPY

## S69 - Firewater Pump Emergency Engine

### Diesel Engine - 40 CFR 60, Subpart IIII

Note: Emissions are based on the largest emission factor provided for the given pollutant

Operational Capacity of Engine = 300 hp

Hours of Operation = 52 hours

**PM Emissions:**

PM Emissions = 0.003 TPY (Assume all PM < 2.5)

**$NO_x$ Emissions:**

Emission Factor = 3 g/hp-hr (40 CFR 60, Subpart IIII, Table 4, 300 hp for years 2009+)

Emission Factor = 0.00661 lbs/hp-hr (1 lb = 453.59 g)

Calculation: (52 hours) * (300 hp) * (0.00661 lbs/hp-hr) * (ton/2000 lb) = 0.052 TPY

**CO Emissions:**

Emission Factor = 2.6 g/hp-hr (40 CFR 60, Subpart IIII, Table 4, 300 hp for years 2009+)

Emission Factor = 0.00573 lbs/hp-hr (1 lb = 453.59 g)

Calculation: (52 hours) * (300 hp) * (0.00573 lbs/hp-hr) * (ton/2000 lb) = 0.045 TPY

**VOC Emissions:**

Emission Factor = 0.0025141 lbs/hp-hr (AP-42, Sec. 3.3, Table 3.3-1, TOC, Exhaust & Crankcase, 10/96)

Calculation: (52 hours) * (300 bhp) * (0.0025141 lbs/hp-hr) * (ton/2000 lb) = 0.020 TPY Assume TOC = VOC

**$SO_2$ Emissions:**

Emission Factor = 0.00205 lbs/hp-hr (AP-42, Sec. 3.3, Table 3.3-1, 10/96)

Calculation: (52 hours) * (300 hp) * (0.00205 lbs/hp-hr) * (ton/2000 lb) = 0.016 TPY

**$CO_2$ Emissions:**

Emission Factor = 1.15 lbs/hp-hr (AP-42, Sec. 3.3, Table 3.3-1, 10/96)

Calculation: (52 hours) * (300 hp) * (1.15 lbs/hp-hr) * (ton/2000 lb) = 8.97 TPY

## S60 - Fermentation ($CO_2$) Scrubber

Maximum Process Rate = 126 MMgal/yr (application info)

Maximum Hours of Operation = 8,760 hrs/yr

**Total PM/$PM_{10}$/$PM_{2.5}$ Emissions (all PM assumed to be condensable $PM_{2.5}$):**

Emission Factor = 5.55 lb/MMgal (application info, based on test data from similar plants)

Calculation: (5.55 lb/MMgal) * (126 MMgal/yr) * (0.0005 ton/lb) = 0.35 TPY

**VOC Emissions:**

Emission Factor = 750 lb/MMgal (BACT, based on ICM test data)

Calculation: (750 lb/MMgal) * (126 MMgal/yr) * (0.0005 ton/lb) = 47.25 TPY

## FUG07 - LDAR (fugitive components)

Maximum Process Rate = 126 MMgal/yr (application info)

Maximum Hours of Operation = 8,760 hrs/yr

**VOC Emissions:**

**Light Liquid Valves**

Number of Light Liquid Valves = 687 valves (application info, counts based on a similar sized facility)

Emission Factor = 0.00403 kg/hr/valve (application info, EPA-453/R-95-017, November 1995)

Control Efficiency = 84% (application info, EPA-453/R-95-017, November 1995)

Calculation: (687 valves) * (0.00403 kg/hr/valve) * (2.205 lb/kg) = 6.10 lb/hr (uncontrolled)

Calculation: (6 lb/hr) * (8760 hrs/yr) * (1 - 84/100) * (0.0005 ton/lb) = 4.28 TPY (controlled)

**Light Liquid Pumps**

Number of Light Liquid Pumps = 57 pumps (application info, counts based on a similar sized facility)

Emission Factor = 0.0199 kg/hr/pump (application info, EPA-453/R-95-017, November 1995)

Control Efficiency = 69% (application info, EPA-453/R-95-017, November 1995)

Calculation: (57 pumps) * (0.0199 kg/hr/pump) * (2.205 lb/kg) = 2.50 lb/hr (uncontrolled)

Calculation: (3 lb/hr) * (8760 hrs/yr) * (1 - 69/100) * (0.0005 ton/lb) = 3.40 TPY (controlled)

**Gas Valves**

Number of Gas Valves = 115 valves (application info, counts based on a similar sized facility)

Emission Factor = 0.00597 kg/hr/valve (application info, EPA-453/R-95-017, November 1995)

Control Efficiency = 87% (application info, EPA-453/R-95-017, November 1995)

Calculation: (115 valves) * (0.00597 kg/hr/valve) * (2.205 lb/kg) = 1.51 lb/hr (uncontrolled)

Calculation: (2 lb/hr) * (8760 hrs/yr) * (1 - 87/100) * (0.0005 ton/lb) = 0.86 TPY (controlled)

**Flanges (Connectors)**

Number of Flanges (Connectors) = 1145 connectors (application info, counts based on a similar sized facility)

Emission Factor = 0.00183 kg/hr/connector (application info, EPA-453/R-95-017, November 1995)

Control Efficiency = 87% (application info, EPA-453/R-95-017, November 1995)

Calculation: (1,145 connectors) * (0.00183 kg/hr/connector) * (2.205 lb/kg) = 4.62 lb/hr (uncontrolled)

Calculation: (5 lb/hr) * (8760 hrs/yr) * (1 - 87/100) * (0.0005 ton/lb) = 2.63 TPY (controlled)

**Total LDAR VOC = 11.17 TPY**

## F77 Biomethanator Flare

Maximum Process Rate = 6.4 MMBtu/hr (Application information, design value)
Maximum Hours of Operation = 500 hrs/yr (emergency safety flare)
Gas Stream Heat Content = 850 Btu/scf (Application information)
Pilot Operating Rate = 0.1 MMBtu/hr (Application information)
pilot fuel heat content = 1,020 Btu/cf (Btu content of natural gas)
Pilot Operating Rate = 0.00010 10^6 cf/hr (Supplied information, 1.0 MMBtu/hr capacity, 1020 Btu/scf)
Pilot Hours of Operation = 8,760 hrs/yr
Unit Conversion 2.205 lb/kg (pounds per kilogram conversion)

**Flaring Emissions**
**PM Emissions (for flare combustion, PM=$PM_{10}$=$PM_{2.5}$):**
*Based on AP-42*
Emission Factor = 0 lb/MMBtu (Smokeless design, AP-42, Table 13.5-1, 9/91)
Calculation: (0 lb/MMBtu) * (6.4 MMBtu/hr) * (500 hrs/yr) * (ton/2000 lb) = 0.00 ton/yr

**CO Emissions:**
Emission Factor = 0.37 lb/MMBtu (AP-42, Table 13.5-1, 9/91)
Calculation: (0.37 lb/MMBtu) * (6.4 MMBtu/hr) * (500 hrs/yr) * (ton/2000 lb) = 0.59 ton/yr

**$NO_x$ Emissions:**
Emission Factor = 0.068 lb/MMBtu (AP-42, Table 13.5-1, 9/91)
Calculation: (0.07 lb/MMBtu) * (6.4 MMBtu/hr) * (500 hrs/yr) * (ton/2000 lb) = 0.11 ton/yr

**$SO_2$ Emissions:**
Emission Factor = 0 lb/MMBtu (Negligable sulfur, AP-42, Table 13.5-1, 9/91)
Calculation: (0 lb/MMBtu) * (6.4 MMBtu/hr) * (500 hrs/yr) * (ton/2000 lb) = 0.00 ton/yr

**VOC Emissions:**
Emission Factor = 0.0518 lb/MMBtu (less methane and ethane, AP-42, Tables 13.5-1&2, 9/91)
Calculation: (0.05 lb/MMBtu) * (6.4 MMBtu/hr) * (500 hrs/yr) * (ton/2000 lb) = 0.08 ton/yr

**$CO_2$ Emissions:**
Emission Factor = 0 kg/MMBtu (Deferred biogenic source)

**$CH_4$ Emissions:**
Emission Factor = 0.001 kg/MMBtu (Natural gas surrogate for methane, 40 CFR 98, Table C-2)
Calculation: (0.001 kg/MMBtu) * (2.205 lb/kg) * (6.4 MMBtu/hr)* (500 hrs/yr) * (ton/2000 lb) = 0.004 ton/yr
$CO_2$e = 0.004 * 21 = 0.07 ton/yr ($CH_4$ GWP = 21, 40 CFR 98, Subpart A, Table A-1)

**$N_2O$ Emissions:**
Emission Factor = 0.0001 kg/MMBtu (Natural gas surrogate for methane, 40 CFR 98, Table C-2)
Calculation: (0.0001 kg/MMBtu) * (2.205 lb/kg) * (6.4 MMBtu/hr)* (500 hrs/yr) * (ton/2000 lb) = 0.0004 ton/yr
$CO_2$e = 0.0004 * 310 = 0.11 ton/yr ($N_2O$ GWP = 310, 40 CFR 98, Subpart A, Table A-1)

**$CO_2$e Emissions:**

$CO_2$e(Total) = $CO_2$ + $CO_2$e($CH_4$) + $CO_2$e($N_2O$)
$CO_2$e(Total) = 0.00 + 0.07 + 0.11 = 0.18 ton/yr

**Pilot Emissions**
**Filterable PM Emissions (for flare combustion, PM=PM10=PM2.5):**
*Based on AP-42*
Emission Factor = 1.9 lb/10^6 scf (AP-42, Table 1.4-2, 7/98)
Calculation: (1.90 lb/10^6 scf) * (0.00010 10^6 cf/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.00 ton/yr

**Condensable PM Emissions:**
*Based on AP-42*
Emission Factor = 5.7 lb/10^6 scf (AP-42, Table 1.4-2, 7/98)
Calculation: (5.70 lb/10^6 scf) * (0.00010 10^6 cf/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.00 ton/yr

**CO Emissions:**
Emission Factor = 84 lb/10^6 scf (AP-42, Table 1.4-2, 7/98)
Calculation: (84.00 lb/10^6 scf) * (0.00010 10^6 cf/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.04 ton/yr

**$NO_x$ Emissions:**
Emission Factor = 100 lb/10^6 scf (AP-42, Table 1.4-2, 7/98)
Calculation: (100.00 lb/10^6 scf) * (0.00010 10^6 cf/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.04 ton/yr

**$SO_2$ Emissions:**
Emission Factor = 0.6 lb/10^6 scf (AP-42, Table 1.4-2, 7/98)
Calculation: (0.60 lb/10^6 scf) * (0.00010 10^6 cf/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.00 ton/yr

**VOC Emissions:**
Emission Factor = 5.5 lb/10^6 scf (AP-42, Table 1.4-2, 7/98)
Calculation: (5.50 lb/10^6 scf) * (0.00010 10^6 cf/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.00 ton/yr

**$CO_2e$ Emissions:**

$CO_2e$ from pilot emissions are accounted for in the facility-wide natural gas $CO_2e$ emissions.

**Flaring + Pilot Emissions**
**PM Total = 0.00 ton/yr**
**CO Total = 0.63 ton/yr**
**NOx Total = 0.15 ton/yr**
**SO2 Total = 0.00 ton/yr**
**VOC Total = 0.09 ton/yr**
**CO2e Total = 0 ton/yr (excludes natural gas from pilot emissions to avoid double counting)**

## Haul Roads

Vehicle Miles Traveled (VMT) per Day = 62,368 VMT per year (company info)

**PM Emissions:**

Predictive equation for emission factor for paved roads provided per AP 42, Ch. 13.2.1, 1/11.
Emission Factor = k * (sL)^0.91 * (W)^1.02 = 0.72 lb/VMT (Equation 13.2.1.3(1))
Where: k = constant = 0.011 lbs/VMT (Value for PM30, AP 42, Table 13.2.1-1, 1/11)
sL = road surface silt loading = 2.4 g/m^2 (Wintertime baseline, Table 13.2.1-2, 1/11)
W = mean vehicle weight = 27.5 tons (company info)
Calculation: (0.72 lb/VMT) * (62,368 VMT per year) * (ton/2000 lb) = 22.36 TPY (Uncontrolled Emissions)

**$PM_{10}$ Emissions:**

Predictive equation for emission factor for paved roads provided per AP 42, Ch. 13.2.1, 1/11.
Emission Factor = k * (sL)^0.91 * (W)^1.02 = 0.14 lb/VMT (Equation 13.2.1.3(1))
Where: k = constant = 0.0022 lbs/VMT (Value for PM10, AP 42, Table 13.2.1-1, 1/11)
sL = road surface silt loading = 2.4 g/m^2 (Wintertime baseline, Table 13.2.1-2, 1/11)
W = mean vehicle weight = 27.5 tons (company info)
Calculation: (0.14 lb/VMT) * (62,368 VMT per year) * (ton/2000 lb) = 4.47 TPY (Uncontrolled Emissions)

**$PM_{2.5}$ Emissions:**

Predictive equation for emission factor for paved roads provided per AP 42, Ch. 13.2.1, 1/11.
Emission Factor = k * (sL)^0.91 * (W)^1.02 = 0.04 lb/VMT (Equation 13.2.1.3(1))
Where: k = constant = 0.00054 lbs/VMT (Value for PM2.5, AP 42, Table 13.2.1-1, 1/11)
sL = road surface silt loading = 2.4 g/m^2 (Wintertime baseline, Table 13.2.1-2, 1/11)
W = mean vehicle weight = 27.5 tons (company info)
Calculation: (0.04 lb/VMT) * (62,368 VMT per year) * (ton/2000 lb) = 1.10 TPY (Uncontrolled Emissions)

## FUG09 VOC fugitive emissions

All information provided by applicant

| Vents | VOC (ppm) | MW | Flow (cfm) | Conv Const | Midwest Scaling factor | VOC lb/hr | VOC TPY |
|---|---|---|---|---|---|---|---|
| AA1 - Slurry Tank Vent | 5 | 59.2 | 200 | 1.56E-07 | 2.3 | 0.0212 | 0.093 |
| AA6 - Thin Stillage Tank Vent | 44 | 59.2 | 100 | 1.56E-07 | 2.3 | 0.0933 | 0.409 |
| AA8 - Syrup Tank Vent | 62.2 | 59.2 | 100 | 1.56E-07 | 2.3 | 0.1319 | 0.578 |
| AA5 - Cook Water Tank | 31 | 59.2 | 100 | 1.56E-07 | 2.3 | 0.0657 | 0.288 |
| AA2 - Liquifaction Train 1 Tank #2 | 64.7 | 59.2 | 100 | 1.56E-07 | 2.3 | 0.1372 | 0.601 |
| AA3 - Liquifaction Train 2 Tank #2 | 64.7 | 59.2 | 100 | 1.56E-07 | 2.3 | 0.1372 | 0.601 |
| AA7 - Whole Stillage Tank Vent | 7 | 59.2 | 100 | 1.56E-07 | 2.3 | 0.0148 | 0.065 |
| AA4 - Process Conditioner Tank | 46.5 | 59.2 | 100 | 1.56E-07 | 2.3 | 0.0986 | 0.432 |
| **TOTALS** | | | | | | | **3.065** |

Tank fugitive emissions

All information provided by applicant

Tanks 4.09 Software

| Tank | VOC lb/yr | VOC TPY |
|---|---|---|
| F62 - 200 proof | 733.59 | 0.367 |
| F63 - 200 proof | 733.59 | 0.367 |
| F64 - denatured ethanol | 481.52 | 0.241 |
| F65 - denatured ethanol | 481.52 | 0.241 |
| F61 - denaturant | 1932.33 | 0.966 |
| F68 - corrosion inhibitor | 9.31 | 0.005 |
| **TOTALS** | | **2.186** |

## F67 Truck Loadout Flare

Maximum production = 126,000,000 gal/yr (company info)

NOTE: the two flares together would combust all of the displaced vapors from loadout up to the maximum plant capacity; therefore, for simplicity only one flare is analyzed and assumed to combust all of the potential displaced vapors from loadout. The truck loadout flare would have higher potential emissions due to the tanks possibly carrying gasoline prior to loading which has a higher emission factor. The flared gas stream would also contain a combination of gasoline and ethanol vapors; however, for simplicity the Department conservatively assumes all of the vapors are from gasoline. It is also assumed that the gasoline vapors have the same combustion characteristics as liquid gasoline for calculation purposes. Railcar tanks would be dedicated ethanol tanks which has lower potential emissions than tanks previously carrying gasoline, so only pilot emissions are presented for the railcar loadout flare.

**VOC Emissions (uncontrolled)/Max waste stream to the flare:**

Predictive equation for emission factor for VOC vapor loss provided per AP 42, Ch. 5.2.-4, 6/08.

Emission Factor L = 12.46 * S*P*M / T = 5.32 lb/1000 gal (Equation 5.2-4(1))

Where: S = saturation factor = 0.6 (submerged, AP 42, Table 5.2-1, 6/08)
P = true vapor pressure = 3.9599 psia (application info, Tanks 4.09)
M = molecular weight = 92 lb/lb-mol (application info)
T = liquid temperature = 512.17 R (application info, Tanks 4.09)

Calculation: (5.32 lb/1000 gal) * (126,000,000 gal/yr) / (1000 gal) * (ton/2000 lb) = 335.02 tons/yr (Uncontrolled Emissions)

Maximum Process Rate = 6.4 MMBtu/hr (Application information, design value)

Maximum Hours of Operation = 8,760 hrs/yr

Pilot Operating Rate = 0.1 MMBtu/hr (Application Information)

Pilot Operating Rate = 0.00010 10^6 cf/hr (1.0 MMBtu/hr capacity, 1020 Btu/scf for NG)

Pilot Hours of Operation = 8,760 hrs/yr

**Conversion of VOC stream to units of gasoline**

Unit Conversion 2.205 lb/kg (pounds per kilogram conversion)

Unit Conversion: 6.2 lb/gal (Supplied information, density of gasoline)

Unit Conversion: 0.125 MMBtu/gal (Higher Heating Value of gasoline, 40 CFR 98, Table C-1)

Conversion Calculation: (0.125 MMBtu/gal) / (6.2 lb/gal) = 0.02 MMBtu/lb (Flare stream heat content by weight)

Flare stream rate: (335.02 tons/yr) / (8760 hrs/yr) * (2000 lb/ton) = 76.49 lb/hr (Flare stream rate as VOC)

Flare stream rate conversion: (76.49 lb/hr) * (0.02 MMBtu/lb) = 1.54 MMBtu/hr (Flare stream rate)

**Flaring Emissions**

**PM Emissions (for flare combustion, $PM=PM_{10}=PM_{2.5}$):**

Based on AP-42

Emission Factor = 0 lb/MMBtu (Smokeless design, AP-42, Table 13.5-1, 9/91)

Calculation: (0.00 lb/MMBtu) * (1.54 MMBtu/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.00 ton/yr

**CO Emissions:**

Emission Factor = 0.37 lb/MMBtu (AP-42, Table 13.5-1, 9/91)

Calculation: (0.37 lb/MMBtu) * (1.54 MMBtu/hr) * (8760 hrs/yr) * (ton/2000 lb) = 2.50 ton/yr

**$NO_x$ Emissions:**

Emission Factor = 0.068 lb/MMBtu (AP-42, Table 13.5-1, 9/91)

Calculation: (0.07 lb/MMBtu) * (1.54 MMBtu/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.46 ton/yr

**$SO_2$ Emissions:**

Emission Factor = 0 lb/MMBtu (Negligable sulfur, AP-42, Table 13.5-1, 9/91)

Calculation: (0.00 lb/MMBtu) * (1.54 MMBtu/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.00 ton/yr

**VOC Emissions:**

Flare Destruction Efficiency = 98 % (BACT)

Calculation: (335 tons/yr) * (1 - 98/100) = 6.70 ton/yr

**$CO_2$ Emissions:**

Emission Factor = 70.22 kg/MMBtu (Motor gasoline, 40 CFR 98, Table C-1)

Calculation: (70.22 kg/MMBtu) * (2.205 lb/kg) * (1.54 MMBtu/hr) * (8760 hrs/yr) * (ton/2000 lb) = 1,045.82 ton/yr

**$CH_4$ Emissions:**

Emission Factor = 0.00 kg/MMBtu (Petroleum (All fuel types in Table C-1), 40 CFR 98, Table C-2)
Calculation: (0.003 kg/MMBtu) * (2.205 MMBtu/gal) * (1.54 MMBtu/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.045 ton/yr

$CO_2e$ = 0.045 * 21 = 0.94 ton/yr ($CH_4$ GWP = 21, 40 CFR 98, Subpart A, Table A-1)

**$N_2O$ Emissions:**

Emission Factor = 0.00 kg/MMBtu (Petroleum (All fuel types in Table C-1), 40 CFR 98, Table C-2)

Calculation: (0.001 kg/MMBtu) * (2.205 ) * (1.54 MMBtu/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.009 ton/yr

$CO_2e$ = 0.009 * 310 = 2.77 ton/yr ($N_2O$ GWP = 310, 40 CFR 98, Subpart A, Table A-1)

**$CO_2e$ Emissions:**

$CO_2e$(Total) = $CO_2$ + $CO_2e$($CH_4$) + $CO_2e$($N_2O$)

$CO_2e$(Total) = 1,046 + 1 + 3 = 1,050 ton/yr

**Pilot Emissions**

**Filterable PM Emissions (for flare combustion, $PM=PM_{10}=PM_{2.5}$):**

Based on AP-42

Emission Factor = 1.9 lb/10^6 scf (AP-42, Table 1.4-2, 7/98)

Calculation: (1.90 lb/10^6 scf) * (0.00010 10^6 cf/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.00 ton/yr

**Condensable PM Emissions:**
Based on AP-42
Emission Factor = 5.7 lb/10^6 scf (AP-42, Table 1.4-2, 7/98)
Calculation: (5.70 lb/10^6 scf) * (0.00010 10^6 cf/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.00 ton/yr

**CO Emissions:**
Emission Factor = 84 lb/10^6 scf (AP-42, Table 1.4-2, 7/98)
Calculation: (84.00 lb/10^6 scf) * (0.00010 10^6 cf/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.04 ton/yr

**$NO_x$ Emissions:**
Emission Factor = 100 lb/10^6 scf (AP-42, Table 1.4-2, 7/98)
Calculation: (100.00 lb/10^6 scf) * (0.00010 10^6 cf/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.04 ton/yr

**$SO_2$ Emissions:**
Emission Factor = 0.6 lb/10^6 scf (AP-42, Table 1.4-2, 7/98)
Calculation: (0.60 lb/10^6 scf) * (0.00010 10^6 cf/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.00 ton/yr

**VOC Emissions:**
Emission Factor = 5.5 lb/10^6 scf (AP-42, Table 1.4-2, 7/98)
Calculation: (5.50 lb/10^6 scf) * (0.00010 10^6 cf/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.00 ton/yr

**$CO_2e$ Emissions:**
$CO_2e$ from pilot emissions are accounted for in the facility-wide natural gas $CO_2e$ emissions.

**Truck Loadout Flaring + Pilot Emissions**
**PM Total = 0.00 ton/yr**
**CO Total = 2.54 ton/yr**
**$NO_x$ Total = 0.50 ton/yr**
**$SO_2$ Total = 0.00 ton/yr**
**VOC Total = 6.70 ton/yr**
**$CO_2e$ Total = 1,050 ton/yr (excludes natural gas from pilot emissions to avoid double counting)**

## F66 Railcar Loadout Flare Pilot Emissions Only

Pilot Operating Rate = 0.1 MMBtu/hr (Maximum capacity of 2x20 MMBtu burners)
pilot fuel heat content = 1,020 Btu/cf (Btu content of natural gas)
Pilot Operating Rate = 0.00010 10^6 cf/hr (Supplied information, 1.0 MMBtu/hr capacity, 1020 Btu/scf)
Pilot Hours of Operation = 8,760 hrs/yr

**Pilot Emissions**
**Filterable PM Emissions (for flare combustion, $PM=PM_{10}=PM_{2.5}$):**
Based on AP-42
Emission Factor = 1.9 lb/10^6 scf (AP-42, Table 1.4-2, 7/98)
Calculation: (1.90 lb/10^6 scf) * (0.00010 10^6 cf/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.00 ton/yr

**Condensable PM Emissions:**

Based on AP-42

Emission Factor = 5.7 lb/10^6 scf (AP-42, Table 1.4-2, 7/98)

Calculation: (5.70 lb/10^6 scf) * (0.00010 10^6 cf/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.00 ton/yr

**CO Emissions:**

Emission Factor = 84 lb/10^6 scf (AP-42, Table 1.4-2, 7/98)

Calculation: (84.00 lb/10^6 scf) * (0.00010 10^6 cf/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.04 ton/yr

**$NO_x$ Emissions:**

Emission Factor = 100 lb/10^6 scf (AP-42, Table 1.4-2, 7/98)

Calculation: (100.00 lb/10^6 scf) * (0.00010 10^6 cf/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.04 ton/yr

**$SO_2$ Emissions:**

Emission Factor = 0.6 lb/10^6 scf (AP-42, Table 1.4-2, 7/98)

Calculation: (0.60 lb/10^6 scf) * (0.00010 10^6 cf/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.00 ton/yr

**VOC Emissions:**

Emission Factor = 5.5 lb/10^6 scf (AP-42, Table 1.4-2, 7/98)

Calculation: (5.50 lb/10^6 scf) * (0.00010 10^6 cf/hr) * (8760 hrs/yr) * (ton/2000 lb) = 0.00 ton/yr

**$CO_2e$ Emissions:**

$CO_2e$ from pilot emissions are accounted for in the facility-wide natural gas $CO_2e$ emissions.

**$CO_2e$ calculation for natural gas combustion facility-wide based on total volume combusted**

Natural Gas combustion (Synthetic Minor Permit Condition limits to no more than $1.55 * 10^9$ cf/yr)

**$CH_4$ Emissions:**

Emission Factor = 2.3 lb/10^6 cf (AP 42, Table 1.4-2, 7/98)

Calculation: (1550000000 cf/yr / 1E6) * (2.3 lb/10^6 cf) * (ton/2000 lb) = 1.78 TPY

$CO_2e$ = 1.78 * 21 = 37.43 TPY ($CH_4$ GWP = 21, 40 CFR 98, Subpart A, Table A-1)

**$N_2O$ Emissions:**

Emission Factor = 2.2 lb/10^6 cf (AP 42, Table 1.4-2, uncontrolled, 7/98)

Calculation: (1550000000 cf/yr / 1E6) * (2.2 lb/10^6 cf) * (ton/2000 lb) = 1.71 TPY

$CO_2e$ = 1.71 * 310 = 528.55 TPY ($N_2O$ GWP = 310, 40 CFR 98, Subpart A, Table A-1)

**$CO_2$ Emissions:**

Emission Factor = 120000 lb/10^6 cf (AP 42, Table 1.4-2, 7/98)

Calculation: (1550000000 cf/yr / 1E6) * (120000 lb/10^6 cf) * (ton/2000 lb) = 93,000 TPY

**$CO_2e$ Emissions:**

$CO_2e(Total) = CO_2 + CO_2e(CH_4) + CO_2e(N_2O)$

$CO_2e$(Total) = 93,000 + 37 + 529 = 93,566 TPY

**$CO_2e$ calculation based on total agricultural by-products combusted**

Agricultural By-products

**$CH_4$ Emissions:**

Emission Factor = 0.58 lb/ton (Derived from EPA website, http://www.epa.gov/climatechange/emissions/GHG-calculator/index.html)

Calculation: (299300 TPY) * (0.58 lb/ton) * (ton/2000 lb) = 86.80 TPY

$CO_2e$ = 86.80 * 21 = 1,822.74 TPY ($CH_4$ GWP = 21, 40 CFR 98, Subpart A, Table A-1)

**$N_2O$ Emissions:**

Emission Factor = 0.07 lb/ton (Derived from EPA website, http://www.epa.gov/climatechange/emissions/GHG-calculator/index.html)

Calculation: (299300 TPY) * (0.07 lb/ton) * (ton/2000 lb) = 10.48 TPY

$CO_2e$ = 10.48 * 310 = 3,247.41 TPY ($N_2O$ GWP = 310, 40 CFR 98, Subpart A, Table A-1)

**$CO_2$ Emissions:**

Emission Factor = 0 lb/ton (Biogenic source, deferred)

Calculation: (299300 TPY / 1E6) * (0 lb/ton) * (ton/2000 lb) = 0 TPY

**$CO_2e$ Emissions:**

$CO_2e$(Total) = $CO_2$ + $CO_2e$($CH_4$) + $CO_2e$($N_2O$)

$CO_2e$(Total) = 0 + 1,823 + 3,247 = 5,070 TPY

## V. Existing Air Quality

The Federal Register (September 9, 1980, 45 FR 59315) designated a corridor along 10th Avenue South as nonattainment for CO based upon air quality data gathered at the intersection of 10th Avenue South and 9th Street. The 1990 Clean Air Act Amendments listed Great Falls as an unclassified nonattainment area for CO. This was based on the 1988 and 1989 data in which no violations of either the one-hour or eight-hour standards were recorded.

Montana previously submitted to EPA a CO control strategy for Great Falls that relied upon significant emission reductions at the Montana Refining Company refinery (formerly Phillips Petroleum and Simmons Refinery) and federal automobile emission standards. On May 9, 2002, Great Falls was redesignated to attainment for CO under a Limited Maintenance Plan.

The air quality classification of the project area is Unclassifiable/Attainment for all air quality criteria pollutants (40 CFR 81.327).

## VI. Ambient Air Impact Analysis

As part of the MAQP Application #4620-00, MAB submitted an ambient air quality dispersion analysis. Bison Engineering, Inc. (Bison) conducted air quality dispersion modeling for the facility that factored in such parameters as wind speed, wind direction, atmospheric stability, stack heights, stack temperatures, and stack emissions, which demonstrated that the emission impacts from the proposed project would not violate any NAAQS or MAAQS. Bison submitted the original modeling report on April 20, 2011; supplied an updated version on October 20, 2011; and provided additional revisions on December 23, 2011. The Department did not require Bison to perform an updated air quality dispersion model for issuing MAQP

#4620-01 because the overall emissions inventory for the Great Falls area has not changed enough to warrant updating the analysis. The air dispersion model from MAQP #4620-00 demonstrates compliance with the current ambient air quality standards.

### Review of Model Inputs

Bison used the Oris Solutions Bee-Line Software BEEST for Windows (Version 9.91). The AERMOD modeling system included AERSURFACE (Version 08009), AERMET (Version 06341), AERMAP (Versions 09040 and 11103), and AERMOD (Version 11103). The EPA-developed Building Profile Input Program – Plume Rise Model Enhancement (BPIP-PRIME) Version 04274 was included with the BEEST AERMOD modeling platform to determine building downwash. For the 1-hour $NO_x$ analyses, the AERMOD modeling system was used in the non-regulatory default mode with the ozone limiting method (OLM) option applied. This method required hourly ozone data and a background $NO_2$ concentration. The OLM limits the amount of nitric oxide (NO) conversion to $NO_2$ by ambient ozone ($O_3$). If the $O_3$ concentration is less than the NO concentration, the amount of $NO_2$ formed by this reaction is limited by the amount of available $O_3$. If the $O_3$ concentration is greater than or equal to the NO concentration, the entire NO concentration is assumed to be converted to $NO_2$. The ambient hourly $O_3$ data was collected near Lake McDonald in Glacier National Park. The in-stack ratio of $NO_2$ to $NO_x$ emitted from $NO_x$ sources was based on information obtained from the San Joaquin Valley Air Pollution Control District (SJVAPC) and EPA AP-42. The MAB analysis used the AERMOD default value of 0.90 for the atmospheric equilibrium ratio of $NO_2$ to $NO_x$. The modeling analyses were conducted using 5 complete years (all four seasons from 1999-2003) of Great Falls ambient air quality surface and upper air data. The modeling inputs were based on the "worst case" emissions from the facility. The air dispersion modeling analysis was independently reviewed by the Department.

### AERMOD Analysis Methodology

Bison first performed significant impact modeling which was used to establish the need for cumulative impact modeling. Significant impact modeling is a screening technique that provides a quick, conservative estimate of air quality impact based on MAB emissions alone. If significant impact modeling results show exceedances of any respective significant impact level (SIL), then a radius of impact (ROI) is used to determine the extent of the significant impact area (SIA). The more refined cumulative impact modeling is then performed for all the receptors that fall within the SIA to determine compliance with the appropriate NAAQS or MAAQS. Cumulative impact modeling takes into account MAB emissions as well as emissions from surrounding sources, ambient background levels, the surrounding terrain, and local meteorology. The results of the significant impact modeling are shown the following table.

| Pollutant | Averaging Period | Modeled Concentration (µg/m$^3$)[1, 2] | Class II SIL (µg/m$^3$) | Significant? (Y/N) | Radius of Impact (km)[3] |
|---|---|---|---|---|---|
| CO | 1-Hour | 52.4<br>(GF 2003) | 2,000 | N | NA[4] |
| | 8-Hour | 27.4<br>(GF 2001) | 500 | N | NA |
| $PM_{2.5}$ | 24-Hour | 11.6[5] | 1.2 | Y | 3.5 |
| | Annual | 3.7<br>(GF 2001) | 0.3 | Y | 2.1 |

| Pollutant | Averaging Period | Modeled Concentration ($\mu$g/m$^3$)[1, 2] | Class II SIL ($\mu$g/m$^3$) | Significant? (Y/N) | Radius of Impact (km)[3] |
|---|---|---|---|---|---|
| PM$_{10}$ | 24-Hour | 56.9<br>(GF 2001) | 5 | Y | 4.2 |
|  | Annual | 14.8<br>(GF 2001) | 1 | Y | 2.1 |
| NO$_x$ | 1-Hour | 30.1[6] | 7.55[7] | Y | 38.6 |
|  | Annual | 1.5<br>(GF 1999) | 1 | Y | 0.6 |
| SO$_2$ | 1-Hour | 22.6[8] | 7.86[7] | Y | 2.2 |
|  | 3-Hour | 22.6 | 25 | N | NA |
|  | 24-Hour | 5.5<br>(GF 2001) | 5 | Y | 0.4 |
|  | Annual | 1.4<br>(GF 1999) | 1 | Y | 0.5 |

[1] $\mu$g/m$^3$ = micrograms per cubic meter.
[2] All selected concentrations were high-first-high (H1H), except otherwise noted.
[3] km = kilometer(s).
[4] NA = Not Applicable.
[5] Oris PMPost AERMOD post-processor was used to calculate the highest 24-hour PM$_{2.5}$ average concentration at a receptor over the 5 years of Great Falls met data.
[6] Oris NO2Post AERMOD post-processor was used to calculate the 98th percentile of the daily maximum 1-hour NO$_2$ concentrations at a receptor over the 5 years of Great Falls met data.
[7] USEPA interim SILs are based on 4% of the 1-hour PM$_{2.5}$ and NO$_2$ NAAQS.
[8] Oris SO2Post post-processor was used to calculate the 99th percentile of the daily maximum 1-hour SO$_2$ concentration at a receptor over the 5 years of Great Falls met data.

The results of the significant impact modeling indicated that cumulative impact modeling would be required to demonstrate NAAQS/MAAQS compliance for PM$_{2.5}$, PM$_{10}$, NO$_x$, and SO$_2$. The results of the cumulative impact modeling are shown in the following table.

| Pollutant | Averaging Period | Modeled Concentration ($\mu$g/m$^3$)[1] | Background Concentration ($\mu$g/m$^3$) | Total Concentration ($\mu$g/m$^3$) | NAAQS ($\mu$g/m$^3$) | Percent of NAAQS (%) | MAAQS ($\mu$g/m$^3$) | Percent of MAAQS (%) |
|---|---|---|---|---|---|---|---|---|
| PM$_{2.5}$ | 24-Hour | 18.0[2] | 12.3 | 30.3 | 35 | 87 | NA[3] | NA |
|  | Annual | 5.5[2] | 5 | 10.5 | 15.0 | 70 | NA | NA |
| PM$_{10}$ | 24-Hour | 61.8[4] | 13 | 74.8 | 150 | 50 | 150 | 50 |
|  | Annual | 17.3[5] | 5 | 22.3 | NA | NA | 50 | 45 |
| NO$_2$ | 1-Hour | 61.7[6] | 40 | 101.7 | 188.679 | 54 | 564 | 18 |
|  | Annual | 3.6[5] | 6 | 9.6 | 100 | 10 | 94 | 10 |
| SO$_2$ | 1-Hour | 114.7[7] | 35 | 149.7 | 195 | 77 | 1,300 | 12 |
|  | 24-Hour | 16.7[4] | 11 | 27.7 | NA | NA | 262 | 11 |
|  | Annual | 2.8[5] | 3 | 5.8 | NA | NA | 52 | 11 |

[1] $\mu$g/m$^3$ = micrograms per cubic meter.

[2] Oris PMPost AERMOD post-processor was used to calculate the highest 24-hour and annual $PM_{2.5}$ average concentrations at a receptor over the 5 years of Great Falls met data.

[3] NA = Not Applicable.

[4] The high-second-high modeled value for a met year was selected.

[5] The high-first-high modeled value for a met year was selected.

[6] Oris NO2Post AERMOD post-processor was used to calculate the 98th percentile of the daily maximum 1-hour $NO_2$ concentrations at a receptor over the 5 years of Great Falls met data.

[7] Oris SO2Post post-processor was used to calculate the 99th percentile of the daily maximum 1-hour $SO_2$ concentration at a receptor over the 5 years of Great Falls met data.

The significant and cumulative impact modeling results indicate that MAB would not cause or contribute to any violations of ambient air quality standards for $PM_{2.5}$, $PM_{10}$, CO, $NO_2$, or $SO_2$.

## Ozone Modeling

The Department instructed MAB to address ozone NAAQS compliance because the facility's potential VOC emissions, an ozone precursor, are greater than 100 tons per year. Ozone is not directly emitted but created in the atmosphere primarily in the presence of sunlight from various reactions involving VOC and $NO_x$. Therefore, the application of AERMOD is inappropriate since this model does not simulate photochemical atmospheric reactions. To provide some assistance in cases involving NAAQS ozone compliance demonstrations for a proposed new or modified source, EPA has published a screening method to evaluate incremental ozone concentration impacts based on a facility's annual $NO_x$ and VOC emissions. The screening method is published in a September 1988 paper entitled; "VOC/$NO_x$ Point Source Screening Tables" by Richard D. Scheffe (http://ndep.nv.gov/bapc/permitting/download/model/scheffe.pdf). It should be noted that this method actually refers to non-methane organic carbon (NMOC). The analysis presented here assumes NMOC is equivalent to VOC. This method estimates a conservatively high ozone concentration impact assessment. The screening analysis requires the following information regarding the proposed facility:

- A determination must be made as to whether the area surrounding the facility is urban or rural; Montana is considered as rural.
- The facility's maximum potential annual emission rates in tons per year of VOC and $NO_x$ are required. These values are used to calculate a ratio that identifies the appropriate lookup table for a given scenario. The potential annual VOC emissions are 232 tons per year and the potential $NO_x$ emissions are 224 tons per year. The ratio of VOC to $NO_x$ is approximately 1.0.

The VOC/$NO_x$ annual rate ratio of 1.0 designates the following lookup table (with linear interpolation results inserted and shaded in ppm) for the rural category only to represent Montana:

| **VOC (tpy)** | **Ozone Impact (ppm) VOC/$NO_x$ (tpy/tpy) < 5.2** |
|---|---|
| | Rural |
| 50 | 0.011 |
| 75 | 0.012 |
| 100 | 0.014 |
| 232 | 0.016 |

| VOC<br>(tpy) | Ozone Impact (ppm)<br>VOC/NO$_x$ (tpy/tpy) < 5.2 |
|---|---|
| | Rural |
| 300 | 0.017 |
| 500 | 0.019 |
| 750 | 0.023 |
| 1000 | 0.027 |

The resulting 0.016 ppm is about 21% and 16 % of the 8-hour and 1-hour ozone NAAQS, respectively. Since the entire state of Montana is classified as attainment or unclassifiable for ozone, the results demonstrate that the MAB will not cause or contribute to a violation of an ozone NAAQS.

## VII. Human Health Risk Assessment

Montana air quality rules require that applicants for facilities meeting the definition of an incineration facility as provided in MCA 75-2-103, and that are subject to rules promulgated in MCA 75-2-215 (Solid or Hazardous Waste Incineration – Additional Permit Requirements), must address potential impacts to human health by performing a human health risk assessment. The RTOs proposed as pollution control devices for the DDGS dryers and the loadout flares proposed for the truck and rail loadout systems qualify as incinerators under the Montana rules because they combust material "primarily for the purpose of removal, destruction, disposal, or volume reduction of any portion of the input material." They also combust a "solid waste," as defined in the statues very broadly to include essentially any waste material in any physical form (i.e., solid, liquid, or gas).

MAB conducted a screening-level risk assessment as provided at ARM 17.8.770(c)(ii). This screening method requires that impacts to ambient concentrations of relevant HAPs first be determined based on results of a dispersion modeling analysis. These model-predicted impacts are then compared against screening threshold concentrations for cancer risk and acute and chronic non-cancer risks. According to the information submitted, the Department believes the emissions from the proposed RTOs and flares represent an acceptable risk to human health.

## VIII. Taking or Damaging Implication Analysis

As required by 2-10-105, MCA, the Department conducted the following private property taking and damaging assessment.

| **YES** | **NO** | |
|---|---|---|
| X | | 1. Does the action pertain to land or water management or environmental regulation affecting private real property or water rights? |
| | X | 2. Does the action result in either a permanent or indefinite physical occupation of private property? |
| | X | 3. Does the action deny a fundamental attribute of ownership? (ex.: right to exclude others, disposal of property) |
| | X | 4. Does the action deprive the owner of all economically viable uses of the property? |
| | X | 5. Does the action require a property owner to dedicate a portion of property or to grant an easement? [If no, go to (6)]. |
| | | 5a. Is there a reasonable, specific connection between the government requirement and legitimate state interests? |
| | | 5b. Is the government requirement roughly proportional to the impact of the proposed use of the property? |
| | X | 6. Does the action have a severe impact on the value of the property? (consider economic impact, investment-backed expectations, character of government action) |
| | X | 7. Does the action damage the property by causing some physical disturbance with respect to the property in excess of that sustained by the public generally? |
| | X | 7a. Is the impact of government action direct, peculiar, and significant? |
| | X | 7b. Has government action resulted in the property becoming practically inaccessible, waterlogged or flooded? |
| | X | 7c. Has government action lowered property values by more than 30% and necessitated the physical taking of adjacent property or property across a public way from the property in question? |
| | X | Takings or damaging implications? (Taking or damaging implications exist if YES is checked in response to question 1 and also to any one or more of the following questions: 2, 3, 4, 6, 7a, 7b, 7c; or if NO is checked in response to questions 5a or 5b; the shaded areas) |

Based on this analysis, the Department determined there are no taking or damaging implications associated with this permit action.

## IX. Environmental Assessment

An environmental assessment, required by the Montana Environmental Policy Act, was completed for this project. A copy is attached.

**DEPARTMENT OF ENVIRONMENTAL QUALITY**
**Permitting and Compliance Division**
**Air Quality Bureau**
**P.O. Box 200901, Helena, Montana 59620**
**(406) 444-3490**

## FINAL ENVIRONMENTAL ASSESSMENT (EA)

*Issued To*: Montana Advanced Biofuels, LLC (MAB)

*Montana Air Quality Permit Number*: 4620-01

*Preliminary Determination Issued*: 11/13/2015
*Department Decision Issued*: 12/01/2015
*Permit Final*: 12/17/2015

1. *Legal Description of Site*: Section 3, Township 20 North, Range 4 East, in Cascade County, Montana.

2. *Description of Project*: MAB proposes to construct and operate a 126 million gallon per year fuel grade ethanol (ethyl alcohol) manufacturing facility. Barley and wheat are to be the primary raw material. The plant will produce distiller's dried grains and solubles (DDGS) for animal feed and wheat gluten as by-products of the alcohol manufacturing process. That plant would be located on what is currently agricultural land with natural vegetation. The Malmstrom Air Force Base is located adjacent to site. The Siebol Soccer Park is approximately 0.4 miles from the site. The Great Springs State Park, 5 Great Falls hydroelectric dams, and Lewis & Clark Interpretive Center are all located over 0.5 miles from the proposed project site.

3. *Objectives of Project*: To generate income from the production and sale of fuel grade ethanol, DDGS, and wheat gluten.

4. *Alternatives Considered*: In addition to the proposed action, the Department also considered the "no-action" alternative. The "no-action" alternative would deny issuance of the air quality preconstruction permit to the proposed facility. A positive impact of not constructing the facility would be that none of the associated potential pollutant emissions would be emitted to the atmosphere. Some negative impacts of not constructing the facility would be that the community would not benefit from the expected employment opportunities of approximately 100 positions with an additional 600 workers required during construction. The Best Available Control Technology (BACT) analysis considered several alternative forms of pollution control for the various processes and emission points at the proposed facility. The outcome of the BACT analysis is the selection of the best performing pollution control strategy taking into account environmental, technical, and economic considerations.

5. *A Listing of Mitigation, Stipulations, and Other Controls*: A list of enforceable conditions, including a BACT analysis, would be included in MAQP #4620-01.

6. *Regulatory Effects on Private Property*: The Department considered alternatives to the conditions imposed in this permit as part of the permit development. The Department determined that the permit conditions are reasonably necessary to ensure compliance with applicable requirements and demonstrate compliance with those requirements and do not unduly restrict private property rights.

7. *The following table summarizes the potential physical and biological effects of the proposed project on the human environment. The "no-action" alternative was discussed previously.*

| | | Major | Moderate | Minor | None | Unknown | Comments Included |
|---|---|---|---|---|---|---|---|
| A | Terrestrial and Aquatic Life and Habitats | | | X | | | Yes |
| B | Water Quality, Quantity, and Distribution | | | X | | | Yes |
| C | Geology and Soil Quality, Stability and Moisture | | | X | | | Yes |
| D | Vegetation Cover, Quantity, and Quality | | | X | | | Yes |
| E | Aesthetics | | | X | | | Yes |
| F | Air Quality | | | X | | | Yes |
| G | Unique Endangered, Fragile, or Limited Environmental Resources | | | X | | | Yes |
| H | Demands on Environmental Resource of Water, Air and Energy | | | X | | | Yes |
| I | Historical and Archaeological Sites | | | X | | | Yes |
| J | Cumulative and Secondary Impacts | | | X | | | Yes |

SUMMARY OF COMMENTS ON POTENTIAL PHYSICAL AND BIOLOGICAL EFFECTS: The following comments have been prepared by the Department.

## A. Terrestrial and Aquatic Life and Habitats

Overall, the impacts from this project to terrestrial and aquatic life and habitats would be minor because of the relatively small portion of land that would be disturbed and the minor impact to the surrounding area from the air emissions (considering the air dispersion characteristics). Terrestrials (such as deer, antelope, rodents) would use the general area of the facility. The surrounding area is currently used for agricultural purposes and will remain an agricultural area. Other industrial sources, such as Montana Refining Company, Malmstrom Air Force Base, a Conoco bulk storage facility, and Malteurop North America Inc., are located within a few miles of the property boundary. The Southern Montana Electric Highwood Generating Station is approximately eight miles from the proposed ethanol plant.

Aquatic life and habitats would realize little or no impact from the proposed facility because MAB is not proposing to directly discharge any material to the surface or ground water in the area as all wastewater drainage from the facility would be handled by the Publicly Owned Treatment Works (POTW) and the resulting air emissions to any water body would be very minor.

The modeling analysis (see section 7.F of this EA) of the air emissions from this facility indicates that the impacts from the MAB emissions on land or surface water would be minor and would consume only a small portion of the ambient air quality standards. The small amount of air impact would correspond to an equally small amount of deposition. The proposed facility is in compliance with National Ambient Air Quality Standards (NAAQS) and Montana Ambient Air Quality Standards (MAAQS), both primary and secondary standards. The secondary standards are applicable in this case, as they protect public welfare, including protection against damage to animals (including terrestrial and aquatic life).

The proposed MAB site resides within the city limits of the City of Great Falls. Although city water and sewer are not connected at this time as the current use of the site is agricultural, part of the facility's construction would include connection with city services. That portion of this project would result in very little impact on the terrestrial and aquatic life and habitats because the activities would result in minimal disturbance to land/water and the disturbances would be temporary where the piping would be installed. The sewer and water system upgrade may require the use of motor vehicles, but again, the impacts would be minor and of a short time duration.

### B. Water Quality, Quantity and Distribution

The proposed facility would result in minor impacts to water quality, quantity, and distribution in the area because little or no impacts to the surrounding surface area would result from the air emissions and the facility would use the services of the City of Great Falls for water demands and sewage discharge. The proposed location does not lie within a 100 year or 500 year floodplain and no part of the project site is within either a state or federally designated wild or scenic river land use district. Storm water discharges will be routed to an onsite storm water retention pond.

As described in Section 7.F of this EA, the maximum impacts from the air emissions from this facility would be relatively minor. As a result of the relatively low air impact from this facility, the corresponding deposition of the air pollutants in the area would also be very minor. Furthermore, the highest impacts identified in Section 7.F do not occur on or near any surface water. Based on the dispersion characteristics (wind speed, wind direction, atmospheric stability, stack temperature, etc.) of the area, the highest impacts would not be at or near the Missouri River. The proposed facility is in compliance with NAAQS and MAAQS, both primary and secondary standards. The secondary standards are applicable in this case, as they protect public welfare, including protection against damage to water resources.

The estimated water requirements for the facility would be 900 gallons per minute (gpm) ± 200 gpm, which is equivalent to approximately five gallons of water per gallon of ethanol produced. The city currently has sufficient water rights to supply the required water demand for the plant. All water for the facility would be obtained from the Great Falls municipal water supply.

Two types of industrial wastewater would be generated at the facility; process and non-contact. The design of the plant is as a zero "contact" process wastewater discharge facility. This means that no contact process wastewater is released to the environment or POTW. The facility incorporates a biomethanator to recycle the contact wastewater for reuse in the process and minimizes water demand for the plant. The biomethanator is a biological water treatment system that converts organic material into fuel gas (primarily methane) which supplements the facility's biogas demand.

The other industrial wastewater that would be generated by the site is non-contact process water. Non-contact process water would include cooling tower blowdown, reverse osmosis reject water, water softener regeneration, and other water filter blowdown. The estimated amount of non-contact water discharge, along with sanitary wastes from restrooms, kitchens, etc., is estimated to be 529,000 gallons per day. This wastewater would be discharged to the Great Falls POTW and regulated by an Industrial Discharge Permit. The proposed non-contact process water to be discharged generally only contains the constituents of the city water, except in higher concentrations due to some of the water being recycled an estimated three to five cycles in the cooling tower before discharge.

The impacts from the water demands for this facility would be minor in comparison with other industrial users. The city of Great Falls Water Pollution Control POTW is sized to handle the additional sanitary and non-contact process water expected to be discharged.

### C. Geology and Soil Quality, Stability and Moisture

The impacts to the geology and soil quality, stability, and moisture from this facility would be minor because the project would impact a relatively small portion of land, the land has previously been disturbed by agricultural tillage, and the amount of resulting deposition of the air emissions would be small. The project site is a 220-acre parcel of land within the city of Great Falls that has been approved for agricultural and industrial use. This parcel is currently being used for agricultural production (wheat) and has been farmed continuously since 1942. Approximately 95 acres would be disturbed for the physical construction of the ethanol plant and the remaining 125 acres of the parcel would remain cropland. The parcel is level and therefore it is not expected that any deep excavations would be required. One storm water retention pond would need excavation. The storm water retention pond would be lined to prevent seepage. Soil stability in the immediate vicinity of the proposed facility would likely be impacted by the new footings and foundations required for the facility. Some of the air emissions from the facility may deposit on local soils, but that deposition would result in only a minor impact to local areas because of the air dispersion characteristics of the area (See Section 7.F of this EA). The proposed facility is in compliance with NAAQS and MAAQS, both primary and secondary standards. The secondary standards are applicable in this case, as they protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

The connection to city services (water and sewer) portion of this project would result in little impact on the geology and soil quality, stability, and moisture because the activities would result in minimal disturbance to land/water and the disturbances would be temporary in those areas. The sewer and water system installation would require the use of motor vehicles, but again, the impacts would be minor and of a short time duration.

### D. Vegetation Cover, Quantity, and Quality

The proposed project would result in minor impacts on the vegetative cover, quantity, and quality in the immediate area because only a small amount of property would be disturbed and the resulting deposition from air emissions would be relatively small. Approximately 95 of the 220 acres are planned on being disturbed for the facility and its perimeter.

In addition, as described in Section 7.F of this EA, the modeled air impacts from the air emission from this facility are minor. As a result, the corresponding deposition of the air pollutants on the surrounding vegetation would also be minor. The proposed facility is in compliance with NAAQS and MAAQS, both primary and secondary standards. The secondary standards are applicable in this case, as they protect public welfare, including protection against damage to vegetation.

The connection to city services would have little, if any, impact on the vegetation in the area because the disturbances would occur on previously disturbed land. Those disturbances to previously disturbed land would be of short duration and would eventually return to their current status.

## E. Aesthetics

The impacts to the aesthetics of the area from this project would be minor because other industrial and commercial facilities/structures are located in the nearby area. The facility would be located 1 ¼ miles from the Missouri River and the plant grain elevator, plant buildings, and various process stacks would not be visible from the Lewis and Clark Interpretive Center. The plant and its stacks would be visible from portions of the city's elevated "River's Edge Trail", along with other industrial sources adjacent to the site. In cold weather, the condensed water vapor from the plant's cooling towers and the thermal oxidizer stack would be visible. MAQP #4620-01 would have conditions and limitations on any visible emissions from the facility; however, condensed steam is not subject to opacity regulations.

The plant would operate 24 hours per day; therefore, lighting would be required to support operations and provide security during nighttime hours. The site would primarily use lighting commonly referred to as "shoebox lights" that are shielded on five sides and allow only downward facing illumination. Some additional spot lighting may be used as well.

Noise at the site during operations would be related primarily to mechanical equipment operations. Much of the mechanical equipment at the site is related to the raw material and product handling operations. Production activities and equipment that would generate noise include dryers, thermal oxidizers, and cooling equipment. In addition to mechanical equipment, the facility would utilize trucks and rail for the transport of raw materials and final product as well as some industrial equipment such as front end loaders for on-site product movement. There will also be noise generated during the construction of the facility.

The land at the proposed site is currently used for agricultural purposes; however, other industries currently operate in the surrounding area. Montana Refining Company is located approximately 3 miles away. Malmstrom Air Force Base and a Conoco bulk storage facility for petroleum products are adjacent to the project site.

The fermentation tanks and DDGS dryers are typically the main generators of odors at ethanol facilities. The VOC emissions from these activities are believed to be the cause of the odors. This facility would use RTOs to control VOC from the DDGS dryers which are designed to destroy approximately 99 percent of these emissions. Fermentation tanks would utilize internal floating roofs that would provide approximately 98 percent control of the VOC emissions. With this level of control, it would be expected that any potential odor impacts would be limited to the areas immediately surrounding the facility.

## F. Air Quality

The proposed MAB project would result in minor air quality impacts because of the relatively low levels of air emissions and the good dispersion characteristics of the stacks and the area. The project would result in emissions of PM, $PM_{10}$, $PM_{2.5}$, $NO_x$, CO, $SO_2$, and VOC. Based on the potential levels of these pollutants, this source would be a minor source of air contaminants with respect to the Prevention of Significant Deterioration (PSD) air permitting rules.

Bison Engineering, Inc. (Bison) conducted air quality dispersion modeling for the facility that factored in such parameters as wind speed, wind direction, atmospheric stability, stack heights, stack temperatures, and stack emissions, which demonstrated that the emission impacts from the proposed project would not violate any NAAQS or MAAQS.

### Review of Model Inputs

Bison used the Oris Solutions Bee-Line Software BEEST for Windows (Version 9.91). The AERMOD modeling system included AERSURFACE (Version 08009), AERMET (Version 06341), AERMAP (Versions 09040 and 11103), and AERMOD (Version 11103). The EPA-developed Building Profile Input Program – Plume Rise Model Enhancement (BPIP-PRIME) Version 04274 was included with the BEEST AERMOD modeling platform to determine building downwash. For the 1-hour $NO_x$ analyses, the AERMOD modeling system was used in the non-regulatory default mode with the ozone limiting method (OLM) option applied. This method required hourly ozone data and a background $NO_2$ concentration. The OLM limits the amount of nitric oxide (NO) conversion to nitrogen dioxide ($NO_2$) by ambient ozone ($O_3$). If the $O_3$ concentration is less than the NO concentration, the amount of $NO_2$ formed by this reaction is limited by the amount of available $O_3$. If the $O_3$ concentration is greater than or equal to the NO concentration, the entire NO concentration is assumed to be converted to $NO_2$. The ambient hourly $O_3$ data was collected near Lake McDonald in Glacier National Park. The in-stack ratio of $NO_2$ to $NO_x$ emitted from $NO_x$ sources was based on information obtained from the San Joaquin Valley Air Pollution Control District (SJVAPC) and EPA AP-42. The MAB analysis used the AERMOD default value of 0.90 for the atmospheric equilibrium ratio of $NO_2$ to $NO_x$. The modeling analyses were conducted using 5 complete years (all four seasons from 1999-2003) of Great Falls ambient air quality surface and upper air data. The modeling inputs were based on the "worst case" emissions from the facility. The air dispersion modeling analysis was independently reviewed by the Department.

### AERMOD Analysis Methodology

Bison first performed significant impact modeling which was used to establish the need for cumulative impact modeling. Significant impact modeling is a screening technique that provides a quick, conservative estimate of air quality impact based on MAB emissions alone. If significant impact modeling results show exceedances of any respective significant impact level (SIL), then a radius of impact (ROI) is used to determine the extent of the significant impact area (SIA). The more refined cumulative impact modeling is then performed for all the receptors that fall within the SIA to determine compliance with the appropriate NAAQS or MAAQS. Cumulative impact modeling takes into account MAB emissions as well as emissions from surrounding sources, ambient background levels, the surrounding terrain, and local meteorology. The results of the significant impact modeling are shown the following table.

| **Pollutant** | **Averaging Period** | **Modeled Concentration (μg/m$^3$)[1, 2]** | **Class II SIL (μg/m$^3$)** | **Significant? (Y/N)** | **Radius of Impact (km)[3]** |
|---|---|---|---|---|---|
| CO | 1-Hour | 52.4<br>(GF 2003) | 2,000 | N | NA[4] |
| | 8-Hour | 27.4<br>(GF 2001) | 500 | N | NA |
| $PM_{2.5}$ | 24-Hour | 11.6[5] | 1.2 | Y | 3.5 |
| | Annual | 3.7<br>(GF 2001) | 0.3 | Y | 2.1 |
| $PM_{10}$ | 24-Hour | 56.9<br>(GF 2001) | 5 | Y | 4.2 |
| | Annual | 14.8<br>(GF 2001) | 1 | Y | 2.1 |
| $NO_x$ | 1-Hour | 30.1[6] | 7.55[7] | Y | 38.6 |
| | Annual | 1.5<br>(GF 1999) | 1 | Y | 0.6 |
| $SO_2$ | 1-Hour | 22.6[8] | 7.86[7] | Y | 2.2 |
| | 3-Hour | 22.6 | 25 | N | NA |
| | 24-Hour | 5.5<br>(GF 2001) | 5 | Y | 0.4 |
| | Annual | 1.4<br>(GF 1999) | 1 | Y | 0.5 |

[1] μg/m$^3$ = micrograms per cubic meter.
[2] All selected concentrations were high-first-high (H1H), except otherwise noted.
[3] km = kilometer(s).
[4] NA = Not Applicable.
[5] Oris PMPost AERMOD post-processor was used to calculate the highest 24-hour $PM_{2.5}$ average concentration at a receptor over the 5 years of Great Falls met data.
[6] Oris NO2Post AERMOD post-processor was used to calculate the 98th percentile of the daily maximum 1-hour NO2 concentrations at a receptor over the 5 years of Great Falls met data.
[7] USEPA interim SILs are based on 4% of the 1-hour $PM_{2.5}$ and $NO_2$ NAAQS.
[8] Oris SO2Post post-processor was used to calculate the 99th percentile of the daily maximum 1-hour $SO_2$ concentration at a receptor over the 5 years of Great Falls met data.

The results of the significant impact modeling indicated that cumulative impact modeling would be required to demonstrate NAAQS/MAAQS compliance for $PM_{2.5}$, $PM_{10}$, $NO_x$, and $SO_2$. The results of the cumulative impact modeling are shown in the following table.

| Pollutant | Averaging Period | Modeled Concentration (µg/m³)[1] | Background Concentration (µg/m³) | Total Concentration (µg/m³) | NAAQS (µg/m³) | Percent of NAAQS (%) | MAAQS (µg/m³) | Percent of MAAQS (%) |
|---|---|---|---|---|---|---|---|---|
| $PM_{2.5}$ | 24-Hour | 18.0[2] | 12.3 | 30.3 | 35 | 87 | NA[3] | NA |
|  | Annual | 5.5[2] | 5 | 10.5 | 15.0 | 70 | NA | NA |
| $PM_{10}$ | 24-Hour | 61.8[4] | 13 | 74.8 | 150 | 50 | 150 | 50 |
|  | Annual | 17.3[5] | 5 | 22.3 | NA | NA | 50 | 45 |
| $NO_2$ | 1-Hour | 61.7[6] | 40 | 101.7 | 188.679 | 54 | 564 | 18 |
|  | Annual | 3.6[5] | 6 | 9.6 | 100 | 10 | 94 | 10 |
| $SO_2$ | 1-Hour | 114.7[7] | 35 | 149.7 | 195 | 77 | 1,300 | 12 |
|  | 24-Hour | 16.7[4] | 11 | 27.7 | NA | NA | 262 | 11 |
|  | Annual | 2.8[5] | 3 | 5.8 | NA | NA | 52 | 11 |

[1] µg/m³ = micrograms per cubic meter.

[2] Oris PMPost AERMOD post-processor was used to calculate the highest 24-hour and annual $PM_{2.5}$ average concentrations at a receptor over the 5 years of Great Falls met data.

[3] NA = Not Applicable.

[4] The high-second-high modeled value for a met year was selected.

[5] The high-first-high modeled value for a met year was selected.

[6] Oris NO2Post AERMOD post-processor was used to calculate the 98th percentile of the daily maximum 1-hour NO2 concentrations at a receptor over the 5 years of Great Falls met data.

[7] Oris SO2Post post-processor was used to calculate the 99th percentile of the daily maximum 1-hour $SO_2$ concentration at a receptor over the 5 years of Great Falls met data.

The significant and cumulative impact modeling results indicate that MAB would not cause or contribute to any violations of ambient air quality standards for $PM_{2.5}$, $PM_{10}$, CO, $NO_2$, or $SO_2$.

### Ozone Modeling

The Department instructed MAB to address ozone NAAQS compliance because the facility's potential VOC emissions, an ozone precursor, are greater than 100 tons per year. Ozone is not directly emitted but created in the atmosphere primarily in the presence of sunlight from various reactions involving VOC and $NO_x$. Therefore, the application of AERMOD is inappropriate since this model does not simulate photochemical atmospheric reactions. To provide some assistance in cases involving NAAQS ozone compliance demonstrations for a proposed new or modified source, EPA has published a screening method to evaluate incremental ozone concentration impacts based on a facility's annual $NO_x$ and VOC emissions. The screening method is published in a September 1988 paper entitled; "VOC/$NO_x$ Point Source Screening Tables" by Richard D. Scheffe (http://ndep.nv.gov/bapc/permitting/download/model/scheffe.pdf). It should be noted that this method actually refers to non-methane organic carbon (NMOC). The analysis presented here assumes NMOC is equivalent to VOC. This method estimates a conservatively high ozone concentration impact assessment. The screening analysis requires the following information regarding the proposed facility:

- A determination must be made as to whether the area surrounding the facility is urban or rural; Montana is considered as rural.
- The facility's maximum potential annual emission rates in tons per year of VOC and $NO_x$ are required. These values are used to calculate a ratio that identifies the appropriate lookup table for a given scenario. The potential annual VOC emissions are 232 tons per year and the potential $NO_x$ emissions are 224 tons per year. The ratio of VOC to $NO_x$ is approximately 1.0.

The VOC/$NO_x$ annual rate ratio of 1.0 designates the following lookup table (with linear interpolation results inserted and shaded in parts per million, ppm) for the rural category only to represent Montana:

| **VOC (tpy)** | **Ozone Impact (ppm) VOC/$NO_x$ (tpy/tpy) < 5.2** |
|---|---|
| | Rural |
| 50 | 0.011 |
| 75 | 0.012 |
| 100 | 0.014 |
| 232 | 0.016 |
| 300 | 0.017 |
| 500 | 0.019 |
| 750 | 0.023 |
| 1000 | 0.027 |

The resulting 0.016 ppm is about 21% and 16 % of the 8-hour and 1-hour ozone NAAQS, respectively. Since the entire state of Montana is classified as attainment or unclassifiable for ozone, the results demonstrate that the MAB will not cause or contribute to a violation of an ozone NAAQS.

Montana air quality rules require that applicants for facilities meeting the definition of an incineration facility as provided in MCA 75-2-103, and that are subject to rules promulgated in MCA 75-2-215 (Solid or Hazardous Waste Incineration – Additional Permit Requirements), must address potential impacts to human health by performing a human health risk assessment. The RTOs proposed as pollution control devices for the DDGS dryers and the loadout flares proposed for the truck and rail loadout systems qualify as incinerators under the Montana rules because they combust material "primarily for the purpose of removal, destruction, disposal, or volume reduction of any portion of the input material." They also combust a "solid waste," as defined in the statues very broadly to include essentially any waste material in any physical form (i.e., solid, liquid, or gas).

Bison conducted a screening-level risk assessment on behalf of MAB in accordance with ARM 17.8.770(c)(ii). This screening method requires that impacts to ambient concentrations of relevant HAPs first be determined based on results of a dispersion modeling analysis. These model-predicted impacts are then compared against screening threshold concentrations for cancer risk and acute and chronic non-cancer risks.

According to the information submitted, the Department believes the emissions from the proposed RTOs and flares represent an acceptable risk to human health.

## G. Unique Endangered, Fragile, or Limited Environmental Resources

To identify any unique, endangered, fragile, or limited environmental resources in the immediate area of the proposed project, the Department contacted the Montana Natural Heritage Program of the Natural Resource Information System (NRIS), which catalogues species of special concern of the U.S. Forest Service, U.S. Fish and Wildlife Service; and Bureau of Land Management. The Natural Heritage Program files identified eight species occurrence reports for four species of concern in the 1-mile buffer area surrounding the section, township, and range of the proposed facility.

The three plant species of concern that were observed in the vicinity of the MAB facility were the *entosthodon rubiginosus* (entosthodon moss), the *psoralea hypogaea* (little Indian breadroot), and the *carex sychnocephala* (many-headed sedge). The entosthodon moss is a nonvascular plant with habitat on or near the Missouri River. The little Indian breadroot is a perennial herb with habitats of rocky or sandy soils. The many-headed sedge has a habitat in the moist soil of meadows along streams and ponds. While these plants are all ranked at risk for extinction or extirpation, their last recorded observations in the area are from 120 years or more ago.

The animal species of concern with a species occurrence in the vicinity of the MAB facility was the *ammodramus savannarum* (grasshopper sparrow). This bird's preferred habitat is open prairies with intermittent brush. The most recent reported observations were from 2006 and occurred approximately two miles to the southeast of the proposed MAB facility location. One reported observation from 1993 occurred approximately one mile northwest of the proposed location along the Missouri River. The grasshopper sparrow has a species ranking of potentially at risk because of limited and/or declining numbers in some areas.

From the information provided by NRIS, the Department is unaware of any unique, endangered, fragile or limited environmental resources on the proposed project site. Recorded observations of species of concern are either of a historical nature from species that are potentially extinct or extirpated, or occur in areas with differing habitats than would be found in the proposed MAB facility location.

Based on the modeled air quality impacts from the MAB facility, the MAB proposal would have little, if any chance of impacting the unique, endangered, fragile, or limited environmental resources in the area. The modeling analysis results presented in Section 7.F of this EA indicate that the highest impacts from the air emissions from this facility would be minor.

## H. Demands on Environmental Resource of Water, Air and Energy

As described in Section 7.B of this EA, the estimated water requirements for the facility would be 900 gallons per minute, with approximately 529,000 gallons per day in wastewater produced. All water for the facility would be obtained from the Great Falls municipal water supply, and all non-contact wastewater would be discharged to the Great Falls POTW. The impacts from the water demands for this facility would be minor. The city currently has sufficient water rights to supply the required water demand from the plant. There would be an increased resource demand for treating the wastewater;

however, the Great Falls POTW has adequate capacity to accommodate the proposed facility's wastewater needs and the necessary permits and/or approvals would be obtained prior to operation. MAB would discharge storm water to an onsite retention pond.

As described in Section 7.F of this EA, the impact on the air resource in the area of the facility would be minor because the air emissions from the facility are relatively low and the dispersion characteristics of the facility and area are very good. Ambient air modeling for $NO_x$, CO, VOC, PM, $PM_{10}$, $PM_{2.5}$, and $SO_2$ was conducted for the facility at "worst case" conditions that demonstrates that the emissions from the proposed facility would not exceed any ambient air quality standard nor significantly contribute to the CO maintenance area. In conjunction with the ambient air quality analysis presented in Section 7.F of the EA, MAQP #4620-01 would contain conditions limiting the emissions from the facility.

The impacts to the energy resources from this facility would be minor based on the anticipated demands from the facility. Natural gas would be provided by Energy West Montana, Inc., a local natural gas distribution company that already serves the surrounding area and has existing utilities that are sufficient to provide the required gas demanded by the project. No new pipeline distribution station would be required as a result of the proposed project. The MAB facility would also supply much of its own heat energy from the combustion of biogas that has been derived from the gasification of the separated husk/bran and wheat midds. MAQP #4620-01 contains a federally enforceable permit condition that limits the maximum potential amount of natural gas used at the facility to 1,550 million standard cubic feet per year. Electricity would be provided by Talen Montana, LLC which already serves the surrounding area and the existing utilities are sufficient to provide the required additional power demanded by the facility.

The connection to city services for this project would result in very little air quality impact because no major air emission activities would be required. The sewer and water system connection may require the use of motor vehicles, but the impacts would be minor and of a short time duration. Similarly, minor fugitive dust emissions would result from the sewer and water system connection as well, but the emissions would be temporary.

## I. Historical and Archaeological Sites

The potential impact to historical and archaeological sites would be minor because the site location contained no visible standing structures, the facility would physically impact a small amount of property (approximately 95 acres), the facility would locate within an area that has been plowed for agricultural purposes, and the site location is in an area that would likely not have been used for any significant historical or archaeological activity. The area of the actual construction contained no visible standing structures and has been thoroughly disturbed by agricultural activities (plowing). Since the topsoil in the area is 4-6 inches thick and covers glacial gravel, any possibility of historical or archaeological material being present was destroyed by the agricultural activities (plowing) in the area.

The physical location of the site also indicates that it was not likely a location for significant historical or archaeological activity. The site location is located in rolling terrain, currently used for wheat farming. The nearest portion of the Missouri River to the site location is approximately ¾ mile away.

The Department contacted the Montana Historical Society – State Historic Preservation Office (SHPO) in an effort to identify any historical, archaeological, or paleontological sites or findings near the proposed project. SHPO's records indicate that there is one previously recorded historic site within the designated search locale. Site 24CA0264 is the old Chicago, Milwaukee, St. Paul, and Pacific Railroad bed. However, this site code covers the entire railroad bed area that lies within Cascade County, not just that area that resides within the project boundaries. The Manchester Overpass on that railroad line, which is the listed site name for Site 24CA0264, is located west of Great Falls. However, part of the railroad line appears to have been located just south of the proposed facility area. No eligible (with respect to the National Register of Historic Places) structures or buildings exist in the proposed project area associated with this site code. In addition, because of the fact that severe agricultural activities have occurred in the area, there is little likelihood of finding undiscovered or unrecorded historical properties. A cultural resource inventory had been previously conducted in the area: *Cultural Resources Survey of Approximately 1250 Acres in the Vicinity of Malmstrom Air Force Base Great Falls, Montana* by T. Weber Greiser. It was conducted in 1988 by the U.S. Air Force. Based on the fact that the proposed project area had been previously surveyed and also previously disturbed, SHPO maintains that there is low likelihood that this project would impact unknown or unrecorded cultural properties.

The connection of city services for this project would result in no impact on historical or archaeological sites because the disturbances would occur within previously disturbed sites, and the sites that are not previously disturbed would be in the same area as previously described in this section.

### J. Cumulative and Secondary Impacts

Overall, the cumulative and secondary impacts from this project on the physical and biological aspects of the human environment would be minor because the overall air impact from MAB in addition to the other Great Falls industrial sources is small, the highest impacts from each of the other nearby industrial sources (Montana Refining Company, Malmstrom Air Force Base, and the forthcoming Southern Montana Electric Highwood Generating Station) would not occur at the same receptor, and the pollutant of concern for each of the nearby industries is generally different. In addition, emissions from the nearby sources that were previously mentioned were included in the cumulative impact modeling performed by MAB at the request of the Department. The modeling analysis indicated that the cumulative emissions from these facilities would not violate any NAAQS or MAAQS.

Although possible odors from this proposed facility would be in addition to other odors common to the Great Falls area (grain handling, vehicle exhaust, and industrial odors from the refinery), the cumulative and secondary impacts would be minor. The odor associated with grain handling is already present in the Great Falls area and odor associated with similar dryers in ethanol facilities has been described as a baking bread odor. MAB would operate RTO pollution control devices on the DDGS driers which would destroy approximately 99% of the organic compound emissions that are believed to cause the majority of the odors from ethanol facilities.

8. *The following table summarizes the potential economic and social effects of the proposed project on the human environment. The "no-action" alternative was discussed previously.*

| | | Major | Moderate | Minor | None | Unknown | Comments Included |
|---|---|---|---|---|---|---|---|
| A | Social Structures and Mores | | | | X | | Yes |
| B | Cultural Uniqueness and Diversity | | | | X | | Yes |
| C | Local and State Tax Base and Tax Revenue | | | X | | | Yes |
| D | Agricultural or Industrial Production | | | X | | | Yes |
| E | Human Health | | | X | | | Yes |
| F | Access to and Quality of Recreational and Wilderness Activities | | | X | | | Yes |
| G | Quantity and Distribution of Employment | | | X | | | Yes |
| H | Distribution of Population | | | | X | | Yes |
| I | Demands for Government Services | | | X | | | Yes |
| J | Industrial and Commercial Activity | | | X | | | Yes |
| K | Locally Adopted Environmental Plans and Goals | | | X | | | Yes |
| L | Cumulative and Secondary Impacts | | | X | | | Yes |

SUMMARY OF COMMENTS ON POTENTIAL ECONOMIC AND SOCIAL EFFECTS: The following comments have been prepared by the Department.

A. Social Structures and Mores

The proposed facility would not cause a disruption to any native or traditional lifestyles or communities (social structures or mores) in the area because the land use proposal would not be out of place given the land use of the larger area surrounding the proposed site and the fact that the immediate surrounding area would remain agricultural. Besides the agricultural properties near the facility, there are other industrial sources, such as Montana Refining Company, Malmstrom Air Force Base, and the forthcoming Southern Montana Electric Highwood Generating Station, in the greater surrounding area.

The connection to city services would have no impact on social structures and mores because these associated activities are not new to Montana or the specific areas of impact. Most of the impacts from the other portions of the project would occur within previously disturbed sites that are already conducting the desired activity, but just need improvements or upgrades.

B. Cultural Uniqueness and Diversity

The proposed facility would not cause a change in the cultural uniqueness and diversity of the area because the area is currently used predominantly for agricultural purposes, and the MAB facility would make use of agricultural products in the process. Even with the addition of MAB to the area, the area would still be used predominantly for agricultural purposes.

Besides the agricultural properties near the facility, industrial activity is not “out of place” given the larger Great Falls area. Other industrial sources, such as Montana Refining Company, Malmstrom Air Force Base, and the forthcoming Southern Montana Electric Highwood Generating Station, operate or are planning to operate in the greater surrounding area of the proposed site location.

The connection to city services would have no impact on cultural uniqueness and diversity because the land use of the area(s) would not be changing.

C. Local and State Tax Base and Tax Revenue

The facility would have a minor effect on the local and state tax base and tax revenue from payroll taxes for the approximately 100 people it would employ. In addition to the plant jobs, MAB estimates that 150 truck drivers would be required to support the facility. MAB estimates that approximately 600 people would be employed during construction of the facility, also adding to the overall income taxes paid.

D. Agricultural or Industrial Production

The impacts to agricultural and industrial production in the area from this facility would be minor because the facility would physically impact a small amount of land, the impact from the air emissions on the land would be small, and the facility would make use of agricultural products as raw materials. The agricultural property on which the facility would be built is 220 acres. The facility would be constructed on approximately 95 acres, and the immediate area surrounding the facility would be fenced. The rest of the land associated with the project would remain as agricultural land.

As described in Section 7.F of the EA, the air quality impacts from this facility are minor, and the resulting deposition of the pollutants from the MAB project is consequently also minor. In addition, as described in Section 7.F, the fact that the facility would comply with the NAAQS and MAAQS (protect public health and promote public welfare) indicates that the impacts from the facility would be minor.

The MAB facility may assist agricultural producers by consuming Montana-grown wheat and barley in their raw materials, thereby providing a ready market to the agricultural community.

The connection to city services would have little, if any impact on agricultural production because the disturbance for most of the activities would be within previously disturbed locations and the disturbances at other locations (addition of utilities) would be minor and not change the predominant setting of the area.

E. Human Health

As described in Section 7.F of the EA, the impacts from this facility on human health would be minor because the impact from the air emissions would be greatly dispersed before reaching an elevation where humans were exposed. Also, as described in Section 7.F, the modeled impacts from this facility, taking into account other dispersion characteristics (wind speed, wind direction, atmospheric stability, stack height, stack temperature, etc.), do not violate any MAAQS or NAAQS. The air quality permit for this facility incorporates conditions to ensure that the facility would be operated in compliance with all applicable rules and standards. These rules and standards are designed to be protective of human health.

Besides the criteria pollutants, the impacts from all other air pollutants (HAPs, for example) would also be greatly minimized by the dispersion characteristics of the facility and the area (wind speed, wind direction, atmospheric stability, stack temperature, facility emissions, etc.). Impacts from other common activities (such as fueling your vehicle for example) would have a greater impact on human health for HAPs because of the concentrations at the point of exposure.

MAB conducted a screening-level human health risk assessment as required by ARM 17.8.770 for the sources that meet the Montana definition of an incinerator (RTOs, truck loadout flare, and railcar loadout flare). The model-predicted impacts were compared against screening threshold concentrations for cancer risk and acute and chronic non-cancer risks. All modeled concentrations were below the relevant screening threshold concentrations.

### F. Access to and Quality of Recreational and Wilderness Activities

The facility would result in a minor impact on the access to and quality of recreational and wilderness activities because the air emissions from the facility are relatively small and would disperse before impacting the recreational areas (see Section 7.F of EA). Within ½ mile are three recreational sites that include a soccer complex and two small residential parks. The proposed facility location is approximately ¾ of a mile from the River's Edge Trail at its closest point and would be visible from the trail. The Rainbow Dam on the Missouri River is approximately ¾ of a mile from the proposed facility location.

The connection of the facility to city services would have no impact on recreational and wilderness activities because the areas of disturbance are currently not sites for these types of activities and because most of the impacts would be temporary.

### G. Quantity and Distribution of Employment

There would be a minor effect on the employment of the area from this project because plant operation would result in approximately 100 plant jobs as well as requiring around 150 truck drivers (non-plant employees) and construction of the facility would require approximately 600 workers. In total, this project would result in approximately 850 employment opportunities.

A few temporary employment opportunities would result from the facility's connection to city services. The sewer and water system upgrades would require some construction and corresponding man-hours. However, the impacts on quantity and distribution of employment would be minor because the required work would be temporary and would likely be handled by current employees of the City of Great Falls.

## H. Distribution of Population

The entire project would not affect the normal population distribution in the area because although approximately 100 full-time positions would be created, many of those employed might come from the existing population in Great Falls. The jobs related to the construction of the facility (approximately 600 jobs) would be temporary. The estimated 150 truck drivers would not be plant employees and these would likely be existing jobs. Neither the 100 full-time positions nor the numerous temporary construction-related positions or truck driving positions would likely affect the distribution of population in the area.

Most employees required for the construction and operation of the ethanol plant would likely be from Great Falls or temporarily locate within Great Falls. For the other construction-related activities with this project, the employees would likely be existing staff in the area and would likely not be moving to Great Falls.

## I. Demands for Government Services

Demands on government services from this facility would be minor because the facility would require some, but not extensive, government services. Government services would be required for the acquisition of the appropriate permits for the facility. Minor increases may be seen in traffic on existing roads in the area while the facility is operating, however, much of the transportation of raw materials and products would take place by rail. Some road improvement on 18th Avenue North would be required and is already being planned by the city (3-inch asphalt overlay on existing road).

As the proposed site is within the limits of the City of Great Falls, it would be connected to city water and sewer, but this connection would be financed by MAB. All water for the facility would be obtained from the Great Falls municipal water supply, and all spent water would be discharged to the POTW. The City of Great Falls currently has adequate capacity in their system to accommodate the proposed facility's water and wastewater needs.

The acquisition of the appropriate permits by the facility (including local building permits and a state air quality permit), the permits for the associated activities of the project, and compliance verification with those permits would also require minor services from the government.

## J. Industrial and Commercial Activity

The MAB facility would represent a minor increase in industrial activity in the area. The facility would operate 24 hours a day and 7 days per week producing ethanol, wheat gluten, and DDGS. Some of the other permitted facilities in the area are Calumet Montana Refining Company, LLC and Malmstrom Air Force Base.

## K. Locally Adopted Environmental Plans and Goals

Prior to July 8, 2002, the City of Great Falls contained a nonattainment area for CO along the 10th Avenue South corridor. On this date the U.S. Environmental Protection agency approved a CO "attainment" limited maintenance plan (LMP) for the area, citing that the area is in compliance with ambient CO standards. The proposed facility is outside of the

CO LMP area and would result in only minor impacts to the area because the CO emissions from the facility have been modeled to demonstrate that the impacts would not significantly contribute to any further CO attainment status problems in the CO LMP area (see Section VI of the permit analysis and Section 8.F of this EA). Overall, the proposed project could result in minor impacts to the local CO attainment LMP area.

The Department is unaware of any other locally adopted environmental plans and goals that would be affected by the facility or the other portions of the project as identified at the beginning of this EA. The state standards would be protective of the environment.

L. Cumulative and Secondary Impacts

Overall, the Department expects that the cumulative and secondary impacts from this project on the social and economic aspects of the human environment would be minor. The proposed facility would represent a new local commercial source of ethanol as well as DDGS for animal feed. Numerous new full-time employment opportunities would result from the facility, many construction-related employment opportunities would be available, and the facility could use Montana-grown agricultural products as raw materials.

The MAB project would result in additional jobs for the Great Falls area. As described in Section 8.G of this EA, the facility would employ approximately 100 full-time people, utilize approximately 150 truck drivers while in production, and require approximately 650 people during the construction phase. The “day-to-day” normal operation positions and the construction-related positions created by the MAB project would bring additional money into the Great Falls economy.

Recommendation: No Environmental Impact Statement (EIS) is required.

If an EIS is not required, explain why the EA is an appropriate level of analysis: The current permitting action is for the construction and operation of an ethanol manufacturing facility. MAQP #4620-01 includes conditions and limitations to ensure the facility will operate in compliance with all applicable rules and regulations. In addition, there are no significant impacts associated with this proposal.

Other groups or agencies contacted or which may have overlapping jurisdiction: Montana Historical Society – State Historic Preservation Office, Natural Resource Information System – Montana Natural Heritage Program.

Individuals or groups contributing to this EA: Department of Environmental Quality – Air Quality Bureau, Montana Historical Society – State Historic Preservation Office, Natural Resource Information System – Montana Natural Heritage Program

EA prepared by: Ed Warner
Date: November 12, 2015