August 18, 2022

Mr. Craig Thorstenson
North Dakota Department of Environmental Quality
Division of Air Quality
Environmental Health Section
918 E. Divide Ave, 2nd Floor
Bismarck, ND 58501

**Re: American Crystal Sugar Company – Drayton Sugarbeet Processing Facility**
**Application for Amended Prevention of Significant Deterioration Construction Permit**
**Permit to Construct No. PTC17001**

Dear Mr. Thorstenson,

Enclosed for your review is an application for amendment of the Prevention of Significant Deterioration (PSD) Construction Permit for the American Crystal Sugar Company (ACSC) Drayton Sugarbeet Processing Facility (DTN). Permit to Construct No. PTC17001 was issued on July 31, 2017. This letter details the requested permit changes and the reasons for each, and provides discussion to supplement or revise the original PSD permit application where appropriate.

During the detailed design and implementation of the permitted project, several as-built changes occurred that deviate from PTC17001. The changes ultimately resulted in a significant decrease in the net emission change calculated for the project. However, it is necessary to amend the PTC to reflect changes in emission limits as applicable.

Major changes include:

- Modification of existing Pulp Dryer No. 1 (EU4) instead of removal and installation of a new pulp dryer;
- Installation of a natural gas-fired vertical lime kiln instead of an anthracite/coke fired vertical lime kiln;
- Upgrade of the lime slaker to match new kiln production parameters; and
- Installation of three new pellet mills and associated cooler to replace all existing pellet mills and cooler instead of adding one new pellet mill.

NDDEQ is aware of the changes to Pulp Dryer No. 1 as engineering testing of this emission unit was previously authorized to evaluate its modification in lieu of replacement with a new pulp dryer. This amendment communicates final emission parameters for incorporation into the amended PTC.

After amendment of PTC17001 ACSC will submit a Title V Operating permit application incorporating all final requirements.

**<u>Summary of Requested Permit Changes</u>**

Section I.B. of Permit to Construct Number PTC17001 includes a table of new emission units and emission units with changes in emission limits. The following table shows the proposed amendments to the changes authorized by PTC17001 based on as-built conditions.

**Table 1. Proposed Changes to PTC17001 Emission Units.**

| Emission Unit Description | Emission Unit (EU) | Emission Point (EP) | Air Pollution Control Equipment | Proposed Amendments |
|---|---|---|---|---|
| Babcock and Wilcox coal-fired spreader stoker boiler with a nominal heat input capacity of 392 million Btu/hr and a nominal steam load capacity of 300,000 lbs/hr | 1 | 1 | Multiclone and Electrostatic Precipitator | **No Change** |
| Pellet mill/cooler | 22 | 22 | Cyclone | **Removed from Service** |
| Direct-fired pulp dryer with a nominal process rate of approximately 110 tons/hr of pressed pulp. The coal-fired furnace has a rated heat input capacity of approximately 230 million Btu/hr | 27 | 26&26a | Cyclone and Wet Scrubber | **Unit was not installed. Instead EU4 was modified and not removed from service.** |
| Vertical shaft lime kiln with a nominal capacity of 550 tons/day of limerock. The Unit has a maximum heat input capacity of approximately 61 million Btu/hr and is fired on coke, anthracite coal or a mixture of anthracite coal and coke. | 28 | 27a (combined carbonation vent)<br>27b ($CO_2$ pressure vent)<br>27c (balance vent)<br>27d (startup/emergency vent) | Inherent Process Controls/Good Combustion Practices | **Unit was replaced with a natural gas-fired lime kiln** |
| Sugar dryer/granulator with a maximum rated capacity of 100 tons/hr | 29 | 28 | Baghouse | **No Change** |
| Eberhardt lime slaker with a capacity of 307 tons/day of calcined lime | 30 | 29 | Good Engineering Practice | **Increased Capacity to Match Kiln** |
| Pulp pellet mill and cooler with a maximum rated capacity of 15 tons/hr | 31 | 30 | Cyclone | **Unit replaced with three pellet mills and cooler.** |

In addition to the proposed amendments listed in the table above, the following additional emission sources were removed from service.

**Table 2. Additional Removed Emission Units.**

| Emission Unit Description | Emission Unit (EU) | Emission Point (EP) | Air Pollution Control Equipment | Proposed Amendment |
|---|---|---|---|---|
| Pellet Mill No. 2 | 7 | 7 | Cyclone | **Removed from service.** |
| Pellet Mill No. 3 | 8 | 8 | Cyclone | **Removed from service.** |

The following table provides a summary of the final amended emission unit parameters and emission limits for those sources that were changed based on final as-built conditions.

**Table 3. Final As-Built Emission Unit Descriptions and Emission Limits.**

| Emission Unit Description | EU | EP | Pollutant/ Parameter | Emission Limit or Design/Work Practice | NDAC Applicable Requirement |
|---|---|---|---|---|---|
| Pulp Dryer No. 1, Stearns-Roger 12'0" x 56' rotary direct-fired, traveling grate pulp dryer, with a nominal process rate of approximately 65 ton/hr pressed pulp. The Combustion Engineering coal-fired Inseco furnace has a nominal heat input capacity of 125 million Btu/hr (6.65 ton/hr). *NOTE: The existing pulp dryer was modified to increase pressed pulp throughput in lieu of installing EP27 as authorized in PTC17001.* | 4 | 4 | PM | 48 lb/hr and 0.74 lb/ton pressed pulp processed, 3-hr avg. (filterable only) | BACT |
| | | | $PM_{10}$ | 88.8 lb/hr and 1.37 lb/ton pressed pulp processed, 3-hr avg. (filterable and condensable) | BACT |
| | | | $PM_{2.5}$ | 81.6 lb/hr and 1.26 lb/ton pressed pulp processed, 3-hr avg. (filterable and condensable) | BACT |
| | | | $SO_2$ | 46.6 lb/hr and 0.72 lb/ton pressed pulp processed, 3-hr avg. | BACT |
| | | | $SO_2$ | 3.0 lb/million Btu heat input | NDAC 33-15-0-01.2 |
| | | | $NO_x$ | 54.3 lb/hr and 0.84 lb/ton pressed pulp processed, 3-hr avg. | BACT |
| | | | CO | 455.0 lb/hr and 7.0 lb/ton pressed pulp processed, 3-hr avg. | BACT |
| | | | VOC | 78.0 lb/hr and 1.20 lb/ton pressed pulp processed, 3-hr avg. | BACT |
| | | | Opacity | 20% | BACT |
| Vertical shaft lime kiln with a nominal capacity of 500 tons/day of lime. The Unit has a maximum heat input capacity of approximately 84.7 million Btu/hr and is fired on natural gas. *NOTE: The coke/ anthracite-fired kiln authorized in PTC17001 was replaced with a natural gas-fired only kiln.* | 28 | 27a-c | PM/$PM_{10}$ | 10.7 lb/hr and 0.53 lb/ton lime produced, 3-hr avg. | BACT |
| | | | $PM_{2.5}$ | 6.63 lb/hr and 0.32 lb/ton of lime produced, 3-hr avg. | BACT |
| | | | $SO_2$ | 3.73 lb/hr and 0.18 lb/ton lime produced, 3-hr avg. | BACT |
| | | | $NO_x$ | 26.8 lb/hr and 1.29 lb/ton lime produced, 3-hr avg. | BACT |
| | | | CO | 521 lb/hr and 25.0 lb/ton lime produced, 3-hr avg. | BACT |
| | | | VOC | 2.73 lb/hr and 0.13 lb/ton lime produced, 3-hr avg. | BACT |

| Emission Unit Description | EU | EP | Pollutant/ Parameter | Emission Limit or Design/Work Practice | NDAC Applicable Requirement |
|---|---|---|---|---|---|
| | | | Opacity | 20% | BACT |
| Pellet Mill/Cooler System: Pulp Pellet Mill Nos. 1, 2 and 3 each with a nominal capacity of 16 ton/hr and Pellet Cooler with a nominal capacity of 30 ton/hr.<br><br>*NOTE: The pellet mill/cooler system replaced all existing pellet mills and cooler: EP6, 7, 8 and 22.* | 31<br>32<br>33 | 30 | $PM/PM_{10}$<br><br>$PM_{2.5}$<br><br>Opacity | 1.5 lb/hr and 0.005 gr/dscf, 3-hr avg.<br><br>0.35 lb/hr and 0.001 gr/dscf, 3-hr avg.<br><br>10% | BACT<br><br>BACT<br><br>BACT |
| Lime Slaker with a nominal capacity of 500 tons/day of calcined lime | 30 | 29 | $PM/PM_{10}$<br><br>$PM_{2.5}$<br><br>Opacity | 3.33 lb/hr and 0.16 lb/ton lime processed, 3-hr avg.<br><br>1.24 lb/hr and 0.06 lb/ton lime processed, 3-hr avg.<br><br>20% | BACT<br><br>BACT<br><br>BACT |
| Dry Pulp Conveyors and Dry Pulp Bucket Elevator, each with a nominal capacity of 16.8 tons/hr.[A] | 9<br>11 | 9 | $PM/PM_{10}$<br><br>Opacity | 0.30 lb/hr and 0.005 gr/dscf, 3-hr avg.<br><br>20% | 33.1-15.02<br><br>33.1-15-03-01.2 |

[A] A separate project was undertaken to combine the exhaust of EU9 and EU11 into one emission point controlled by a new fabric filter baghouse with a design flow rate of 6,000 acfm.

**<u>Estimated Emission Changes (See Attachment A)</u>**

The design changes in emission units as summarized above will result in minor changes to the net emission increased proposed in PTC17001. An updated emissions spreadsheet, showing emission calculations for the affected sources, is included as Attachment A of this letter. The table below summarizes the change in net emission increases due to as-built changes. As shown in the table, the net emission decreased significantly for all pollutants except for $PM_{2.5}$ as a result of the as-built changes. $PM_{2.5}$ increased slightly due to higher than anticipated tested $PM_{2.5}$ emissions for the modified pulp dryer (EU4).

**Table 4. Change to Net Emission Increase.**

| Pollutant | PTC17001 Emission Increase (tpy) | Revised Emission Increase (tpy) | Change In Emission Increase (tpy) |
|---|---|---|---|
| PM | 284 | 223 | -61.0 |
| $PM_{10}$ | 508 | 431 | -77.0 |
| $PM_{2.5}$ | 328 | 334 | **6.0** |

| Pollutant | PTC17001 Emission Increase (tpy) | Revised Emission Increase (tpy) | Change In Emission Increase (tpy) |
|---|---|---|---|
| $NO_x$ | 864 | 664 | -200 |
| CO | 5,619 | 2,787 | -2,832 |
| VOC | 708 | 473 | -235 |
| $SO_2$ | 1,731 | 1,551 | -180 |
| Carbon dioxide equivalent ($CO_2e$) | 370,329 | 332,343 | -37,986 |
| Lead (Pb) | 0.03 | 0.02 | -0.01 |
| Sulfuric acid mist ($H_2SO_4$) | 5 | 5 | 0.0 |
| Fluorides (measured as HF) | 2 | 1 | -1 |

**Best Available Control Technology (BACT) Update (see Attachment B)**

Because the as-built changes resulted in minor differences in emission unit production capacities for some modified emission units, the BACT analysis was revised for those units. Updated BACT analyses are included in Attachment B of this letter for the following emission units:

- Pulp Dryer No. 1 (EU4)
- Vertical Lime Kiln (EU28)
- Lime Slaker (EU30)
- Pellet Mill and Cooler System (EU31)

**Dispersion Modeling Update (See Attachment C)**

As indicated in the previous table, the overall net emissions increase for the modification decreased as a result of the as-built changes. However, because the $PM_{2.5}$ emissions increased a minor amount, it was necessary to update the dispersion modeling analysis to confirm compliance with the National Ambient Air Quality Standards (NAAQS) and PSD Increment Standards. Updated modeling analyses for PM, $PM_{10}$ and $PM_{2.5}$ are included as Attachment C to this letter. Because of the significant reduction in emissions for $NO_x$, CO and $SO_2$, dispersion modeling for these pollutants was not updated and compliance with the applicable NAAQS and PSD Increment Standards is assumed.

The original dispersion modeling analysis was updated to include the new emission rates (and stack parameters where applicable) and the model was run using the latest approved version of AERMOD. No other changes were made to the analysis (i.e., meteorological data, building downwash, receptor locations, etc. remain unchanged).

The first step in the updated modeling analysis was to revalidate the existing model by performing a verification run using the original permitted (PTC17001) parameters to duplicate the original results. The verification run shows the difference in modeled impacts due to changes in the updated AERMOD model code since the original analysis. The table below shows the results of the verification run.

**Table 5. Dispersion Model Verification Results.**

| Pollutant | Averaging Period | PTC17001 Modeled Impact (μg/m³) | Verification Modeled Impact (μg/m³) |
|---|---|---|---|
| $PM_{10}$ | 24-hour | 118.4 | 118.2 |
| $PM_{2.5}$ | 24-hour | 15.5 | 15.5 |
| | Annual | 3.72 | 3.72 |

As shown in the table above, the verification run duplicated the results of the original modeling analysis nearly exactly. Therefore, there is a high degree of confidence that the updated modeling analysis will accurately demonstrate compliance with NAAQS following the same procedures as used for PTC17001.

The following tables provide the results of the updated modeling analysis incorporating the revised emission rates as discussed above.

**Table 6. Revised Model NAAQS Results.**

| Pollutant | | Met Year | Modeled Emissions (μg/m³) | Distant Background (μg/m³) | Total Impact (μg/m³) | AAQS (μg/m³) | |
|---|---|---|---|---|---|---|---|
| | | | | | | State | Federal |
| $PM_{10}$ | 24-hour[A] | NA | 111.9 | 30 | 141.9 | 150 | 150 |
| $PM_{2.5}$ | 24-hour[B] | NA | 21.12 | 13.7 | 34.8 | - | 35 |
| | Annual[C] | 2013 | 4.62 | 4.75 | 9.37 | - | 15 |

[A] Modeled concentration is the highest-sixth-highest 24-hour average across five years of meteorological data.
[B] Modeled concentration is the 98th percentile (eighth-high) of the annual distribution of maximum 24-hour concentrations averaged across five years of meteorological data.
[C] Modeled concentration is the highest annual average concentration of five modeled years of meteorological data.

**Table 7. Revised Model PSD Increment Results.**

| Pollutant | | Met Year | Easting (m) | Northing (m) | Modeled Impact (μg/m³) | Class II Standard (μg/m³) |
|---|---|---|---|---|---|---|
| $PM_{10}$ | 24-hour[A] | 2010 | 634317.00 | 5383879.70 | 24.96 | 30 |
| | Annual[B] | 2010 | 625500.00 | 5373000.00 | 0.08 | 17 |
| $PM_{2.5}$ | 24-hour[A] | 2010 | 633900.00 | 5284250.00 | 6.49 | 9 |
| | Annual[B] | 2013 | 634759.00 | 5383060.20 | 0.99 | 4 |

[A] Modeled concentration is the highest-second-high concentration of five modeled years of meteorological data.
[B] Modeled concentration is the highest annual average concentration of five modeled years of meteorological data.

A detailed listing of source parameters and modeling input/output summary data in included in Attachment C to this letter. If electronic modeling files are required for a complete review by NDDEQ staff, the electronic files can be provided upon request.

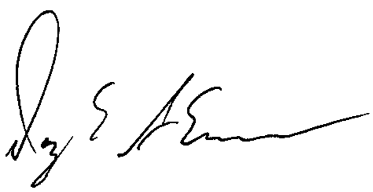
**Permit Application Forms**

No updated permit application forms were included with this amendment letter because the general information that was communicated in the previous PTC is still applicable. If the NDDEQ requires an updated certification or additional permit application forms to process the requested amendment, such forms will be submitted upon request.

We are prepared to assist NDDEQ staff as needed in your review of this application for amendment of PTC17001. If there are any questions regarding this permit application, please do not hesitate to contact me at (218) 236-4777, or our consultant, HDR Engineering, Inc., Greg Raetz, at (763) 278-5905.

Sincerely,

**American Crystal Sugar Company**



Douglas Emerson
Environmental Affairs Manager

Attachments

A) Updated Emission Calculations
B) Revised BACT Analysis
C) Dispersion Modeling Inputs and Results

c. Paul King, ACSC
Greg Raetz, HDR Engineering, Inc.

# Attachment A

# Emission Calculations:

1) Net Emission Increase Summary
2) Modified Pulp Dryer (EU4)
3) Lime Kiln (EU28)
4) Lime Slaker (EU30)
5) Pellet Mills/Cooler (EU31)
6) Modified Pulp Conveyors and Elevator (EU9)

**Computation**

| | | | |
|---|---|---|---|
| | | Job No. | 271619 |
| Project | American Crystal Sugar Company | Computed | GJR |
| Subject | Drayton Expansion - Potential Emissions | Checked | MKD |
| Task | Emission Summary | Sheets | NA |

| ***Nitrogen Oxides ($NO_x$)*** **Emission Unit** | **Potential (tpy)** | **Actual (tpy)** | **Net Increase (tpy)** |
|---|---|---|---|
| EU1/EP1 B&W Boiler | 869.44 | 516.81 | 352.63 |
| EU3/EP3 Pulp Dryer No. 2 | 98.08 | 36.09 | 61.99 |
| Modified Dryer EU4 | 237.97 | 43.33 | 194.64 |
| New Kiln EU28 & EU13/EP13 Belgian Lime Kiln | 118.19 | 63.63 | 54.56 |
| **Total** | **1324** | **660** | **664** |
| **PSD Significant Emission Rate (tpy)** | | | **40** |
| **Major Modification** | | | **Yes** |

| ***Carbon Monoxide (CO)*** **Emission Unit** | **Potential (tpy)** | **Actual (tpy)** | **Net Increase (tpy)** |
|---|---|---|---|
| EU1/EP1 B&W Boiler | 228.32 | 272.58 | -44.26 |
| EU3/EP3 Pulp Dryer No. 2 | 1040.02 | 660.13 | 379.88 |
| Modified Dryer EU4 | 1992.87 | 660.13 | 1332.74 |
| New Kiln EU28 & EU13/EP13 Belgian Lime Kiln | 2295.88 | 1177.18 | 1118.70 |
| **Total** | **5557** | **2770** | **2787** |
| **PSD Significant Emission Rate (tpy)** | | | **100** |
| **Major Modification** | | | **Yes** |

| ***Volatile Organic Compounds (VOC)*** **Emission Unit** | **Potential (tpy)** | **Actual (tpy)** | **Net Increase (tpy)** |
|---|---|---|---|
| EU1/EP1 B&W Boiler | 4.57 | 2.73 | 1.84 |
| EU3/EP3 Pulp Dryer No. 2 | 178.23 | 24.84 | 153.39 |
| Modified Dryer EU4 | 341.66 | 34.75 | 306.91 |
| New Kiln EU28 & EU13/EP13 Belgian Lime Kiln | 12.03 | 1.09 | 10.94 |
| **Total** | **536** | **63** | **473** |
| **PSD Significant Emission Rate (tpy)** | | | **40** |
| **Major Modification** | | | **Yes** |

| ***Sulfur Dioxide ($SO_2$)*** **Emission Unit** | **Potential (tpy)** | **Actual (tpy)** | **Net Increase (tpy)** |
|---|---|---|---|
| EU1/EP1 B&W Boiler | 1598.23 | 294.93 | 1303.31 |
| EU3/EP3 Pulp Dryer No. 2 | 163.09 | 35.38 | 127.71 |
| Modified Dryer EU4 | 203.89 | 55.12 | 148.77 |
| New Kiln EU28 & EU13/EP13 Belgian Lime Kiln | 17.68 | 46.82 | -29.14 |
| **Total** | **1983** | **432** | **1551** |
| **PSD Significant Emission Rate (tpy)** | | | **40** |
| **Major Modification** | | | **Yes** |

| *Lead (Pb)*<br>**Emission Unit** | **Potential (tpy)** | **Actual (tpy)** | **Net Increase (tpy)** |
|---|---|---|---|
| EU1/EP1 B&W Boiler | 0.04 | 0.02 | 0.01 |
| EU3/EP3 Pulp Dryer No. 2 | 0.01 | 0.00 | 0.01 |
| Modified Dryer EU4 | 0.01 | 0.00 | 0.01 |
| New Kiln EU28 & EU13/EP13 Belgian Lime Kiln | 0.00 | 0.01 | -0.01 |
| **Total** | **0.06** | **0.04** | **0.02** |
| **PSD Significant Emission Rate (tpy)** | | | **0.6** |
| **Major Modification** | | | **No** |

| *Sulfuric Acid Mist ($H_2SO_4$)*<br>**Emission Unit** | **Potential (tpy)** | **Actual (tpy)** | **Net Increase (tpy)** |
|---|---|---|---|
| EU1/EP1 B&W Boiler | 4.63 | 0.86 | 3.78 |
| EU3/EP3 Pulp Dryer No. 2 | 0.47 | 0.10 | 0.37 |
| Modified Dryer EU4 | 0.59 | 0.16 | 0.43 |
| New Kiln EU28 & EU13/EP13 Belgian Lime Kiln | 0.00 | 0.00 | 0.00 |
| **Total** | **5.70** | **1.12** | **5** |
| **PSD Significant Emission Rate (tpy)** | | | **7** |
| **Major Modification** | | | **No** |

| *Fluorides (measured as HF)*<br>**Emission Unit** | **Potential (tpy)** | **Actual (tpy)** | **Net Increase (tpy)** |
|---|---|---|---|
| EU1/EP1 B&W Boiler | 0.07 | 0.04 | 0.03 |
| EU3/EP3 Pulp Dryer No. 2 | 0.62 | 0.24 | 0.38 |
| Modified Dryer EU4 | 0.77 | 0.24 | 0.54 |
| New Kiln EU28 & EU13/EP13 Belgian Lime Kiln | 0.00 | 0.00 | 0.00 |
| **Total** | **1.46** | **0.51** | **1** |
| **PSD Significant Emission Rate (tpy)** | | | **3** |
| **Major Modification** | | | **No** |

| *Carbon Dioxide Equivalent ($CO_2e$)*<br>**Emission Unit** | **Potential (tpy)** | **Actual (tpy)** | **Net Increase (tpy)** |
|---|---|---|---|
| EU1/EP1 B&W Boiler | 440511.66 | 262951.15 | 177560.51 |
| EU3/EP3 Pulp Dryer No. 2 | 55295.64 | 21204.13 | 34091.50 |
| Modified Dryer EU4 | 105728.68 | 20802.10 | 84926.58 |
| New Kiln EU28 & EU13/EP13 Belgian Lime Kiln | 70360.77 | 34596.49 | 35764.29 |
| **Total** | **671897** | **339554** | **332343** |
| **PSD Significant Emission Rate (tpy)** | | | **75000** |
| **Major Modification** | | | **Yes** |

| *Particulate Matter (PM)*<br>**Emission Unit** | **Potential (tpy)** | **Actual (tpy)** | **Net Increase (tpy)** |
|---|---|---|---|
| EU1/EP1 B&W Boiler | 68.50 | 39.74 | 28.75 |
| EU1a/EP1a Coal Handling Dust Collector | 1.28 | 0.94 | 0.33 |
| EU3/EP3 Pulp Dryer No. 2 | 179.63 | 73.79 | 105.83 |
| Modified Dryer EU4 | 210.24 | 131.51 | 78.73 |
| EU5 & EU24/EP5 Lime Mixing Tank and Lime Kiln Cooler | 0.00 | 28.08 | -28.08 |
| New Pellet Mills and Cooler EU31, EU32, EU33 | 6.57 | 12.10 | -5.53 |
| EU7/EP7 Pellet Mill No. 2 | 0.00 | 12.10 | -12.10 |
| EU8/EP8 Pellet Mill No. 3 | 0.00 | 12.10 | -12.10 |
| EU9/EP9 Dry Pulp Belt Conveyors | 1.13 | 1.98 | -0.85 |
| EU10/EP10 Dry Pulp Reclaim System | 2.65 | 1.98 | 0.67 |
| EU11/EP9 Dry Pulp Bucket Elevator | 0.00 | 1.98 | -1.98 |
| New Sugar Dryer EU29 & EU12/EP12 Sugar Dryer | 9.73 | 9.06 | 0.66 |
| New Kiln EU28 & EU13/EP13 Belgian Lime Kiln | 52.42 | 9.71 | 42.71 |
| EU14a/EP14a MAC 2 Flow Headhouse | 15.02 | 15.02 | 0.00 |
| EU14b & EU 14c/EP14b Hummer Pulsaire and MAC | 14.27 | 14.27 | 0.00 |
| EU15/EP15 Pulp Pellet Bin No. 1 | 1.61 | 1.61 | 0.00 |
| EU16/EP16 Pulp Pellet Bin No. 2 | 1.61 | 1.61 | 0.00 |
| EU17/EP17 Pulp Pellet Bin No. 3 | 1.61 | 1.61 | 0.00 |
| EU19a/EP19a Bulk Loading Pulsaire | 0.48 | 0.48 | 0.00 |
| EU20/EP20 Main Sugar Warehouse Pulsaire | 1.97 | 1.97 | 0.00 |
| EU22/EP22 Pulp Pellet Mill & Cooler | 0.00 | 0.80 | -0.80 |
| EU23/EP23 Pulp Dryer Coal Hopper | 3.90 | 2.96 | 0.94 |
| EU25/EP24 Flume Lime Slaker | 0.18 | 0.00 | 0.18 |
| New Lime Slaker EU30 & EU26/EP25 Lime Slaker | 14.58 | 2.90 | 11.67 |
| Fug 1 Pellet Loadout Area | 1.99 | 1.56 | 0.43 |
| Fug 2a Coal Handling Emissions | 0.13 | 0.09 | 0.05 |
| Fug 2b Coal Handling Wind Erosion | 2.67 | 2.67 | 0.00 |
| Fug 3 Limerock & Coke Handling Emissions | 0.44 | 0.14 | 0.29 |
| Fug 4 Spent Lime Wind Erosion | 1.08 | 1.08 | 0.00 |
| Fugitive Emissions from Unpaved Roads | 50.30 | 37.50 | 12.80 |
| **Total** | **644** | **421** | **223** |
| **PSD Significant Emission Rate (tpy)** | | | **25** |
| **Major Modification** | | | **Yes** |

| *Particulate Matter < 10 Microns ($PM_{10}$)*<br>**Emission Unit** | **Potential (tpy)** | **Actual (tpy)** | **Net Increase (tpy)** |
|---|---|---|---|
| EU1/EP1 B&W Boiler | 130.32 | 59.86 | 70.47 |
| EU1a/EP1a Coal Handling Dust Collector | 1.28 | 0.94 | 0.33 |
| EU3/EP3 Pulp Dryer No. 2 | 332.31 | 136.52 | 195.79 |
| Modified Dryer EU4 | 388.94 | 243.29 | 145.65 |
| EU5 & EU24/EP5 Lime Mixing Tank and Lime Kiln Cooler | 0.00 | 18.59 | -18.59 |
| New Pellet Mills and Cooler EU31, EU32, EU33 | 6.57 | 12.10 | -5.53 |
| EU7/EP7 Pellet Mill No. 2 | 0.00 | 12.10 | -12.10 |
| EU8/EP8 Pellet Mill No. 3 | 0.00 | 12.10 | -12.10 |
| EU9/EP9 Dry Pulp Belt Conveyors | 1.13 | 1.98 | -0.85 |
| EU10/EP10 Dry Pulp Reclaim System | 2.65 | 1.98 | 0.67 |
| EU11/EP9 Dry Pulp Bucket Elevator | 0.00 | 1.98 | -1.98 |
| New Sugar Dryer EU29 & EU12/EP12 Sugar Dryer | 9.73 | 9.06 | 0.66 |
| New Kiln EU28 & EU13/EP13 Belgian Lime Kiln | 52.42 | 9.71 | 42.71 |
| EU14a/EP14a MAC 2 Flow Headhouse | 15.02 | 15.02 | 0.00 |
| EU14b & EU 14c/EP14b Hummer Pulsaire and MAC | 14.27 | 14.27 | 0.00 |
| EU15/EP15 Pulp Pellet Bin No. 1 | 1.61 | 1.61 | 0.00 |
| EU16/EP16 Pulp Pellet Bin No. 2 | 1.61 | 1.61 | 0.00 |
| EU17/EP17 Pulp Pellet Bin No. 3 | 1.61 | 1.61 | 0.00 |
| EU19a/EP19a Bulk Loading Pulsaire | 0.48 | 0.48 | 0.00 |
| EU20/EP20 Main Sugar Warehouse Pulsaire | 1.97 | 1.97 | 0.00 |
| EU22/EP22 Pulp Pellet Mill & Cooler | 0.00 | 0.80 | -0.80 |
| EU23/EP23 Pulp Dryer Coal Hopper | 3.90 | 2.96 | 0.94 |
| EU25/EP24 Flume Lime Slaker | 0.18 | 0.00 | 0.18 |
| New Lime Slaker EU30 & EU26/EP25 Lime Slaker | 14.58 | 2.90 | 11.67 |
| Fug 1 Pellet Loadout Area | 1.99 | 1.56 | 0.43 |
| Fug 2a Coal Handling Emissions | 0.13 | 0.09 | 0.05 |
| Fug 2b Coal Handling Wind Erosion | 2.67 | 2.67 | 0.00 |
| Fug 3 Limerock & Coke Handling Emissions | 0.44 | 0.14 | 0.29 |
| Fug 4 Spent Lime Wind Erosion | 1.08 | 1.08 | 0.00 |
| Fugitive Emissions from Unpaved Roads | 50.30 | 37.50 | 12.80 |
| **Total** | **1037** | **606** | **431** |
| **PSD Significant Emission Rate (tpy)** | | | **15** |
| **Major Modification** | | | **Yes** |

| *Particulate Matter < 2.5 Microns ($PM_{2.5}$)* **Emission Unit** | **Potential (tpy)** | **Actual (tpy)** | **Net Increase (tpy)** |
|---|---|---|---|
| EU1/EP1 B&W Boiler | 110.46 | 53.72 | 56.74 |
| EU1a/EP1a Coal Handling Dust Collector | 0.30 | 0.22 | 0.08 |
| EU3/EP3 Pulp Dryer No. 2 | 206.57 | 84.86 | 121.71 |
| Modified Dryer EU4 | 357.41 | 223.56 | 133.84 |
| EU5 & EU24/EP5 Lime Mixing Tank and Lime Kiln Cooler | 0.00 | 10.42 | -10.42 |
| New Pellet Mills and Cooler EU31, EU32, EU33 | 1.52 | 1.85 | -0.33 |
| EU7/EP7 Pellet Mill No. 2 | 0.00 | 1.85 | -1.85 |
| EU8/EP8 Pellet Mill No. 3 | 0.00 | 1.85 | -1.85 |
| EU9/EP9 Dry Pulp Belt Conveyors | 0.26 | 0.46 | -0.20 |
| EU10/EP10 Dry Pulp Reclaim System | 0.61 | 0.46 | 0.16 |
| EU11/EP9 Dry Pulp Bucket Elevator | 0.00 | 0.46 | -0.46 |
| New Sugar Dryer EU29 & EU12/EP12 Sugar Dryer | 1.99 | 1.39 | 0.61 |
| New Kiln EU28 & EU13/EP13 Belgian Lime Kiln | 31.70 | 1.17 | 30.53 |
| EU14a/EP14a MAC 2 Flow Headhouse | 3.48 | 3.48 | 0.00 |
| EU14b & EU 14c/EP14b Hummer Pulsaire and MAC | 3.30 | 3.30 | 0.00 |
| EU15/EP15 Pulp Pellet Bin No. 1 | 0.24 | 0.24 | 0.00 |
| EU16/EP16 Pulp Pellet Bin No. 2 | 0.24 | 0.24 | 0.00 |
| EU17/EP17 Pulp Pellet Bin No. 3 | 0.24 | 0.24 | 0.00 |
| EU19a/EP19a Bulk Loading Pulsaire | 0.11 | 0.11 | 0.00 |
| EU20/EP20 Main Sugar Warehouse Pulsaire | 0.46 | 0.46 | 0.00 |
| EU22/EP22 Pulp Pellet Mill & Cooler | 0.00 | 0.12 | -0.12 |
| EU23/EP23 Pulp Dryer Coal Hopper | 0.90 | 0.69 | 0.22 |
| EU25/EP24 Flume Lime Slaker | 0.07 | 0.00 | 0.07 |
| New Lime Slaker EU30 & EU26/EP25 Lime Slaker | 5.41 | 1.08 | 4.33 |
| Fug 1 Pellet Loadout Area | 0.03 | 0.02 | 0.01 |
| Fug 2a Coal Handling Emissions | 0.00 | 0.00 | 0.00 |
| Fug 2b Coal Handling Wind Erosion | 0.40 | 0.40 | 0.00 |
| Fug 3 Limerock & Coke Handling Emissions | 0.00 | 0.00 | 0.00 |
| Fug 4 Spent Lime Wind Erosion | 0.16 | 0.16 | 0.00 |
| Fugitive Emissions from Unpaved Roads | 5.03 | 3.75 | 1.28 |
| **Total** | **731** | **397** | **334** |
| **PSD Significant Emission Rate (tpy)** | | | **10** |
| **Major Modification** | | | **Yes** |

# Computation

| | |
|---|---|
| Job No. | 271619 |
| Project | American Crystal Sugar Company |
| Subject | Drayton Expansion - Potential Emissions |
| Task | Modified Pulp Dryer No. 1 (EU4) |
| Computed | GJR |
| Checked | MKD |
| Sheets | NA |

| Hours | Throughput (tph) | Heat Content (Btu/lb) | Heat Input (MMBtu/hr) | Firing Rate (ton/hr) | Fuel Use (ton/yr) |
|---|---|---|---|---|---|
| 8760 | 65.0 | 9,400 | 125 | 6.65 | 58,254 |

| PSD Regulated Air Pollutants | CAS# | Emission Factor | Potential Emissions | |
|---|---|---|---|---|
| | | (lb/ton) | (lb/hr) | (tpy) |
| Nitrogen Oxides ($NO_x$)[b] | 10102-43-9 | 8.17 | 54.3 | 238.0 |
| Carbon Monoxide (CO)[b] | 630-08-0 | 68.42 | 455.0 | 1992.9 |
| Particulate Matter (PM)[c] | - | 7.22 | 48.0 | 210.2 |
| Particulate Matter < 10 Microns ($PM_{10}$)[d] | - | 13.35 | 88.8 | 388.9 |
| Particulate Matter < 2.5 Microns ($PM_{2.5}$)[e] | - | 12.27 | 81.6 | 357.4 |
| Volatile Organic Compounds (VOC)[a] | - | 11.73 | 78.0 | 341.7 |
| Sulfur Dioxide ($SO_2$)[f] | 7446-09-5 | 7.00 | 46.6 | 204 |
| Sulfuric Acid Mist ($H_2SO_4$)[g] | - | 0.02 | 0.1 | 0.6 |
| Fluorides (measured as HF)[h] | - | 0.03 | 0.2 | 0.8 |
| Lead (Pb)[i] | 7439-92-1 | 0.0004 | 0.0 | 0.0 |
| Carbon Dioxide ($CO_2$)[a] | 124-38-9 | 3,617 | 24,050 | 105,338 |
| Methane ($CH_4$)[j] | 74-82-8 | 0.06 | 0.4 | 1.7 |
| Nitrous Oxide ($N_2O$)[j] | 10024-97-2 | 0.04 | 0.3 | 1.2 |
| Carbon Dioxide Equivalent ($CO_2e$)[k] | - | NA | 24,139 | 105,729 |

| Hazardous Air Pollutants | CAS# | Emission Factor | Potential Emissions | |
|---|---|---|---|---|
| | | (lb/ton) | (lb/hr) | (tpy) |
| **Organic Compounds:** | | | | |
| Acetaldehyde[m] | 75-07-0 | 5.70E-04 | 3.79E-03 | 1.66E-02 |
| Acetophenone[m] | 98-86-2 | 1.50E-05 | 9.98E-05 | 4.37E-04 |
| Acrolein[m] | 107-02-8 | 2.90E-04 | 1.93E-03 | 8.45E-03 |
| Benzene[m] | 71-43-2 | 1.30E-03 | 8.65E-03 | 3.79E-02 |
| Benzyl chloride[m] | 100-44-7 | 7.00E-04 | 4.66E-03 | 2.04E-02 |
| Bis(2-ethylhexyl)phthalate (DEHP)[m] | 117-81-7 | 7.30E-05 | 4.85E-04 | 2.13E-03 |
| Bromoform[m] | 75-25-2 | 3.90E-05 | 2.59E-04 | 1.14E-03 |
| Carbon disulfide[m] | 75-15-0 | 1.30E-04 | 8.65E-04 | 3.79E-03 |
| 2-Chloroacetophenone[m] | 532-27-4 | 7.00E-06 | 4.66E-05 | 2.04E-04 |
| Chlorobenzene[m] | 108-90-7 | 2.20E-05 | 1.46E-04 | 6.41E-04 |
| Chloroform[m] | 67-66-3 | 5.90E-05 | 3.92E-04 | 1.72E-03 |
| Cumene[m] | 98-82-8 | 5.30E-06 | 3.52E-05 | 1.54E-04 |
| Cyanide[m] | 57-12-5 | 2.50E-03 | 1.66E-02 | 7.28E-02 |
| 2,4-Dinitrotoluene[m] | 121-14-2 | 2.80E-07 | 1.86E-06 | 8.16E-06 |
| Dimethyl sulfate[m] | 77-78-1 | 4.80E-05 | 3.19E-04 | 1.40E-03 |
| Ethylbenzene[m] | 100-41-4 | 9.40E-05 | 6.25E-04 | 2.74E-03 |
| Ethyl chloride[m] | 75-00-3 | 4.20E-05 | 2.79E-04 | 1.22E-03 |
| Ethylene dichloride[m] | 107-06-2 | 4.00E-05 | 2.66E-04 | 1.17E-03 |
| Ethylene dibromide[m] | 106-93-4 | 1.20E-06 | 7.98E-06 | 3.50E-05 |

| | | | | |
|---|---|---|---|---|
| Formaldehyde[m] | 50-00-0 | 2.40E-04 | 1.60E-03 | 6.99E-03 |
| Hexane[m] | 110-54-3 | 6.70E-05 | 4.46E-04 | 1.95E-03 |
| Isophorone[m] | 78-59-1 | 5.80E-04 | 3.86E-03 | 1.69E-02 |
| Methyl bromide[m] | 74-83-9 | 1.60E-04 | 1.06E-03 | 4.66E-03 |
| Methyl chloride[m] | 74-87-3 | 5.30E-04 | 3.52E-03 | 1.54E-02 |
| Methyl hydrazine[m] | 60-34-4 | 1.70E-04 | 1.13E-03 | 4.95E-03 |
| Methyl methacrylate[m] | 80-62-6 | 2.00E-05 | 1.33E-04 | 5.83E-04 |
| Methyl tert butyl ether[m] | 1634-04-4 | 3.50E-05 | 2.33E-04 | 1.02E-03 |
| Methylene chloride[m] | 75-09-2 | 2.90E-04 | 1.93E-03 | 8.45E-03 |
| Phenol[m] | 108-95-2 | 1.60E-05 | 1.06E-04 | 4.66E-04 |
| Propionaldehyde[m] | 123-38-6 | 3.80E-04 | 2.53E-03 | 1.11E-02 |
| Tetrachlorethylene (Perc)[m] | 127-18-4 | 4.30E-05 | 2.86E-04 | 1.25E-03 |
| Toluene[m] | 108-88-3 | 2.40E-04 | 1.60E-03 | 6.99E-03 |
| 1,1,1-Trichloroethane (methyl chloroform)[m] | 71-55-6 | 2.00E-05 | 1.33E-04 | 5.83E-04 |
| Styrene[m] | 100-42-5 | 2.50E-05 | 1.66E-04 | 7.28E-04 |
| Vinyl acetate[m] | 108-05-4 | 7.60E-06 | 5.05E-05 | 2.21E-04 |
| Xylenes[m] | 1330-20-7 | 3.70E-05 | 2.46E-04 | 1.08E-03 |
| Dioxins/Furans (PCDD/PCDF)[n] | - | 1.76E-09 | 1.17E-08 | 5.13E-08 |
| Polynuclear Aromatic Hydrocarbons (PAH)[o] | - | 2.08E-05 | 1.38E-04 | 6.06E-04 |
| HCl (Hydrochloric acid)[p] | 7647-01-0 | 2.40E-02 | 1.60E-01 | 6.99E-01 |
| HF (Hydrofluoric acid)[h] | 7664-39-3 | 2.65E-02 | 1.76E-01 | 7.72E-01 |
| Antimony[i] | 7440-36-0 | 1.80E-05 | 1.20E-04 | 5.24E-04 |
| Arsenic[i] | 7440-38-2 | 4.10E-04 | 2.73E-03 | 1.19E-02 |
| Beryllium[i] | 7440-41-7 | 2.10E-05 | 1.40E-04 | 6.12E-04 |
| Cadmium[i] | 7440-43-9 | 5.10E-05 | 3.39E-04 | 1.49E-03 |
| Chromium[i] | 7440-47-3 | 2.60E-04 | 1.73E-03 | 7.57E-03 |
| Cobalt[i] | 7440-48-4 | 1.00E-04 | 6.65E-04 | 2.91E-03 |
| Lead[i] | 7439-92-1 | 4.20E-04 | 2.79E-03 | 1.22E-02 |
| Manganese[i] | 7439-96-5 | 4.90E-04 | 3.26E-03 | 1.43E-02 |
| Mercury[i] | 7439-97-6 | 8.30E-05 | 5.52E-04 | 2.42E-03 |
| Nickel[i] | 7440-02-0 | 2.80E-04 | 1.86E-03 | 8.16E-03 |
| Selenium[i] | 7782-49-2 | 1.30E-03 | 8.65E-03 | 3.79E-02 |
| | | | **Total HAPs =** | **1.8** |

**Notes:**

[a] AP42 (3/97) Table 9.10.1.2-2, VOC 1.2 lb/ton pulp, $CO_2$ 370 lb/ton pulp

[b] ACS HLB stack test 7.0 lb CO/ton pressed pulp, HLB BACT limit 100 lb/hr $NO_x$.

[c] NDAC 33-15-05-01.2, E (lb/hr) = $55.0p^{0.11}$ - 40, p = ton pressed pulp + fuel

[d] $PM_{10}$ assumed to be 100% of PM plus condensable fraction equal to 85% of $PM_{10}$

[e] Based on test data $PM_{2.5}$ equal to be 85% of $PM_{10}$ plus condensable fraction equal to 85% of $PM_{10}$

[f] AP42 (9/98) Table 1.1-3, maximum sulfur content of 0.5 percent and 60% inherent control

[g] EPRI (3/12) Estimating Total Sulfuric Acid Emissions from Stationary Power Plants, 0.29% of $SO_2$

[h] Spring Creek Mine Coal Specification, 41.9 ppm F as HF. Also incorporates 60% inherent control.

[i] AP42 (9/98) Table 1.1-18

[j] AP42 (9/98) Table 1.1-19

[k] 40 CFR 98, Subpart A, GWP $CH_4$ 25, $N_2O$ 298

[m] AP-42 (9/98) Table 1.1-14

[n] AP-42 (9/98) Table 1.1-12

[o] AP-42 (9/98) Table 1.1-13

[p] Spring Creek Mine Coal Specification, 16.65 ppm Cl

**Computation**

| | | | | |
|---|---|---|---|---|
| Project | American Crystal Sugar Company | | Job No. | 271619 |
| Subject | Drayton Expansion - Potential Emissions | | Computed | GJR |
| Task | Natural Gas-Fired Lime Kiln (EU28) | | Checked | MKD |
| | | | Sheets | NA |

### New Kiln - Ofenmantel GDS-4.3 (Natural gas-fired) Production Parameters

| Hours | Limerock Throughput[a] (tpd) | Fuel Per Limerock[b] (MMBtu/ton) | Fuel Throughput (MMBtu/day) | Fuel Heat Content[c] (Btu/scf) | Max Heat Input (MMBtu/hr) | Lime Production[d] (tpd) |
|---|---|---|---|---|---|---|
| 8,760 | 892 | 2.28 | 2,034 | 1,020 | 84.7 | 500 |

[a] Maximum limerock througput capacity based on kiln design.

[b] Fuel per limerock percentage is based on observed performance test parameters.

[c] Maximum heat content applies to coke, anthracite would result in lower maximum heat input.

[d] Theoretcial lime production is based on 100% pure limerock and full calcination.

### Potential Start-Up Emissions: Limited by process to 120 hours (5 days) per year at 50% capacity.
### (Historical start-up operations are 3-days at 50% capacity)

| Criteria Air Pollutants | CAS# | Combustion Emission Factor | | Maximum Design Uncontrolled Emissions | | Startup Emissions (bypass stack) | |
|---|---|---|---|---|---|---|---|
| | | (value) | (units) | (lb/hr) | (tpy) | (lb/hr) | (tpy) |
| Nitrogen Oxides ($NO_x$)[a] | 10102-43-9 | 1.29 | lb/ton lime | 26.8 | 117.4 | 13.4 | 0.80 |
| Carbon Monoxide (CO)[b] | 630-08-0 | 25.00 | lb/ton lime | 520.6 | 2280.3 | 260.3 | 15.62 |
| Particulate Matter (PM)[c] | - | 7.02 | lb/ton lime | 146.2 | 640.5 | 73.1 | 4.39 |
| Particulate Matter < 10 Microns ($PM_{10}$)[c] | - | 7.02 | lb/ton lime | 146.2 | 640.5 | 73.1 | 4.39 |
| Particulate Matter < 2.5 Microns ($PM_{2.5}$)[d] | - | 4.25 | lb/ton lime | 88.4 | 387.3 | 44.2 | 2.65 |
| Volatile Organic Compounds (VOC)[e] | - | 0.131 | lb/ton lime | 2.7 | 11.9 | 1.4 | 0.08 |
| Carbon Dioxide ($CO_2$)[f] | - | 2,047 | lb/ton lime | 42,627 | 186,708 | 21,314 | 1,279 |
| Sulfur Dioxide ($SO_2$)[g] | 7446-09-5 | 2.14 | lb/ton lime | 44.6 | 195.2 | 22.3 | 1.34 |
| Lead (Pb)[h] | 7439-92-1 | 1.99E-06 | lb/ton lime | 4.14E-05 | 1.82E-04 | 2.07E-05 | 1.24E-06 |
| Acid Gases (F, $H_2SO_4$, $H_2S$)[i] | | negl. | lb/ton lime | 0.000 | 0.000 | 0.000 | 0.000 |

[a] $NO_x$ emissions based on maximum of European vertical shaft kiln data, which ranges from 5.36 to 26.79 lb/hr.

[b] CO emissions based on maximum European kiln data multiplied by safety factor of 2.0 to reflect spot testing and engineering estimate.

[c] $PM/PM_{10}$ emissions calculated from maximum venturi controlled European test data. Includes condensable portion (0.082 lb/ton lime) from AP42, Table 11.17-2.

[d] $PM_{2.5}$ emissions are calculated as 60% of $PM_{10}$ emissions using particle size distribution for rotary kilns, AP42, Table 11.17-7, plus condensable.

[e] VOC emissions based on AP42, Table 1.4-2, for natural gas combustion multipled by a safety factor of 3.0 percent to account for different combustion process.

[f] $CO_2$ emissions based AP42, Table 1.4-2, for natural gas combustion plus mass balance of calcined limerock.

[g] $SO_2$ emissions based AP42, Table 1.4-2 for natural gas combustion.

[h] Pb emissions based on AP42, Table 1.4-2, for natural gas combustion.

[i] Based on the high retention of $SO_2$ in the combustion process and the preferential removal of acid gases, emissions are anticipated to be negligible.

### Balance Vent Emissions: 30% of combustion gas flow after gas-washer control.

| Criteria Air Pollutants | CAS# | Uncontrolled Emissions | | Gas Washer Control[a] | Amount of Flow | Balance Vent Emissions (normal operations) | |
|---|---|---|---|---|---|---|---|
| | | (lb/hr) | (tpy) | (%) | (%) | (lb/hr) | (tpy) |
| Nitrogen Oxides ($NO_x$) | 10102-43-9 | 26.8 | 117.4 | 0% | 30% | 8.0 | 35.22 |
| Carbon Monoxide (CO) | 630-08-0 | 520.6 | 2280.3 | 0% | 30% | 156.2 | 684.08 |
| Particulate Matter (PM) | - | 146.2 | 640.5 | 75% | 30% | 11.0 | 48.04 |
| Particulate Matter < 10 Microns ($PM_{10}$) | - | 146.2 | 640.5 | 75% | 30% | 11.0 | 48.04 |
| Particulate Matter < 2.5 Microns ($PM_{2.5}$) | - | 88.4 | 387.3 | 75% | 30% | 6.6 | 29.05 |
| Volatile Organic Compounds (VOC) | - | 2.7 | 11.9 | 0% | 30% | 0.8 | 3.58 |
| Carbon Dioxide ($CO_2$) | - | 42,627 | 186,708 | 0% | 30% | 12,788 | 56012.39 |
| Sulfur Dioxide ($SO_2$) | 7446-09-5 | 44.6 | 195.2 | 75% | 30% | 3.3 | 14.64 |
| Lead (Pb) | 7439-92-1 | 0.000 | 0.000 | 75% | 30% | 0.000 | 0.00 |
| Acid Gases (HF, $H_2SO_4$) | | 0.000 | 0.000 | 0% | 30% | 0.000 | 0.000 |

[a] Gas washer control efficiency for PM is 70%. Lead is controlled as a particulate. $SO_2$ emissions are controlled 75% due to the combination of lime dust in the exhuast gas and the wet scrubber. Acid gases are negligible due to preferential removal.

### Carbonation Vent Emissions: Remaining 70% of combustion gas flow after gas-washer control.

| Criteria Air Pollutants | CAS# | Gas Washer Controlled Emissions | | Carbonation Control[a] | Amount of Flow | Carbonation Process Emissions | |
|---|---|---|---|---|---|---|---|
| | | (lb/hr) | (tpy) | (%) | (%) | (lb/hr) | (tpy) |
| Nitrogen Oxides ($NO_x$) | 10102-43-9 | 26.8 | 117.4 | 0% | 70% | 18.8 | 82.17 |
| Carbon Monoxide (CO) | 630-08-0 | 520.6 | 2280.3 | 0% | 70% | 364.4 | 1596.18 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Particulate Matter (PM) | - | 36.6 | 160.1 | 100.0% | 70% | 0.00 | 0.00 |
| Particulate Matter < 10 Microns ($PM_{10}$) | - | 36.6 | 160.1 | 100.0% | 70% | 0.00 | 0.00 |
| Particulate Matter < 2.5 Microns ($PM_{2.5}$) | - | 22.1 | 96.8 | 100.0% | 70% | 0.00 | 0.00 |
| Volatile Organic Compounds (VOC) | - | 2.7 | 11.9 | 0% | 70% | 1.9 | 8.36 |
| Carbon Dioxide ($CO_2$) | - | 42,627 | 186708.0 | 90% | 70% | 2,984 | 13,070 |
| Sulfur Dioxide ($SO_2$) | 7446-09-5 | 11.1 | 48.8 | 95% | 70% | 0.4 | 1.71 |
| Lead (Pb) | 7439-92-1 | 0.000 | 0.0 | 100.0% | 70% | 0.000 | 0.000 |
| Acid Gases (HF, $H_2SO_4$) | | 0.000 | 0.0 | 95% | 70% | 0.000 | 0.000 |

[a] Carbonation process controls 100% of remaining particulate matter and 95% of remaining $SO_2$/acid gases. 90% of $CO_2$ is abosorbed in the carbonation process and recombined with CaO to form $CaCO_3$.

**Total KR6.5 Lime Kiln Emissions**

| Criteria Air Pollutants | Start Up Emissions (bypass stack) | | Balance Vent Emissions (normal operations) | | Carbonation Process Emissions | | Total Emissions |
|---|---|---|---|---|---|---|---|
| | (lb/hr) | (tpy) | (lb/hr) | (tpy) | (lb/hr) | (tpy) | (tpy) |
| Nitrogen Oxides ($NO_x$) | 13.40 | 0.8 | 8.04 | 35.2 | 18.76 | 82.2 | 118.19 |
| Carbon Monoxide (CO) | 260.30 | 15.6 | 156.18 | 684.1 | 364.43 | 1596.2 | 2295.88 |
| Particulate Matter (PM) | 73.11 | 4.4 | 10.97 | 48.0 | 0.00 | 0.0 | 52.42 |
| Particulate Matter < 10 Microns ($PM_{10}$) | 73.11 | 4.4 | 10.97 | 48.0 | 0.00 | 0.0 | 52.42 |
| Particulate Matter < 2.5 Microns ($PM_{2.5}$) | 44.21 | 2.7 | 6.63 | 29.0 | 0.00 | 0.0 | 31.70 |
| Volatile Organic Compounds (VOC) | 1.36 | 0.1 | 0.82 | 3.6 | 1.91 | 8.4 | 12.03 |
| Carbon Dioxide ($CO_2$) | 21,314 | 1,279 | 12,788 | 56,012 | 2,984 | 13,070 | 70,361 |
| Sulfur Dioxide ($SO_2$) | 22.28 | 1.3 | 3.34 | 14.6 | 0.39 | 1.7 | 17.7 |
| Lead (Pb) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Acid Gases (HF, $H_2SO_4$) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

# Computation

| | | | |
|---|---|---|---|
| Project | American Crystal Sugar Company | Job No. | 271619 |
| Subject | Drayton Expansion - Potential Emissions | Computed | GJR |
| Task | Proposed New Lime Slaker | Checked | MKD |
| | | Sheets | NA |

| Hours | Throughput (tph) | Flowrate (acfm) |
|---|---|---|
| 8760 | 20.8 | 3,000 |

| PSD Regulated Air Pollutants | CAS# | Emission Factor | Potential Emissions | |
|---|---|---|---|---|
| | | (lb/ton) | (lb/hr) | (tpy) |
| Particulate Matter (PM)[a] | - | 0.16 | 3.33 | 14.58 |
| Particulate Matter < 10 Microns ($PM_{10}$)[b] | - | 0.16 | 3.33 | 14.58 |
| Particulate Matter < 2.5 Microns ($PM_{2.5}$)[c] | - | 0.06 | 1.24 | 5.41 |

**Notes:**

[a] AP42 Table 11.17-2 incorporating a 200% safety factor for variable process

[b] $PM_{10}$ filterable is equal to PM filterable

[c] $PM_{2.5}$ filterable is 37.1% of PM based on the average parameters listed below

[d] Flowrate is passive as a result of exothermic process

**AP-42, Appendix B, Particle Size Distribution For Multiclone And Scrubber Controlled Sources:**

| Section | Source Type | $PM_{2.5}$ (% less than) |
|---|---|---|
| 9.70 | Cotton Ginning: Battery Condensor | 11.0 |
| 9.70 | Cotton Ginning: Lint Cleaner Air Exhaust | 11.0 |
| 10.50 | Woodworking Waste Collection Operations | 29.5 |
| 11.10 | Coal Cleaning: Thermal Dryer | 53.0 |
| 11.10 | Coal Processing: Thermal Incinerator | 21.3 |
| 11.20 | Lightweight Aggregate (Clay): Rotary Kiln | 55.0 |
| 11.20 | Lightweight Aggregate (Clay): Reciprocating Grate Clinker Cooler | 19.3 |
| 11.20 | Lightweight Aggregate (Slate): Rotary Kiln | 33.0 |
| 11.21 | Phosphate Rock Processing: Calciner | 94.0 |
| 11.21 | Phosphate Rock Processing: Oil-Fired Rotary Drier | 89.0 |
| 11.21 | Phosphate Rock Processing: Oil-Fired Rotary Drier | 15.7 |
| 11.21 | Phosphate Rock Processing: Ball Mill | 6.5 |
| 11.21 | Phosphate Rock Processing: Roller Mill and Bowl Mill Grinding | 21.0 |
| 12.10 | Primary Aluminum Production: Bauxite Processing | 60.5 |
| **Average Particle Size Distribution** | | **37.1** |

# Computation

| | |
|---|---|
| Job No. | 271619 |

| | | | | |
|---|---|---|---|---|
| Project | American Crystal Sugar Company | | Computed | GJR |
| Subject | Drayton Expansion - Potential Emissions | | Checked | MKD |
| Task | New Pulp Pellet Mills & Cooler | | Sheets | NA |

| Hours | Throughput (tph) | Flowrate (acfm) |
|---|---|---|
| 8760 | 30.0 | 35,000 |

| PSD Regulated Air Pollutants | CAS# | Emission Factor (gr/scf) | Potential Emissions (lb/hr) | Potential Emissions (tpy) |
|---|---|---|---|---|
| Particulate Matter (PM)[a] | - | 0.005 | 1.50 | 6.6 |
| Particulate Matter < 10 Microns ($PM_{10}$)[b] | - | 0.005 | 1.50 | 6.6 |
| Particulate Matter < 2.5 Microns ($PM_{2.5}$)[c] | - | 0.001 | 0.35 | 1.5 |

**Notes:**

[a] PM emissions based on manufactuer data (35,000 dscfm)

[b] $PM_{10}$ filterable is equal to PM filterable

[c] $PM_{2.5}$ emissions are 23.2% of PM filterable based on following average parameters:

**AP-42, Appendix B, Particle Size Distribution For Fabric Filter Controlled Sources:**

| Section | Source Type | $PM_{2.5}$ (%less than) |
|---|---|---|
| 8.XX | Boric Acid Dryer | 3.3 |
| 8.XX | Potash (Postassium Sulfate) Dryer | 18.0 |
| 10.50 | Woodworking Waste Collection Operations | 14.3 |
| 11.10 | Coal Cleaning: Dry Process | 16.0 |
| 11.20 | Lightweight Aggregate (Clay): Reciprocating Grate Clinker Cooler | 39.0 |
| 11.21 | Phosphate Rock Processing: Roller Mill and Bowl Mill Grinding | 25.0 |
| 11.XX | Nonmetalic Minerals: Fluorspar Ore Rotary Drum Dryer | 10.0 |
| 12.10 | Primary Aluminum Production: Bauxite Ore Storage Storage | 50.0 |
| 12.15 | Storage Battery Production: Lead Oxide Mill | 32.8 |
| **Average Particle Size Distribution** | | **23.2** |

# Computation

| | | | |
|---|---|---|---|
| Project | American Crystal Sugar Company | Job No. | 271619 |
| Subject | Drayton Expansion - Potential Emissions | Computed | GJR |
| Task | EU9/EP9 Dry Pulp Belt Conveyors | Checked | MKD |
| | | Sheets | NA |

| Hours | Throughput (tph) | Flowrate (acfm) |
|---|---|---|
| 8760 | 16.8 | 6,000 |

**MODIFIED BAGHOUSE INCLUDING EU11**

| PSD Regulated Air Pollutants | CAS# | Emission Factor | Potential Emissions | |
|---|---|---|---|---|
| | | (lb/ton) | (lb/hr) | (tpy) |
| Particulate Matter (PM)[a] | - | 0.005 | 0.3 | 1.1 |
| Particulate Matter < 10 Microns ($PM_{10}$)[b] | - | 0.005 | 0.3 | 1.1 |
| Particulate Matter < 2.5 Microns ($PM_{2.5}$)[c] | - | 0.001 | 0.060 | 0.3 |

**Notes:**

[a] Air Emission Permit No. T5-X73015

[b] $PM_{10}$ filterable is equal to PM filterable

[c] $PM_{2.5}$ emissions are 23.2% of PM filterable based on following average parameters:

**AP-42, Appendix B, Particle Size Distribution For Fabric Filter Controlled Sources:**

| Section | Source Type | $PM_{2.5}$ (%less than) |
|---|---|---|
| 8.XX | Boric Acid Dryer | 3.3 |
| 8.XX | Potash (Postassium Sulfate) Dryer | 18.0 |
| 10.50 | Woodworking Waste Collection Operations | 14.3 |
| 11.10 | Coal Cleaning: Dry Process | 16.0 |
| 11.20 | Lightweight Aggregate (Clay): Reciprocating Grate Clinker Cooler | 39.0 |
| 11.21 | Phosphate Rock Processing: Roller Mill and Bowl Mill Grinding | 25.0 |
| 11.XX | Nonmetalic Minerals: Fluorspar Ore Rotary Drum Dryer | 10.0 |
| 12.10 | Primary Aluminum Production: Bauxite Ore Storage Storage | 50.0 |
| 12.15 | Storage Battery Production: Lead Oxide Mill | 32.8 |
| **Average Particle Size Distribution** | | **23.2** |

# Attachment B

# Revised BACT Analysis:

1) Modified Pulp Dryer (EU4)
2) Lime Kiln (EU28)
3) Lime Slaker (EU30)
4) Pellet Mills/Cooler (EU31)

# American Crystal Sugar Company
# Drayton Sugar Beet Processing Facility
# Revised BACT Analysis
# Pulp Dryer No. 1 (EU4) Modification

In July of 2017, the American Crystal Sugar Company (ACSC) Drayton (DTN) facility was issued permit to construct PTC17001, which authorized the replacement of Pulp Dryer No. 1 (EU4) with a new pulp dryer (EU27). EU4 has a nominal process rate of approximately 34.7 tons per hour (tph) of pressed pulp and 6.6 tph of coal for a combined total material permitted process rate of 41.3 tph. The heat input capacity of EU4 is 125 million British thermal units per hour (MMBtu/hr). The proposed new dryer, EU27, would have a nominal process rate of 110 tph pressed pulp and a heat input capacity of 230 MMBtu/hr.

During the engineering design review of the proposed project, it was determined that modification of the EU4 ID fan may allow increased pulp drying capacity such that it will meet the needs of the DTN facility. Modification of EU4 would be a more desirable solution from a capital expenditure standpoint versus complete replacement with EU27.

On November 29, 2018, the North Dakota Department of Environmental Quality (NDDEQ) approved DTN to proceed with trial operations and an engineering performance evaluation of EU4 to determine if the dryer could be modified and meet processing demands. DTN completed modifications to EU4, which include a higher capacity ID fan controlled with a variable frequency drive (VFD), associated ductwork and ancillary equipment, electrical, control instrumentation and an upgraded multiclone pollution control system. The post-modification pulp dryer has maximum process rate of 65 tph pressed pulp. The coal-firing capacity remains unchanged at 6.65 tph. The post-modification total material throughput is 71.65 tph.

PTC17001 was issued based on a Best Available Control Technology (BACT) analysis for the proposed new larger dryer (EU27) and did not include a BACT analysis for the modification of EU4. Therefore, to support the modification of EU4, the BACT analysis has been revised. The following subsections address each applicable pollutant emitted from the modified coal-fired direct contact pulp dryer (EU4) at the DTN facility.

## 1.0 BACT for PM

PM emissions from coal-fired combustion are a function of the combination of the burner firing configuration, operation practices, and fuel properties. PM emissions from coal-fired sources typically include ash from the combustion of the fuel, potential burning embers, and unburned carbon resulting from incomplete combustion. Because of the direct contact nature of the pulp dryer, the most significant portion of PM emissions result from the dryer process itself (i.e., particles of dried pulp entrained in the dryer exhaust).

The final proposed BACT emission limit contains a condensable particulate matter (CPM) component for compliance purposes, but the control technology evaluation is based on filterable PM emissions only.

CPM forms from the condensing of gases and/or vapors in a flue gas stream after combustion. This is a result of chemical reactions as well as the physical properties and phenomena of matter phase changes (i.e., solid/liquid/gas). In general, material that is not particulate matter at stack conditions can condense or react upon cooling and dilution by ambient air to form a particulate. This formation generally occurs within a few seconds after discharge from an exhaust stack. However, with typical exhaust gas velocities, the particulate matter is being formed (condensed) up to 100 feet away from the exhaust gas exit.

Aside from questions concerning the accurate quantification of CPM and test method performance, available control options for CPM are limited. The fact that much CPM formation occurs outside of the exhaust stack exit point, possibly as far as 100 feet away, makes control of CPM very difficult. The difficulty in control can be summarized in the following three questions:

1.) Can CPM formation be prevented? This would entail a form of combustion control that manages complete combustion and controls moisture in the combustion process. Furthermore, accurate real-time quantification of potential CPM formation would need to be developed in order to manage such combustion control. At this time no standard methods exist for this option.

2.) Can CPM be removed after formation? This is not technically feasible as it would require the capture of CPM formed outside of the exhaust point of the stack. In essence, it would be the control of secondary pollution formation in the ambient air.

3.) Can the stack conditions be altered to promote the formation and capture of CPM before release to the ambient air? In general, this would involve either significant dilution of flue gases in the exhaust stack or significant artificial cooling of hot combustion gases. Dilution of exhaust gases is strictly prohibited by most state air quality laws. Artificial cooling of the high volume exhaust gases from larger combustion sources would be extremely cost prohibitive.

The following paragraphs briefly address current particulate matter control technologies with respect to their technical feasibility for controlling CPM.

*Mechanical Collectors*: Mechanical collectors generally use the inertia of a moving particle in an exhaust gas stream to achieve particulate collection. A particle-laden exhaust stream is forced to rapidly change direction, either through cyclonic flow in a cylinder or by passing through a series of sieve plates in an impingement device. The mass of the particles in the exhaust stream causes them to move outside of the exhaust stream and impact on a collection surface where they then settle into a hopper or are collected in some other manner. Some mechanical collectors are specifically designed (and generally operated in series) to provide high efficiency particulate matter collection down to a particle size of one micrometer. However, as stated previously, at stack conditions, CPM is in a vapor or gaseous form, and thus has no significant difference in mass as compared to the surrounding exhaust gas. Therefore, inertial type mechanical collectors are not technically feasible for the capture of CPM.

*Particulate Scrubbers*: Particulate wet scrubbers exist in many forms. All particulate wet scrubber designs utilize particle and/or droplet inertia as the fundamental force to transfer particles from the gas steam to the liquid steam. Within a scrubber, particle laden air is forced to contact liquid droplets, sheets of liquid on packing material, or jets of liquid from a plate. As with the mechanical collectors, but on a smaller scale, the inertia of droplets or particles causes an impact with the collection media. However, vapors or gases with no significant mass with respect to the surrounding exhaust gases will pass around the "target" droplets, steams, or media. The ability of a particulate wet scrubber to remove particles primarily depends on the aerodynamic diameter of a particle, the velocity of a particle, and the velocity of droplets or collection media. Due to the extremely small (molecular) size of gases and vapors, they tend to follow Brownian diffusion, which means they diffuse slowly and primarily due to their interactions with gas molecules in the exhaust gas steam, and are not significantly influenced by inertia.

The only advantage provided by a wet particulate scrubber is the potential ability to reduce the exhaust gas stream temperature to a degree which will promote the condensation of a portion of the CPM. After condensation, the particulate matter will then have a larger diameter and mass, which will allow the mechanics of particle collection to function. However, based on the high temperature and flowrate of exhaust gases produced by most combustion sources, particulate wet scrubbers cannot sufficiently reduce the exhaust gas temperature to result in particle condensation. Therefore, particulate wet scrubbers are not technically feasible for the capture of CPM.

*Electrostatic Precipitators*: Electrostatic Precipitators (ESP) utilize non-uniform high voltage fields to apply large electrical charges to particulates moving through the field. The charged particles are then attracted to oppositely charged collection plates to promote particulate capture. Gases and vapors are not significantly influenced by the electrical fields and therefore are not captured by ESP devices. As with the other particulate collection devices, the temperature of the exhaust gas steam would need to be reduced to a degree that promotes the condensation of CPM to facilitate capture. As discussed, it is not economically feasible to reduce the exhaust gas temperature, therefore ESP devices are not technologically feasible for the capture of CPM.

*Fabric Filtration*: Fabric filters are used to collect particulate matter on the surface of filter bags. Most particles are collected by inertial impaction, interception and sieving. As particles are collected, the layer of particles, or filter cake, that develops increases the chances of capture by reducing the size of the fabric filter holes and increasing the chance for interception and sieving. Fabric filters have some limitations in that they are not used with corrosive or high moisture exhaust gas streams. Corrosive gases can destroy the integrity of the filters, leading to leaks, and high moisture exhaust gases will result in blinding (plugging) of the fabric filters when absorbed by the filter cake.

Despite the limitations, fabric filters offer some advantage for the capture of some specific CPM, especially when used in conjunction with other control devices. For example, sulfur trioxides ($SO_3$), which may react with moisture in the exhaust gases to form sulfuric acid mist ($H_2SO_4$), which is a CPM, can be collected on the surface of a fabric filter in the presence of a reagent such as lime. The presence of the lime, due to the implementation of $SO_2$ controls upstream of the fabric filter, results in a chemical reaction to remove the specific CPM. Fabric filters are therefore considered a technically feasible option for the control of limited and specific CPM emissions when used in conjunction with other control devices. However, as discussed below, fabric filter is not a feasible control option for the modified pulp dryer.

*Absorption*: Absorption will only be discussed briefly as such systems are generally cost-prohibitive with respect to the level of CPM control offered. In general, the use of an absorbent such as activated carbon can capture numerous gases and vapors prior to, and without necessity of, condensation. However, due to the large flowrates of the modified pulp dryer, the surface area and size of an absorption tower or bed would have to be prohibitively large to provide for proper residence time and collection efficiency. Therefore, although absorption is theoretically feasible, it is not practical for the modified pulp dryer.

In addition to excluding CPM, all cost evaluations are based on the assumption that TSP, $PM_{10}$ and $PM_{2.5}$ size fractions are equivalent as this presents the most conservative (worst-case) analysis.

### *1.1 Identification of PM Control Technologies*

The following sections identify potentially available control technologies for filterable PM (referred to as PM emissions) from coal-fired combustion processes. Additionally, the feasibility of the control technologies as applied to the operation of EU4 is addressed.

Control of PM emissions is achieved through the addition of equipment added downstream of the combustion device and pulp dryer drum. Five control technologies have been identified as alternatives for EU4: fabric filter baghouse, electrostatic precipitator (ESP), wet electrostatic precipitator (WESP), wet scrubber, and mechanical separator (cyclone/multiclone).

#### Fabric Filter Baghouse

Fabric filtration in a baghouse consists of a number of filtering bags that are suspended in a housing. The particulate-laden gas passes through the housing and collects on the fabric of the filter bag. Accumulated particulate matter on the bag surfaces enhance the filtering efficiency. Periodically, the accumulated material or "cake" is removed from the bags through the use of a physical mechanism such as shaking or pulsing the bags with compressed air. The dust is collected in a hopper and eventually removed.

Because of the very high moisture content of the exhaust gas stream from the pulp dryer, there is great potential for blinding/plugging any fabric filter control device used on the system. Furthermore, because of the direct contact nature of the dryer, there is also potential for burning pulp or coal embers to be transported to the fabric filter, which presents a fire safety issue. Therefore the application of a fabric filter to control PM emissions from the modified EU4 is not considered technically feasible.

#### Electrostatic Precipitator (Dry)

Electrostatic precipitators (ESPs) remove PM from the flue gas stream using the principle of electrostatic attraction. PM in the exhaust stream is charged with a very high direct current (DC) voltage and the charged particles are attracted to oppositely charged collection plates in the ESP. PM collected by the ESP continues to accumulate on the plates until removed by rapping the electrodes. The dust is then collected in a hopper for disposal. ESPs can handle large gas streams, high particulate loading and can operate at high temperature conditions. However, like baghouse fabric filters, ESPs do not function well with wet exhaust gas streams. Because the exhaust gas from the pulp dryer is saturated with moisture, there is the potential for buildup of particles on the collection plates, which reduces the collection effectiveness and requires additional maintenance, as well as the potential for electrical shorting. As a result of the saturated exhaust gas steam, ESPs are not considered a technically feasible option for the modified EU4.

Wet Electrostatic Precipitator

Wet electrostatic precipitators (WESPs) operate using the same principles as a standard ESP, but the final cleaning step is different. The collection surfaces are cleaned with water that can be delivered from spray nozzles or by condensing moisture from the flue gas. WESPs effectively reduce particle re-entrainment since the surfaces of the collection plates are constantly cleaned with liquid. WESPs also operate under higher electrical power than standard ESPs and enable higher reduction of very small particles. Operation of a WESP requires the collection and treatment and/or disposal of wastewater containing fly ash from the combustion device.

The operation of a WESP on the modified EU4 is assumed technically feasible. However, it should be noted that there are no known direct-fired pulp dryer operations that currently utilize WESP control, therefore, unknowns concerning particle resistivity could reduce anticipated collection efficiencies. However, humidity lowers the resistivity of most materials, therefore, it is anticipated that adequate collection efficiency could be maintained.

Wet Scrubber

Numerous wet scrubber designs can be used to control PM emissions with varying degrees of efficiency. Final design generally depends on the specific source type and target pollutants. Designs include mechanically aided scrubbers, orifice scrubbers, packed-bed scrubbers, packed tower scrubbers, spray chamber/spray tower scrubbers and venturi scrubbers.

Because PM is the sole pollutant of concern for the pulp dryer, the most effective wet scrubber design considering exhaust gas flow rate and particulate loading is a mechanically aided scrubber. Particulate laden gas enters the scrubber and is spun in a vortex like fashion due to the offset configuration of the gas inlet. The gas then passes upward through a series of spray rings where nozzles spray water downward into the rising gas. The spray nozzles produce rapidly moving water droplets that sweep PM from their path. Some droplets interact with each other and agglomerate into larger droplets that settle to the bottom of the scrubber. Other droplets move upward and enter turning vanes that work to spin and throw the droplets outwards to the scrubber wall where they collect and drop to the bottom of the scrubber.

Mechanically aided scrubbers are designed for many applications and are used extensively on a wide variety of industrial applications. Therefore, they are considered a technically feasible option for controlling PM emissions from the modified EU4.

Mechanical Separator

Mechanical separators (cyclones) operate through inertial separation of particles entrained in an exhaust gas stream. The collection efficiency varies as a function of particle size and cyclone design. Cyclone efficiency generally increases with particle size density, inlet duct velocity, cyclone body length, number of revolutions in the cyclone, ratio of cyclone body diameter to gas exit diameter, dust loading and cyclone wall smoothness.

Cyclones are designed for many applications and are used extensively on a wide variety of industrial applications. Additionally, groups of cyclones can be operated together in a single control device known as a multiclone. Cyclones and multiclones are considered a technically feasible option for controlling PM emissions from the modified EU4.

### *1.1.1 PM Control Technology Summary*

Table 1.1.1 summarizes the different PM control technologies and indicates which technologies have been chosen as technically feasible options for the modified EU4.

**Table 1.1.1 – PM Control Technology Summary**

| Identified Control Technology | Available and Demonstrated Effective | In Service On Similar Units | Technically Feasible for Pulp Dryer |
|---|---|---|---|
| Fabric Filter | Yes | No | No |
| ESP | Yes | No | No |
| WESP | Yes | No | Yes |
| Wet Scrubber | Yes | Yes | Yes |
| Cyclone/Multiclone | Yes | Yes | Yes |

### *1.1.2 Top-Down Ranking*

The PM control technologies that are considered technically feasible for implementation on the modified EU4 have been ranked from most to least effective in terms of PM emissions reduction potential. Table 1.1.2 summarizes the control technology ranking. The particulate control is expressed as a range to reflect the varied particle size distribution of $PM_{2.5}$, $PM_{10}$ and TSP.

**Table 1.1.2 – Top-Down Ranking of PM Control Technologies**

| Identified Control Technology | Percent PM Reduction |
|---|---|
| WESP | 90-99 |
| Wet Scrubber | 70-90 |
| Cyclone/Multiclone | 40-80 |

*1.2 Control Technology Evaluation*

The following sections present detailed evaluations of the feasible PM control technologies. Energy, environmental and economic impacts are also considered.

Wet ESP

As stated previously, WESPs remove PM from the flue gas stream using the principle of electrostatic attraction. PM in the exhaust stream is charged with a very high direct current (DC) voltage, and the charge particles are attracted to oppositely charged collection plates in the ESP. PM collected by the WESP is continually removed as the surfaces of the collection plates are constantly cleaned with liquid.

Under high pollutant loading conditions and where PM consists of relatively large particles (i.e. greater than 2 microns), it is typical to use a wet scrubber or spray chamber to reduce the load on the WESP. The use of wet scrubbers would also be necessary to reduce the exhaust gas temperature of the direct-fired dryer to an acceptable range of 170 to 190°F. Typical uncontrolled dryer temperatures are greater than 250°F. Additionally, for very large particles (i.e. greater than 10 microns), mechanical collectors such as multiclones are also necessary to prevent interference with removal of fine particulate in the scrubber, prevent plugging due to excess particulate buildup and to reduce the generation of excess wastewater and wet material disposal. The direct-contact process of the pulp dryer, in conjunction with high airflow, is anticipated to generate a high concentration of large particles as compared to other combustion related sources. Therefore it will be necessary to employee a cyclone and wet scrubber prior to the WESP to prevent overloading of this control system.

For BACT analysis purposes, a conservative 75 percent capacity factor was incorporated into emission estimates to provide a more accurate analysis with respect to annual control effectiveness costs and to reflect the fact that typical processing campaigns and pulp processing operations do not last for an entire year. Operating and control costs were performed assuming base (maximum) load operations and the 75 percent annual capacity factor. A summary of the estimated baseline and controlled PM emissions is provided in Table 1.2.1.

**Table 1.2.1 – Pulp Dryer Baseline PM Emission Rate and Wet ESP Control**

| Emission Unit Description | Baseline Emissions | | Controlled Emissions | |
|---|---|---|---|---|
| | Baseline Emission Rate (lb/hr)[A] | Annual Emissions (tpy)[B] | BACT Emission Rate (lb/hr)[C] | Annual Emissions (tpy)[B] |
| Pulp Dryer | 67.3 | 221.1 | 6.73 | 22.1 |

[A] Based on the existing EU4 multiclone controlled emission rate of 1.036 lb/ton pressed pulp (2015 source testing) and a post-modification pressed pulp throughput of 65 tons/hr.
[B] Assumed annual capacity factor of 75 percent.
[C] Based on an assumed control efficiency of 90 percent of baseline emissions.

As indicated in Table 1.2.1, the target controlled PM emission rate is 6.73 lb/hr. This corresponds to approximately 90 percent control of baseline PM emissions. Incorporating the 75 percent historical annual capacity factor, the overall reduction in PM emissions would be 199 tons per year. The reasons for the anticipated low control efficiency of 90 percent for the WESP system include the high flue gas flowrate of the pulp dryer, unknown resistivity of particulate and variable/inconsistent operation of the pulp dryer. Furthermore, it should be noted that the baseline emission level includes the existing multiclone control device. This is necessary to remove the large particles from the flue gas prior to entry to the wet ESP to prevent overloading, as described previously.

*Energy*: Direct energy penalties associated with the operation of a WESP system on the pulp dryer are mainly associated with electricity consumption required to operate the WESP. However, additional pumps and water supply will also create energy penalties. The amount of electricity consumed is related to the concentration of PM in the exhaust stream to be controlled.

*Environmental*: Detrimental environmental effects resulting from the use of a WESP system to control PM emissions from the pulp dryer include the production of wastewater sludge as a result of the collection of particles with water and a small amount of secondary air pollutant emissions as a result of power generation to meet the WESPs power consumption demand.

*Economic*: Table 1.2.2 presents the capital costs associated with the installation of a WESP for the pulp dryer to achieve a PM emission level of 6.73 lb/hr. Capital costs were based on standard engineering estimating practices presented in the EPA Air Pollution Control Cost Manual, Sixth Edition, January 2002, as well as additional applicable guidance from the EPA and other resources.

**Table 1.2.2 – WESP Capital Cost Summary**

| Description of Cost | Cost ($)[A] | Remarks |
|---|---|---|
| Equipment Costs[B] | 3,613,100 | Vendor estimate |
| Control/Instrumentation[C] | 361,300 | 10% of equipment cost |
| Sales Tax | 216,800 | 6% of equipment costs |
| Freight[C] | 180,700 | 5% of equipment costs |
| Total Equipment Costs (TEC) | 4,371,900 | |
| Total Installation Costs (TIC)/Balance of Plant Costs | 3,016,600 | Based on percentage of TEC: 4% Foundation and Supports, 50% Erection, 8% Electrical, 1% Piping, 4% Painting, 2% Insulation |
| Site Preparation[D] | 750,000 | Estimated based on similar project conditions |
| **Total Direct Investment (TDI)** | **8,138,500** | **TEC + TIC + Site Preparation = TDI** |
| Contingency | 131,200 | 3% of TEC |
| Engineering | 874,400 | 20% of TEC |
| Construction and Field Expense | 874,400 | 20% of TEC |
| Contractor Fees | 437,200 | 10% of TEC |
| Start-Up Assistance | 43,700 | 1% of TEC |
| Performance Test | 43,700 | 1% of TEC |
| Model Study | 87,400 | 2% of TEC |
| **Total Indirect Investment (TII)[C]** | **2,492,000** | |
| **Total Capital Investment (TCI)** | **10,630,500** | **TDI + TII = TCI** |

[A] Values rounded to nearest $100.
[B] Capital costs scaled from 2015 vendor estimate for similar equipment.
[C] Direct and indirect cost percentages estimated from EPA’s Air Pollution Control Cost Manual, Sixth Edition, January 2002 for ESPs.
[D] Estimated by HDR.

As indicted in Table 1.2.2, the total capital investment for the WESP equipment is estimated to be $10,748,500. Table 1.2.3 presents the annual operating costs associated with the WESP. Annual operating costs include operation labor, maintenance and electricity costs.

**Table 1.2.3 – WESP Annual Cost Summary**

| Description of Cost | Cost ($)[A] | Remarks |
|---|---|---|
| ESP Operator | 61,600 | 1 hour per shift at $75 |
| ESP Supervisor | 9,200 | 15% of operator costs |
| ESP Coordinator | 20,300 | 33% of operator costs |
| ESP Maintenance Labor | 15,400 | ¼ hour per shift at $75 |
| ESP Maintenance Material | 30,000 | 1% of TEC |
| Solids Disposal | 2,700 | $20/ton @ 2 miles and 0.50/ton-mile |
| Electricity Costs[C] | 92,200 | $0.06 x 234 kW-hr x 8760 hr x 75% capacity |
| **Direct Annual Costs (DAC)[B]** | **231,400** | |
| Overhead | 81,900 | 60% of O&M Labor and Materials |
| Administrative Charges | 212,600 | 2% of TCI |
| Property Tax | 106,300 | 1% of TCI |
| Insurance | 106,300 | 1% of TCI |
| WESP Capital Recovery[D] | 1,167,100 | (TCI) x (CRF of 0.10979) |
| **Indirect Annual Costs (IAC)** | **1,674,200** | |
| **Total Annualized Costs (TAC)** | **1,905,600** | **DAC + IAC = TAC** |

[A] Values rounded to nearest $100. All direct and annual costs adjusted to 75% capacity factor.
[B] Direct and indirect cost percentages estimated from EPA's Air Pollution Control Cost Manual, Sixth Edition, January 2002, for ESPs.
[C] Based on actual average energy cost of $0.06/kW.
[D] Capital Recovery Factor (CRF) based on 15-year life and an interest rate of 7%, EPA Air Pollution Control Cost Manual, January 2002, Table A2.

Total current year annualized costs for the WESP system are calculated as the sum of the current year operating costs, plus a capital recovery factor multiplied by the total installed costs. A historical 75 percent capacity factor is also included. The total annualized costs to maintain a 6.73 lb/hr PM emission level for the pulp dryer is estimated to be $1,905,600. Based on the emissions information presented in Table 1.2.1, the annual reduction in PM emissions would be 199.0 tons per year. The resulting cost effectiveness for installing and operating the WESP is estimated at $9,600/ton of PM removed.

The calculated cost effectiveness does not include the installation of a flue gas quenching system or wet scrubber to reduce the flue gas temperature from 250 °F to a suitable operating temperature for the wet ESP. Therefore, the presented cost effectiveness is conservatively low and would be anticipated to be significantly higher. Based on the lowest annualized scrubber costs presented in Table 1.2.5, an additional $2,400/ton of PM removed would be required to provide a simple quenching system to reduce flue gas temperature. Therefore, the total cost effectiveness would likely be on the order of $12,000/ton of PM removed.

<u>Wet Scrubber</u>

As stated previously, wet scrubbers remove PM from the flue gas stream using the principle of particle and/or droplet inertia as the fundamental force to transfer particles from the gas stream to the liquid stream. Within a scrubber, particle laden air is forced to contact liquid droplets.

Is indicated in Table 1.1.2, the control effectiveness of wet scrubbers and multiclones, as applied to direct contact coal-fired pulp dryers, has significant overlap. Meaning, wet scrubbers may not provide significantly greater control than high efficiency multiclones. ACSC currently employees a multiclone and wet scrubber system on their coal-fired pulp dryer at the Hillsboro (HLB) facility. Historically, the scrubber at HLB has resulted in very high maintenance costs and questionable performance. It has been redesigned several times in order to meet compliance with current emission limitations. This evidences the harsh conditions and difficulty controlling PM emissions with a scrubber on a direct contact dryer. In addition to the maintenance concerns, operation of a wet scrubber results in a significant amount of wastewater. Because DTN does not have a wastewater treatment system similar to HLB, this is anticipated to result in a significant additional cost to install a pretreatment system to allow the generated wastewater to be disposed of in the existing treatment pond system.

It is anticipated that a wet scrubber would provide a control effectiveness of 85% given that the pulp dryer already has some emission control from the existing multiclone system. For BACT analysis purposes, a conservative 75 percent capacity factor was incorporated into emission estimates to provide a more accurate analysis with respect to annual control effectiveness costs. As indicated previously, typical processing campaigns do not last for an entire year. Furthermore, pulp processing operations do not last the entire length of the processing campaign. Operating and control costs were performed assuming base (maximum) load operations and the 75 percent annual capacity factor. A summary of the estimated baseline and controlled PM emissions is provided in Table 1.2.4.

**Table 1.2.4 – Pulp Dryer Baseline PM Emission Rate and Scrubber Control**

| Emission Unit Description | Baseline Emissions | | Controlled Emissions | |
|---|---|---|---|---|
| | Baseline Emission Rate (lb/hr)[A] | Annual Emissions (tpy)[B] | BACT Emission Rate (lb/hr)[C] | Annual Emissions (tpy)[B] |
| Pulp Dryer | 67.3 | 221.0 | 10.1 | 33.2 |

[A] Based on the existing EU4 multiclone controlled emission rate of 1.036 lb/ton pressed pulp (2015 source testing) and a post-modification pressed pulp throughput of 65 tons/hr.
[B] Assumed annual capacity factor of 75 percent.
[C] Based on an assumed control efficiency of 85 percent of baseline emissions.

As indicated in Table 1.2.1, the target controlled PM emission rate is 10.1 lb/hr. This corresponds to approximately 85 percent control of baseline PM emissions. Incorporating the 75 percent historical annual capacity factor, the overall reduction in PM emissions would be 188 tons per year. The reasons for the anticipated low control efficiency of 85 percent for the wet scrubber system include the high flue gas flowrate of the pulp dryer, variable/inconsistent operation of the pulp dryer, and experience with scrubber functionality at the ACSC HLB facility.

*Energy*: Direct energy penalties associated with the operation of a wet scrubber system on the pulp dryer are mainly associated with electricity consumption required to operate water pump systems. Additional pumps and water supply will create energy penalties. The amount of electricity consumed is related to the concentration of PM in the exhaust stream to be controlled.

*Environmental*: Detrimental environmental effects resulting from the use of a wet scrubber system to control PM emissions from the pulp dryer include the production of wastewater sludge as a result of the collection of particles with water.

*Economic*: Table 1.2.5 presents the capital and annual costs associated with the installation of a wet scrubber system for the pulp dryer to achieve a PM emission level of 10.1 lb/hr. Capital and annual costs were based on information obtained from the EPA Air Pollution Control Fact Sheet for Mechanically-Aided Scrubbers (EAP452/F-03-013). Because of the relatively minor level additional control of PM that would be anticipated to result from the operation of the wet scrubber system in conjunction with the existing multiclone system, detailed cost estimates were not obtained from vendors. The anticipated excessive cost effectiveness resulting from the minor level of additional control did not warrant further investigation.

**Table 1.2.5 – Wet Scrubber Capital and Annual Cost Summary**

| Description of Cost | Cost ($)[A] | Remarks |
|---|---|---|
| Capital Equipment Costs[A] | 330,200 – 2,159,000 | Range of costs presented in EPA fact sheet |
| Annualized Operating Costs[B] | 431,800 – 10,287,000 | Range of costs presented in EPA fact sheet |

[A] Based on $2.60 to $17 per cfm.
[B] Based on $3.40 to $81 per cfm.

As indicated in Table 1.2.5, there is a significant range in capital and annual operating costs for a scrubber system. Based on the fact that the wet scrubber system would be retrofit to an existing dryer system, it is anticipated that the installation costs would be significantly higher than for a new system due to space constraints. Therefore, it is estimated that capital equipment costs would be in the upper end of the range provided.

Annual operating costs would be influenced by three primary factors, which include the size of the dryer (and commensurate airflow), the source operation characteristics, and wastewater disposal. The large airflow from the dryer would provide some economy of scale. Smaller units controlling low concentration waste streams are generally more expensive on a cfm basis. However, given the challenges associated with operations of the HLB scrubber, including corrosive environment, maintenance, and wastewater disposal it is anticipated that the annualized operating costs will be in the middle of the presented range.

Based on the emissions information presented in Table 1.2.4, the annual reduction in PM emissions would be 188 tons per year. The resulting range of cost effectiveness for installing and operating a wet scrubber system is estimated at $28,500 per ton of PM removed. The cost effectiveness was calculated from the mid-point of the annualized operating cost range.

Cyclone/Multiclone

As stated previously, DTN currently uses a multiclone system to control PM emissions from the pulp dryer. The multiclone system is a mechanical separator that operates through inertial separation of particles entrained in an exhaust gas stream.

As part of the current project, DTN completed aspiration airflow changes to the multiclone/dryer system and contracted with Boiler & Steam Systems, LLC to replace the existing multiclone system with an upgraded multiclone collector, new drop-out dust collector and new inlet and outlet ducting. Based on engineering testing before and after the multiclone changes, the new system provides an additional 30 percent reduction in overall PM emissions from the dryer. Capital equipment costs for the dust collector upgrade were on the order of $784,300. Detailed installation and annual operating costs were not calculated because this technology was selected as BACT.

A summary of the estimated baseline and controlled PM emissions is provided in Table 1.2.6.

**Table 1.2.6 – Pulp Dryer Baseline PM Emission Rate and Upgraded Multiclone Control**

| Emission Unit Description | Baseline Emissions | | Controlled Emissions | |
|---|---|---|---|---|
| | Baseline Emission Rate (lb/hr)[A] | Annual Emissions (tpy)[B] | BACT Emission Rate (lb/hr)[C] | Annual Emissions (tpy)[B] |
| Pulp Dryer | 67.3 | 221.1 | 48.0 | 157.7 |

[A] Based on the existing EU4 multiclone controlled emission rate of 1.036 lb/ton pressed pulp (2015 source testing) and a post-modification pressed pulp throughput of 65 tons/hr.
[B] Assumed annual capacity factor of 75 percent.
[C] Based on an assumed control efficiency of 30 percent of baseline emissions.

## *1.3 Proposed PM BACT Selection*

Table 1.3.1 summarizes the results of the Top-Down BACT analysis for PM emissions. Note that the emission rate baseline for calculating costs is the use of the existing (pre-upgrade) multiclone control device to remove large particles in order to reduce the loading to and allow proper operation of the WESP and scrubber systems. Furthermore, as discussed previously, a historical annual capacity factor of 75 percent has been included in the emission calculations to more accurately reflect actual project utilization of the modified pulp dryer and associated control equipment.

**Table 1.3.1 – Summary of Top-Down BACT for PM Emissions from the Pulp Dryer**

| Control Alternative | Emission Level (lb/hr, tpy) | Emission Reduction (tpy) | Annualized Costs ($/yr) | Cost Effectiveness ($/ton) | Adverse Impact (Yes/No) |
|---|---|---|---|---|---|
| WESP | 6.73, 22.1 | 199 | 2,406,200[A] | 12,100 | No |
| Multiclone/Scrubber | 10.1, 33.2 | 188 | 4,810,800 | 25,600 | No |
| Upgraded Multiclone | 48.0, 158 | 63.4 | - | - | - |

[A] Annualized cost includes WESP and scrubber flue gas quenching system.

The fundamental obstacle to adding a WESP or scrubber system to the pulp dryer to control PM emissions is the overall economics in comparison to the amount of emission reduction.

In light of the prohibitive cost of adding a WESP or scrubber system to the pulp dryer, BACT for PM is proposed as use of the upgraded multiclone control. Table 1.3.2 lists the PM emission limitation proposed as BACT under typical operating ranges for the pulp dryer.

**Table 1.3.2 – Proposed PM BACT Emission Limit**

| Emission Unit | BACT Limit | Control Type |
|---|---|---|
| Pulp Dryer | PM: 48.0 lb/hr (0.74 lb/ton of pressed pulp)<br>3-hour average filterable only.<br>$PM_{10}$: 88.8 lb/hr (1.37 lb/ton of pressed pulp)<br>3-hour average filterable and condensable.<br>$PM_{2.5}$: 81.6 lb/hr (1.26 lb/ton of pressed pulp)<br>3-hour average filterable and condensable. | Multiclone |

The BACT analysis for PM focused only on controlling filterable particulate matter. However, as indicated in Table 1.3.2 the proposed final particulate matter limit incorporates both condensable and filterable fractions for $PM_{10}$ and $PM_{2.5}$. The combined condensable/filterable limit will provide the most flexibility with regard to compliance demonstrations, in which various test method interferences have indicated the potential for a high degree of variability in results.

### *1.4 RBLC Database Review*

Information concerning recently permitted industrial process dryers was obtained from the EPA's RBLC. Due to the lack of available data presented in the RBLC for process dryers similar to the method of operation of the proposed pulp dryer, only one representative emission source was found. This source is the pulp dryer installed at the ACS Hillsboro facility in 1997.

The DTN pulp dryer is approximately one-third the size of the Hillsboro facility pulp dryer and has differences in the internal dryer configuration. The size and configuration difference result in different operational efficiencies that make it difficult to do a direct, scaled comparison in emissions. The Hillsboro pulp dryer was permitted with a PM BACT emission limit of 52.0 lb/hr utilizing a multiclone followed by a wet scrubber. As indicated previously, due to retrofit costs leading to a high cost-effectiveness and the necessity of disposing of additional wastewater, the addition of a scrubber for the Drayton pulp dryer was ruled out. The proposed BACT limit for the Drayton pulp dryer is 48.0 lb/hr, utilizing a multiclone.

## 2.0 BACT for $SO_2$

Control of $SO_2$ emissions from fuel-combustion sources, such as EU4, can be accomplished through two approaches: removal of elemental sulfur from the fuel prior to combustion, and flue gas desulfurization (FGD), which consists of removal of $SO_2$ from flue gas after combustion (post-combustion control).

Many oil refineries operate catalyst-based desulfurization units to remove organic sulfur from liquid crude oil. However, in solid fuels, such as coal, a significant fraction of the sulfur is in the form of pyrite ($FeS_2$) or other mineral sulfates. It is possible to remove some mineral sulfates through physical processes such as washing and/or chemical processing. However, desulfurization of solid fuels is generally viewed as inefficient and expensive. Furthermore, it is unlikely that sufficient desulfurization of solid fuels can be accomplished to meet anticipated emission requirements. Therefore removal of sulfur from the coal prior to combustion will not be considered a viable option for this BACT analysis.

## *2.1 Identification of $SO_2$ Control Technologies*

The following sections identify potentially available control technologies for coal-fired combustion processes. Additionally, the feasibility of the control technologies as applied to the operation of the modified EU4 is addressed.

FGD technologies can be divided into two main categories, regenerative and throwaway processes. Regenerative processes recover sulfur in a usable form that can be sold as a reusable sulfur product. Throwaway processes remove sulfur from flue gas and scrubber byproducts are subsequently discarded. FGD technologies employed on relatively high sulfur fuels, such as eastern coal, can achieve control efficiencies in excess of 95 percent. However, for relatively low sulfur fuels, such as western subbituminous coal, removal efficiencies may be lower than 80 percent.

Regenerative processes, by nature, contain a regeneration step in the FGD process that results in higher costs than throwaway processes due to equipment and operation expenses. However, in instances where disposal options are limited and markets for recovered sulfur products are readily available, regenerative processes may be used. Potential regenerative processes that are available include the Wellman-Lord (W-L) process, magnesium oxide process, citrate scrubbing process, Flakt-Boliden process, aqueous carbonate process, Sulf-X process, Conosox process, Westvaco process and adsorption of $SO_2$ by a bed of copper oxide.

A newer regenerative process that was developed as an indirect result of collaborative research with the former U.S. Bureau of Mines and the University of Minnesota is the Pahlman process. The Pahlman process is a dry removal technology that can remove multiple pollutants ($NO_x$ and $SO_2$) at efficiencies greater than 99 percent. As a regenerative process, the Pahlman process purportedly reduces problems associated with waste disposal and creates a commercially valuable byproduct. In the closed-loop process, the Pahlmanite sorbent repeatedly captures $NO_x$ and $SO_2$, which upon regeneration, yields raw sulfates and nitrates. The Pahlman process is a new technology that has been pilot tested at several industrial sites, including smaller coal-fired electrical generating plants. However, proven technical feasibility with application to industrial sources such as the modified EU4, has yet to be demonstrated. Therefore, this new regenerative technology will not be considered commercially available for this BACT analysis.

Throwaway processes such as limestone scrubbing have become widely accepted by the coal-fired power industry. Because the throwaway process can achieve the same removal efficiencies as regenerative processes and cost less, this BACT analysis for $SO_2$ will focus on throwaway processes and further discussion of regenerative processes will not be considered.

Throwaway processes can be divided into two categories, wet and dry. Wet or dry refers to the state of the waste by-products. Both wet and dry technologies have advantages and disadvantages with respect to initial capital and operational expenses.

Wet FGD

Wet scrubbing (wet FGD) systems used for $SO_2$ reduction typically consist of the following operations: scrubbing or absorption, lime handling and slurry preparation, sludge processing, and flue gas handling.

Wet FGD technology is a well-established process for removing $SO_2$ from flue gas. In wet scrubbers, the flue gas enters a spray tower or absorber where it is sprayed with a water slurry, which is approximately 10 percent lime or limestone. Sodium alkali solutions can also be used in FGD systems, however these processes are considerably more expensive than lime. The preferred sorbents are limestone and lime, respectively, due to the availability and relatively low cost of limestone. Calcium in the slurry reacts with the $SO_2$ in the flue gas to form calcium sulfite or calcium sulfate. The overall chemical reaction can be simply expressed as:

$$SO_2 + CaCO_3 \rightarrow CaSO_3 + CO_2$$

Spent slurry from the reaction tank is pumped into a thickener where solids settle before being filtered for final dewatering to approximately 50 percent solids. Water removed during this process is sent to a process water holding tank, which eventually will require wastewater treatment. In a non-regenerative system, the waste sludge must also be disposed of properly.

Most wet FGD systems have two stages, one for fly ash removal and one for $SO_2$ removal. The flue gas normally passes first through a fly ash removal device, either an electrostatic precipitator (ESP) or a bag filter, and then into the $SO_2$ absorber. There are many different types of absorbers that can be used in wet FGD systems, including: spray towers, venturis, plate towers, and mobile packed beds. However, many of these systems can result in scale buildup, plugging or erosion, which can affect the dependability and efficiency of the absorber. Therefore, simple scrubbers such as spray towers are commonly used. The chief drawback of the spray tower design is that it requires a higher liquid-to-gas ratio for equivalent removal of $SO_2$ to other absorber designs.

Wet FGD systems have been in operation in the United States for several years and are used widely throughout the coal-fired electric utility industry. Additionally, simple spray towers and venturi scrubbers have been used on direct contact process dryer applications. Therefore, wet FGD systems are considered technically feasible for implementation on the modified EU4.

Dry FGD

In contrast to wet scrubbing systems, dry FGD (spray dryer) systems use much smaller amounts of liquid. With a spray dryer system, the flue gases enter an absorbing tower (dryer) where the hot gases are contacted with a finely atomized slurry, which is usually a calcium-based sorbent such as calcium hydroxide or calcium oxide (lime). Acid gases and $SO_2$ are absorbed by the slurry mixture and react to form solid salts. The heat of the flue gas evaporates the water droplets in the sprayed slurry, and a non-saturated flue gas exits the absorber tower. The absorption process is also somewhat temperature dependent. Cooler flue gases allow the acid gases to more effectively react with the sorbents. The overall chemical reactions can be simply expressed as:

$$Ca(OH)_2 + SO_2 \rightarrow CaSO_3(s) + H_2O$$

$$Ca(OH)_2 + 2HCl \rightarrow CaCl_2\ (s) + 2H_2O$$

As can be seen above, one mole of calcium hydroxide will neutralize one mole of $SO_2$, whereas one mole of calcium hydroxide will neutralize two moles of hydrochloric acid (HCl). A similar reaction occurs with the neutralization of hydrofluoric acid (HF). These reactions demonstrate that when using a spray dryer the HCl and HF are removed more readily than $SO_2$. Reagent requirements should consider that the HCl and HF are removed first, followed by the reagent quantity required to remove the $SO_2$[1].

The exhaust stream exiting the absorber contains fly ash, calcium salts, and un-reacted lime, which must be sent to a particulate control device such as a fabric filter (baghouse). The particulate control device not only is necessary to control particulate matter, but also aids in acid-gas removal. Acid gases are removed when the flue gas comes in contact with the lime-containing particles on the surface of the baghouse. Modern dry FGD systems include a loop to recycle a portion of the baghouse-collected material for re-use in the FGD module because this material contains a relatively high amount of unreacted lime.

Dry FGD systems are currently used for many coal-fired utility boilers and some industrial boilers. However, a primary difference in coal-fired boiler application vs. coal-fired pulp dryer application is the temperature and moisture content of the exhaust gas. Pulp dryer exhaust gas temperatures are typically less than 250°F, which is about half the exhaust gas temperature of a typical coal-fired boiler. Pulp dryer exhaust gases are also in the range of 35 to 40 percent moisture as compared to 10 percent or less in a typical coal-fired boiler. The low exhaust gas temperature and high moisture content presents a problem with respect to dry FGD operation as there is not enough heat to effectively evaporate the injected slurry mixture. Furthermore, limiting the slurry injection rate to accommodate the reduced evaporation potential would result in reduced effectiveness of the $SO_2$ control. Additionally, as the exhaust gas passes through the dry FGD system the temperature is further reduced, which promotes the condensation of acid gases. The acid gases are corrosive to the components of the exhaust gas system and reduce the life of the system as well as increase maintenance costs. Finally, the application of a baghouse as part of the dry FGD system is not technically feasible as the high moisture content of the exhaust gases from the dryer process leads to blinding (plugging) of the fabric filter.

[1] Karl B. Schnelle, Jr. and Charles A. Brown, Air Pollution Control Technology Handbook, CRC Press, 2002.

Because of the technical issues affecting the proper operation of a dry FGD system and the fact that there are no known installations of dry FGD systems on coal-fired pulp dryers in the United States, dry FGD is not considered technically feasible for implementation on the modified EU4 and will not be addressed further in this BACT.

<u>Dry Sorbent Injection (DSI)/Fabric Filter</u>

Dry Sorbent Injection (DSI) $SO_2$ scrubber systems consist of a dry powder $SO_2$ control reagent that is injected into a flue gas stream ahead of a particulate collection device, which is most often a fabric filter. The dry powdered injection does not require a slurry mix system or additional cooling of the flue gas for drying of the slurry; however, the $SO_2$ reaction and resulting control efficiency is not as great as with the slurry systems (dry FGD).

Several dry DSI systems have been installed on municipal solid waste and hospital medical waste-fired incinerator systems in the United States in the past several years. There are currently no known operating coal-fired pulp dryer facilities in the United States that employ DSI systems.

With respect to technical feasibility, the DSI and fabric filter system has some of the same issues as discussed with the dry FGD system. Because of the high moisture content of the exhaust gases, the fabric filter associated with the system would be subject to blinding and therefore not feasible for use. Injection of reagent prior to the current multiclone control device would also not be feasible as the reagent would combine with the pulp that is being dried, thus reducing the effectiveness of control as well as contaminating the dried pulp which is sold as a livestock food supplement. Therefore, dry injection fabric filter systems are not considered technically feasible for implementation on the modified EU4 and will not be addressed further in this BACT analysis.

<u>Inherent Process Controls</u>

Any proposed add on flue gas control for the proposed pulp dryer must be evaluated with respect to the inherent $SO_2$ control experienced by normal dryer operations. The resulting effectiveness of any add-on $SO_2$ control will be greatly reduced as a result of the low concentration of $SO_2$ in the exhaust gas stream. The maximum $SO_2$ emission rate from the modified EU4, based on typical coal sulfur content and heat content, would be expected to be approximately 116 lbs/hr, or 17.5 lbs/ton of coal combusted (9,400 Btu/lb coal at 0.5 percent S). Historic stack test data for EU4 shows average $SO_2$ emission rates ranging from 3.1 to 3.8 lb/ton of coal combusted. This indicates that through both retention of sulfur in the coal ash and $SO_2$ adsorbed by the pulp during the drying process a significant amount of $SO_2$ is removed by the inherent scrubbing properties of the dryer process. Inherent process controls are considered the baseline emission level for BACT analysis purposes.

### *2.1.1 $SO_2$ Control Technology Summary*

Table 2.1.1 summarizes the different $SO_2$ control technologies and indicates which technologies have been chosen as technically feasible options for EU4.

**Table 2.1.1 – $SO_2$ Control Technology Summary**

| Identified Control Technology | Available and Demonstrated Effective | In Service On Similar Units | Technically Feasible for Pulp Dryer |
|---|---|---|---|
| Wet FGD | Yes | No | Yes |
| Dry FGD | Yes | No | No |
| DSI | Yes | No | No |

### *2.1.2 Top-Down Ranking*

The $SO_2$ control technologies that are considered technically feasible for implementation on EU4 have been ranked from most to least effective in terms of emission reduction potential. Table 2.1.2 summarizes the control technology ranking. The percent $SO_2$ reduction for wet FGD is listed as a range because it is dependent on the $SO_2$ concentration of the inlet exhaust gas stream. Higher concentration exhaust gas streams would experience higher levels of control.

**Table 2.1.2 – Top-Down Ranking of $SO_2$ Control Technologies**

| Identified Control Technology | Percent $SO_2$ Reduction |
|---|---|
| Wet FGD | 50-90 |

## *2.2 Control Technology Evaluation*

The following sections present detailed evaluations of the feasible $SO_2$ control technologies. Energy, environmental and economic impacts are considered.

Wet FGD

There are numerous operating parameters that can affect the $SO_2$ removal rate of the wet FGD system such as: liquid-to-gas ratio, pH, gas velocity, residence time, gas distribution, scrubber design and turndown. Additionally, fuel properties such as heating value, moisture content, sulfur content, ash content, and chlorine content play a significant role. Another design consideration with wet FGD systems is that the saturated flue gas exiting the absorber still contains some $SO_2$. This can lead to the formation of corrosive acid gases that are damaging to downstream equipment. To minimize corrosion of the downstream equipment, the gases can be reheated to temperatures above the dew point, or construction materials and design conditions can be selected to withstand the corrosive conditions.

Both of these alternatives increase the capital and operating cost of the system. Reheaters can also experience operational problems ranging from acid attack on reheater components to vibration, which causes structural deterioration.

Another potential problem with wet FGD systems using limestone as a reagent is that calcium sulfite in the sludge produced by the system settles and filters poorly. This problem can be remedied using a forced oxidation system in a designated section of the absorber or in a separate oxidation tank. This process creates calcium sulfate (gypsum), which is easily filtered and sometimes marketed as a material for production of drywall. The forced oxidation process also helps to prevent scale buildup by removing calcium sulfites through conversion to calcium sulfate, thus preventing calcium sulfites from oxidizing and precipitating out in the scrubber internal areas. Scaling and oxidation can also be reduced through the use of chemical inhibitors such as magnesium and dibasic acid. The necessary reduction of scaling in wet FGD equipment increases the operational cost for these systems.

Wet FGD processes also produce a sludge waste, which must be disposed of properly. In these processes, the scrubbing liquid can be recycled or regenerated, but no useful product is obtained from the sludge. Additionally, wastewater treatment is required for the process wastewater produced by wet FGD systems.

For BACT analysis purposes, a conservative 75 percent capacity factor was incorporated into emission estimates to provide a more accurate analysis with respect to annual control effectiveness costs. As indicated previously, typical processing campaigns do not last for an entire year. Furthermore, pulp processing operations do not last the entire length of the processing campaign. Operating and control costs were performed assuming base (maximum) load operations and the 75 percent annual capacity factor. A summary of the estimated baseline and controlled $SO_2$ emissions is provided in Table 2.2.1.

**Table 2.2.1 – Pulp Dryer Baseline $SO_2$ Emission Rate**

| Emission Unit Description | Baseline Emissions | | Controlled Emissions | |
|---|---|---|---|---|
| | Baseline Emission Rate (lb/hr)[A] | Annual Emissions (tpy)[B] | BACT Emission Rate (lb/hr)[C] | Annual Emissions (tpy)[B] |
| Pulp Dryer | 46.6 | 153.1 | 18.6 | 61.2 |

[A] Based on current inherently controlled emission rate of 0.72 lb/ton of pressed pulp (7.0 lb $SO_2$/ton coal based on AP42 and 60% inherent control, 6.65 tph firing rate, 0.5 percent S).
[B] Assumed annual capacity factor of 75 percent.
[C] Based on an assumed control efficiency of 60 percent of baseline emissions.

As indicated in Table 2.2.1, the target controlled $SO_2$ emission rate is 18.6 lb/hr. This corresponds to approximately 60 percent control of baseline uncontrolled $SO_2$ emissions. Incorporating the 75 percent historical annual capacity factor, the overall reduction in $SO_2$ emissions would be 91.9 tons per year. The reasons for the anticipated low control efficiency of 60 percent for the wet FGD system include the low inlet concentration of $SO_2$ into the wet FGD as a result of inherent process control, as well as the fact that the low temperature, high moisture, dryer exhaust gas stream will reduce the evaporation and chemical reaction within the wet FGD system.

*Energy*: Use of wet FGD to control $SO_2$ emissions from the pulp dryer will result in significant energy penalties to facility operations in the form of the electricity demand required for operation of the ancillary equipment, as well as additional backpressure on the exhaust system that results in a slight reduction in output.

*Environmental*: The primary detrimental environmental effect of the Wet FGD system is the creation of waste byproducts from the spent slurry. Dewatering of the spent slurry results in the production of a wastewater stream as well as a waste sludge that must be disposed in a landfill.

*Economic*: Because of the anticipated low $SO_2$ removal amount of 91.9 tons per year, a complete detailed cost analysis for a wet scrubber was not performed. Instead, information from the EPA Air Pollution Control Technology Fact Sheet for spray-chamber/spray-tower wet scrubbers was used to determine an order of magnitude cost. Based on information presented in the fact sheet the high exhaust gas flowrate of the pulp dryer combined with the low pollutant concentration would likely result in higher typical operating costs. Using the average costs presented in the fact sheet, anticipated annualized costs would be on the order of $25 per scfm. This value is assumed to be conservatively low considering it is expressed in 2002 dollars. Combined with the flow rate of the pulp dryer (114,000 scfm), the calculated annualized costs would be $2,850,000 per year, which would result in cost effectiveness of $31,000 per ton of $SO_2$ removed.

### *2.3 Proposed $SO_2$ BACT Selection*

Table 2.3.1 summarizes the results of the Top-Down BACT analysis for $SO_2$ emissions. Note that the emission rate baseline for calculating costs is the use of inherent process controls and the combustion of low sulfur western coals. Furthermore, as discussed previously, a historical annual capacity factor of 75 percent has been included in the emission calculations to more accurately reflect actual project utilization of the modified pulp dryer and associated control equipment.

**Table 2.3.1 – Summary of Top-Down BACT for $SO_2$ Emissions from the Pulp Dryer**

| Control Alternative | Emission Level (lb/hr, tpy) | Emission Reduction (tpy) | Annualized Costs ($/yr) | Cost Effectiveness ($/ton) | Adverse Impact (Yes/No) |
|---|---|---|---|---|---|
| Wet-FGD | 18.6, 61.2 | 91.9 | 2,850,000 | 31,000 | No |
| Inherent Controls (Baseline) | 46.6, 153.1 | - | - | - | - |

The fundamental obstacle to the use of a wet-FGD system to control $SO_2$ emissions from the modified EU4 is the overall economics in comparison to the amount of emission reduction. The overall annualized cost to meet a $SO_2$ emission limit of 18.6 lb/hr (0.29 lb/ton presed pulp) is judged to be excessive. In light of the prohibitive cost of add-on $SO_2$ controls, BACT for the pulp dryer is proposed as the use of low sulfur western coals in conjunction with the emission limit presented in Table 2.3.2 below.

**Table 2.3.2 – Proposed $SO_2$ BACT Emission Limit**

| Emission Unit | BACT Limit | Control Type |
| --- | --- | --- |
| Pulp Dryer | 46.6 lb/hr (0.72 lb/ton of pressed pulp)<br><br>3-hour average | Low Sulfur Coal, Good Combustion Practice |

*2.4 RBLC Database Review*

Information concerning recently permitted industrial process dryers was obtained from the EPA's RBLC. Due to the lack of available data presented in the RBLC for process dryers similar to the method of operation of the proposed pulp dryer, only one representative emission source was found. This source is the pulp dryer installed at the ACS Hillsboro facility in 1997.

The DTN pulp dryer is approximately one-third the size of the Hillsboro facility pulp dryer and has differences in the internal dryer configuration. The size and configuration difference result in different operational efficiencies that make it difficult to do a direct, scaled comparison in emissions. The Hillsboro pulp dryer was permitted with a $SO_2$ BACT emission limit of 63.3 lb/hr utilizing good combustion practices. The proposed BACT limit for the modified EU4 is 46.6 lb/hr, also utilizing inherent process controls and low sulfur coal.

## 3.0 BACT for $NO_x$

The primary form of $NO_x$ emissions control for the modified EU4 would be through the application of combustion controls or flue gas treatment (post-combustion) technologies. Combustion-based $NO_x$ formation control processes reduce the quantity of $NO_x$ formed during the combustion process. Post-combustion technologies reduce the $NO_x$ emissions in the flue gas stream after the $NO_x$ has been formed as a result of the combustion process. These methods may be used alone or in combination to achieve the various degrees of $NO_x$ emissions required.

*3.1 Identification of $NO_x$ Control Technologies*

The following sections identify potentially available $NO_x$ control technologies for coal-fired direct contact process dryers. Additionally, the feasibility of the control technologies as applied to the operation of EU4 is addressed.

Selective Catalytic Reduction

Selective Catalytic Reduction (SCR) systems are an add-on flue gas treatment (post-combustion control technology) to control $NO_x$ emissions. The SCR process involves the injection of a nitrogen-based reducing agent (reagent) such as ammonia ($NH_3$) or urea to reduce the $NO_x$ in the flue gas to $N_2$ and $H_2O$. The reagent is injected into the flue gas prior to passage through a catalyst bed, which accelerates the $NO_x$ reduction reaction rate. SCR systems cause a small level of $NH_3$ emissions, known as $NH_3$ slip. As the catalyst degrades, $NH_3$ slip will increase, ultimately driving catalyst replacement.

Many types of catalysts, ranging from active metals to highly porous ceramics, are available for different applications. The type of catalyst chosen depends on several operational parameters, such as reaction temperature range, flue gas flow rate, fuel source, catalyst activity and selectivity, operating life, and cost. Catalyst materials include platinum (Pt), vanadium (V), titanium (Ti), tungsten (W), titanium oxide ($TiO_2$), zirconium oxide ($ZrO_2$), vanadium pentoxide ($V_2O_5$), silicon oxide ($SiO_2$), and zeolites (crystalline alumina silicates). The optimum exhaust gas temperature for conventional metal oxide catalysts range from about 480 to 750°F.

SCR systems can utilize aqueous $NH_3$, anhydrous $NH_3$, or a urea solution to produce $NH_3$ on demand. Aqueous $NH_3$ is generally transported and stored in concentrations ranging from 19 to 30 percent and therefore requires more storage capacity than anhydrous $NH_3$. Anhydrous $NH_3$ is nearly 100 percent pure in concentration and is a gas at normal atmospheric temperature and pressure. Anhydrous $NH_3$ must be stored and transported under pressure and when stored in quantities greater than 10,000 pounds, is subject to Risk Management Planning (RMP) requirements (40 CFR 68). Urea solutions (urea and water at approximately 32 percent concentration) are used to form $NH_3$ on demand for injection into the flue gas. Generally, a specifically designed duct and decomposition chamber with a small supplemental burner is used to provide an appropriate temperature window and residence time to decompose urea to $NH_3$ and isocyanic acid (HNCO).

Because of the relatively low exhaust gas temperature of the pulp dryer, which is typically less than 250°F, proper operation of a SCR system could not be maintained without substantial energy input to reheat the exhaust stream. Furthermore, because of the high degree of particulate matter, moisture, and inorganic trace constituents in the exhaust gas (as a result of the direct contact nature of the dryer), fouling and short catalyst life would be experienced. Finally, because there are no known applications of SCR systems on coal-fired direct contact process dryers in the United States, SCR technologies are not considered technically feasible for implementation on the pulp dryer and will not be discussed further in this BACT analysis

Selective Non-Catalytic Reduction

Selective non-catalytic reduction (SNCR) is another method of post-combustion control. Similar to SCR, the SNCR process involves the injection of a nitrogen-based reducing agent (reagent) such as $NH_3$ or urea to reduce the $NO_x$ in the flue gas to $N_2$ and $H_2O$. However, the SNCR process works without the use of a catalyst. Instead, the SNCR process occurs within a combustion unit, which acts as the reaction chamber. The heat from the combustion process provides the energy for the $NO_x$ reduction reaction.

Flue gas temperatures in the range of 1,500 to 1,900°F, along with adequate reaction time within this temperature range, are required for this technology. SNCR is currently being used for $NO_x$ emission control on coal fired industrial boilers, and can achieve $NO_x$ reduction efficiencies of up to 75 percent. However, in typical applications, SNCR provides 30 to 50 percent $NO_x$ reduction.

Because of the direct contact nature of the pulp dryer, the burner configuration is such that it is attached directly to the dryer drum and combustion gases pass through the pulp to be dried. There is not sufficient room to install reagent injection nozzles in an optimum temperature zone to ensure adequate operation of a SNCR system. Furthermore, inconsistent firing of the pulp dryer due to changing pulp quality, moisture content and availability would further reduce the ability to balance a SNCR injection system properly. Finally, the injection of ammonia directly into the combustion chamber prior to the pulp would result in saturating the pulp with excess unreacted ammonia. This would potentially contaminate the pulp, which is currently sold as a livestock feed supplement. There are no known applications of SNCR systems on coal-fired direct contact process dryers in the United States, therefore, SNCR technologies are not considered technically feasible for implementation on the pulp dryer and will not be discussed further in this BACT analysis.

Combustion Controls

Combustion controls such as flue gas recirculation (FGR), reducing air preheat temperature (RAP), oxygen trim (OT), low excess air (LEA), staged combustion air (SCA), and low $NO_x$ burners (LNB), can be used to reduce $NO_x$ emissions depending on the type of burner, characteristics of fuel and method of firing. In practice, combustion controls have not provided the same degree of $NO_x$ control as provided by add-on post combustion control technologies. The current operation practice of similar coal-fired direct contact pulp dryers is to route a small percentage of exhaust gas from multiclone PM control devices back into the dryer furnace. This practice essentially constitutes exhaust gas recirculation and helps to reduce $NO_x$ emissions.

Implementation of further combustion controls is not feasible for the modified EU4 because the balancing of air flow and dryer throat temperature to maintain adequate pulp drying may interfere with additional combustion air flow changes.

### *3.1.1 $NO_x$ Control Technology Summary*

Table 3.1.1 summarizes the different $NO_x$ control technologies and indicates which technologies have been chosen as technically feasible options for EU4.

**Table 3.1.1 – $NO_x$ Control Technology Summary**

| Identified Control Technology | Available and Demonstrated Effective | In Service On Similar Units | Technically Feasible for Pulp Dryer |
|---|---|---|---|
| SCR | Yes | No | No |
| SNCR | Yes | No | No |
| Combustion Controls | Yes | Yes | Yes |

## *3.2 Control Technology Evaluation*

As a result of the type of combustion process and associated source-specific exhaust parameters, the only $NO_x$ control technology feasible for implementation on the pulp dryer is the continued use of good combustion practice and limited exhaust gas recirculation.

*Energy*: There are no significant energy penalties associated with the use combustion controls. Furthermore, there are no additional energy impacts associated with exhaust system modifications or ancillary equipment installations for the control technology.

*Environmental*: There are no detrimental environmental effects resulting from the use of combustion controls. The technology functions through strict control of air/fuel mixtures and combustion parameters and does not utilize chemical additives or contribute to the generation of potentially hazardous compounds not associated with the combustion process.

*Economic*: A detailed economic analysis addressing the use of combustion controls was not performed for this BACT analysis. Combustion controls are considered the baseline cost and emission scenario.

## *3.3 Proposed $NO_x$ BACT Selection*

Use of combustion controls is supported as a viable BACT alternative in light of the above analysis. Furthermore, use of combustion controls will prevent any potential collateral impacts as associated with other $NO_x$ control technologies. Table 3.3.1 lists the $NO_x$ emission limitation proposed as BACT under typical operating ranges for EU4.

**Table 3.3.1 – Proposed $NO_x$ BACT Emission Limit**

| Emission Unit | BACT Limit | Control Type |
|---|---|---|
| Pulp Dryer | 54.3 lb/hr (0.84 lb/ton of pressed pulp)<br>3-hour average | Good Combustion Practice |

### *3.4 RBLC Database Review*

Information concerning recently permitted industrial process dryers was obtained from the EPA's RBLC. Due to the lack of available data presented in the RBLC for process dryers similar to the method of operation of the proposed pulp dryer, only one representative emission source was found. This source is the pulp dryer installed at the ACS Hillsboro facility in 1997.

The DTN pulp dryer is approximately one-third the size of the Hillsboro facility pulp dryer and has differences in the internal dryer configuration. The size and configuration difference result in different operational efficiencies that make it difficult to do a direct, scaled comparison in emissions. The Hillsboro pulp dryer was permitted with a $NO_x$ BACT emission limit of 100.0 lb/hr utilizing good combustion practices. The proposed BACT limit for the modified EU4 is 54.3 lb/hr, also utilizing good combustion practice.

## 4.0 BACT for CO

The objective of this analysis is to determine BACT for CO emissions from the modified EU4. The rate of CO emissions from combustion sources is dependent upon the combustion efficiency of the source. High combustion temperatures, adequate excess air, and good air/fuel mixing during combustion can minimize CO emissions. Control of CO emissions can be achieved by application of combustion controls or by treatment of the flue gas after combustion. Often, measures used to minimize or control emissions of $NO_x$ can result in incomplete combustion and increased CO emissions. Therefore, an acceptable compromise is necessary to achieve the lowest $NO_x$ emission rate possible while still keeping CO emissions as low as practical.

### *4.1 Identification of CO Control Technologies*

The following technologies have been identified for potential control of CO emissions: catalytic oxidation, thermal oxidation, and combustion controls. Catalytic oxidation and thermal oxidation are post-combustion controls designed for the exhaust gas stream.

Catalytic Oxidation

There are a variety of manufacturers who offer oxidation catalysts to control CO emissions. The catalysts are a flue gas treatment technology with a typically honeycomb type of arrangement to allow the maximum surface area exposure to a given gas flow. CO catalysts are generally precious metal based. The use of an oxidation catalyst with sulfur-containing fuels can promote oxidation of $SO_2$ to $SO_3$, which can readily form $H_2SO_4$ in the presence of moisture, causing severe corrosion in the ductwork and downstream control equipment. Oxidation catalysts also require a minimum temperature (>500 °F) for proper operation.

Because of the relatively low exhaust gas temperature of the pulp dryer, which is typically less than 250°F, proper operation of an oxidation catalyst system could not be maintained. Furthermore, because of the high degree of particulate matter, moisture, and inorganic trace constituents in the exhaust gas (as a result of the direct contact nature of the dryer), fouling and short catalyst life would be experienced. Finally, because there are no known applications of oxidation catalyst systems on coal-fired direct contact process dryers in the United States, oxidation catalyst technologies are not considered technically feasible for implementation on the modified EU4 will not be discussed further in this BACT analysis.

Thermal Oxidation

High temperature oxidation is another method for controlling emissions of CO in the flue gas. This type of system would be added at the exit of a particulate control device and has been reported to achieve up to 95% reduction of CO in the exhaust gas on other types of industrial facilities with much higher CO emissions and lower flow rates than the pulp dryer. The application of thermal oxidation would require additional fuel usage, and would result in secondary emissions from that combustion process. Given the low exhaust gas temperatures following the particulate control device, as well as the high flowrate and high moisture content of the exhaust gas, the size and fuel consumption rate of a thermal oxidizer necessary to achieve complete oxidation of CO emissions would not be practical. A review of the EPA's BACT/RACT/LAER Clearinghouse for coal-fired process dryers did not reveal any documentation of facilities that have specified thermal oxidation as BACT. Therefore, use of a thermal oxidation system for the modified EU4 is not considered technically feasible.

Combustion Controls

CO emissions primarily result from incomplete combustion. The oxidation of CO to $CO_2$ is dependent upon temperature and residence time of the combustion process. The use of good combustion practice such as high combustion temperatures, adequate combustion air, and proper air/fuel mixing can minimize CO emissions. Proper design and operation of a coal-fired furnace effectively acts like a thermal oxidizer for control of CO emissions. Therefore, good combustion practice is considered a feasible control technology for CO emissions.

#### *4.1.1 CO Control Technology Summary*

Table 4.1.1 summarizes the different CO control technologies and indicates which technologies have been chosen as technically feasible options for the modified EU4.

**Table 4.1.1 – CO Control Technology Summary**

| Identified Control Technology | Available and Demonstrated Effective | In Service On Similar Units | Technically Feasible for Pulp Dryer |
|---|---|---|---|
| Catalytic Oxidation | Yes | No | No |
| Thermal Oxidation | Yes | No | No |
| Combustion Controls | Yes | Yes | Yes |

## *4.2 Control Technology Evaluation*

As a result of the type of combustion process and associated source-specific exhaust gas parameters including low temperature, high moisture and high flowrate, the only CO control technology feasible for implementation on the modified EU4 is the continued use of good combustion practice.

*Energy*: There are no significant energy penalties associated with the use combustion controls. Furthermore, there are no additional energy impacts associated with exhaust system modifications or ancillary equipment installations for the control technology.

*Environmental*: There are no detrimental environmental effects resulting from the use of combustion controls. The technology functions through strict control of air/fuel mixtures and combustion parameters and does not utilize chemical additives or contribute to the generation of potentially hazardous compounds not associated with the combustion process.

*Economic*: A detailed economic analysis addressing the use of combustion controls was not performed for this BACT analysis. Combustion controls are considered the baseline cost and emission scenario.

## *4.3 Proposed CO BACT Selection*

Use of combustion controls is supported as a viable BACT alternative in light of the above analysis. Furthermore, use of combustion controls will prevent any potential collateral impacts as associated with other CO control technologies. Table 4.3.1 lists the CO emission limitation proposed as BACT under typical operating ranges for the modified EU4.

**Table 4.3.1 – Proposed CO BACT Emission Limit**

| Emission Unit | BACT Limit | Control Type |
|---|---|---|
| Pulp Dryer | 455.0 lb/hr (7.0 lb/ton of pressed pulp)<br><br>3-hour average | Good combustion practice |

## *4.4 RBLC Database Review*

Information concerning recently permitted industrial process dryers was obtained from the EPA's RBLC. Due to the lack of available data presented in the RBLC for process dryers similar to the method of operation of the pulp dryer, only one representative emission source was found. This source is the pulp dryer installed at the ACS Hillsboro facility in 1997.

The DTN pulp dryer is approximately one-third the size of the Hillsboro facility pulp dryer and has differences in the internal dryer configuration. The size and configuration difference result in different operational efficiencies that make it difficult to do a direct, scaled comparison in emissions. The

Hillsboro pulp dryer was permitted with a CO BACT emission limit of 700.0 lb/hr utilizing good combustion practices. The proposed BACT limit for the modified EU4 is 455.0 lb/hr, also utilizing good combustion practice.

## 5.0 BACT for VOC

The objective of this analysis is to determine BACT for VOC emissions from the modified EU4. VOC formation generally follows the same principles of CO formation in combustion related emission sources. High combustion temperatures, adequate excess air, and good air/fuel mixing during combustion can minimize VOC emissions. Control of VOC emissions can be achieved by application of combustion controls or by treatment of the flue gas after combustion.

### *5.1 Identification of VOC Control Technologies*

As with CO emissions, the same following technologies have been identified for potential control of VOC emissions: catalytic oxidation, thermal oxidation, and combustion controls. Catalytic oxidation and thermal oxidation are post-combustion controls designed for the exhaust gas stream.

### *5.1.1 VOC Control Technology Summary*

Table 5.1.1 summarizes the different VOC control technologies and indicates which technologies have been chosen as technically feasible options for the modified EU4. The same discussion as presented in the previous section for CO emissions control and feasibility applies to VOC emissions.

**Table 5.1.1 – VOC Control Technology Summary**

| Identified Control Technology | Available and Demonstrated Effective | In Service On Similar Units | Technically Feasible for Pulp Dryer |
|---|---|---|---|
| Catalytic Oxidation | Yes | No | No |
| Thermal Oxidation | Yes | No | No |
| Combustion Controls | Yes | Yes | Yes |

### *5.2 Control Technology Evaluation*

As a result of the type of combustion process and associated source-specific exhaust gas parameters including low temperature, high moisture and high flowrate, the only VOC control technology feasible for implementation on the modified EU4 is the use of good combustion practice.

*Energy*: There are no significant energy penalties associated with the use combustion controls. Furthermore, there are no additional energy impacts associated with exhaust system modifications or ancillary equipment installations for the control technology.

*Environmental*: There are no detrimental environmental effects resulting from the use of combustion controls. The technology functions through strict control of air/fuel mixtures and combustion parameters and does not utilize chemical additives or contribute to the generation of potentially hazardous compounds not associated with the combustion process.

*Economic*: A detailed economic analysis addressing the use of combustion controls was not performed for this BACT analysis. Combustion controls are considered the baseline cost and emission scenario.

## *5.3 Proposed VOC BACT Selection*

Use of combustion controls is supported as a viable BACT alternative in light of the above analysis. Furthermore, use of combustion controls will prevent any potential collateral impacts as associated with other VOC control technologies. Table 5.3.1 lists the VOC emission limitation proposed as BACT under typical operating ranges for the modified EU4.

**Table 5.3.1 – Proposed VOC BACT Emission Limit**

| Emission Unit | BACT Limit | Control Type |
|---|---|---|
| Pulp Dryer | 78.0 lb/hr (1.20 lb/ton of pressed pulp)<br>3-hour average | Good combustion practice |

## *5.4 RBLC Database Review*

Information concerning recently permitted industrial process dryers was obtained from the EPA's RBLC. Due to the lack of available data presented in the RBLC for process dryers similar to the method of operation of the pulp dryer, only one representative emission source was found. This source is the pulp dryer installed at the ACS Hillsboro facility in 1997.

The DTN pulp dryer is approximately one-third the size of the Hillsboro facility pulp dryer and has differences in the internal dryer configuration. The size and configuration difference result in different operational efficiencies that make it difficult to do a direct, scaled comparison in emissions. The Hillsboro pulp dryer was permitted with a VOC BACT emission limit of 92.1 lb/hr utilizing good combustion practices. The proposed BACT limit for the modified EU4 is 78.0 lb/hr, also utilizing good combustion practices.

# American Crystal Sugar Company
# Drayton Sugar Beet Processing Facility
# Revised BACT Analysis
# Lime Kiln (EU28)

In July of 2017, the American Crystal Sugar Company (ACSC) Drayton (DTN) facility was issued permit to construct PTC17001, which authorized the installation of a new Lime Kiln (EU28). EU28 was proposed as an anthracite/coke-fired lime kiln.

During the engineering design review of the proposed project, it was determined that sufficient natural gas supply existed to support a natural gas-fired lime kiln. Therefore, DTN changed the design of the proposed lime kiln to a natural gas-fired kiln. EU28, as constructed, does not support the combustion of anthracite coal or coke.

PTC17001 was issued based on a Best Available Control Technology (BACT) analysis for a proposed anthracite/coke-fired lime kiln and did not include natural-gas as a potential fuel type. Therefore, to support the as-built construction of EU28, the BACT analysis has been revised. The following subsections address each applicable pollutant emitted from the natural gas-fired lime kiln (EU28) at the DTN facility.

## 1.0 BACT for PM

PM emissions from the proposed natural gas-fired vertical shaft kiln at the DTN would occur from finely divided particles in the limerock feed and from thermal and mechanical degradation of the lime and limerock within the lime kiln during the calcination process.

The DTN lime kiln will be a forced draft kiln equipped with a combustion balance vent located downstream in the process as opposed to a booster fan located directly on the kiln. Limerock charging is a continuous metered process whereby limerock is introduced at the top of the sealed kiln. The limerock charging is maintained at negative pressure to prevent air from escaping the top of the kiln and also to prevent the migration of natural gas upward through the kiln which could present a safety risk. There is no damper allowing combustion or process generated gases to be released directly to the atmosphere. Instead, all gases produced in the kilning operation are routed through an integral gas washer prior to introduction to the sugar purification process or exhausting through the combustion balance vent. The integral gas washer is part of the process and is used to condition the gas by reducing the temperature and particulate loading prior to introduction to the carbonation process. This design reduces particulate emissions and only allows for emissions to occur as part of the combustion balancing process as kiln exhaust gases are directed to the sugar purification process.

### *1.1 Identification of PM Control Technologies*

European emission data notes that because of the wide range of exhaust gas conditions present for various kiln types, a variety of dust collectors may be used, including cyclones, wet scrubbers, fabric filters, electrostatic precipitators and gravel bed filters. However, the DTN kiln process is substantially different from other industrial kiln processes such as cement and lime manufacturing. As stated previously, a primary purpose of the lime kiln at DTN is to provide $CO_2$ gas to the sugar purification process. This results in a significant portion of exhaust gases from the kiln being routed to the production process where they are passed through liquid (sugar juice) as part of a carbonation process. This wet process provides 100 percent control of particulate matter contained in the kiln exhaust gases.

Under normal operation, a portion of the kiln gases are vented from a balance vent that is used to maintain proper draft on the kiln for combustion purposes, as well as to manage the pressure of $CO_2$ gas introduced to the carbonation process. The maximum portion of kiln exhaust gases vented through the balance vent would be 30 percent depending on $CO_2$ demand and kiln draft requirements.

As discussed previously, the kiln exhaust gases are immediately passed through an integral gas washer after exiting the kiln. The integral gas washer is essentially a scrubber and is estimated to provide a minimum of 70 percent control of particulate emissions.

Due to the low volumetric flow and variable flowrate the only form of particulate control that would provide additional control of the balance vent would be the addition of a fabric filter. However, due to the high degree of exhaust gas moisture in the balance vent emissions resulting from the gas conditioning, it is not technically feasible to operate a fabric filter. The low temperature (40°C) and saturated condition of the exhaust gas would result in filter blinding during warm conditions and icing during freezing conditions (which account for a large percentage of the kiln operating season).

Implementation of a fabric filter prior to the integral gas washer would be disruptive to the sugar purification process. The kiln exhaust gas and $CO_2$ delivery system is designed to provide $CO_2$ at near-atmospheric pressures entering into the gas conditioning system and at slightly above atmospheric pressures entering into the carbonation system. The incorporation of particulate control device prior the gas conditioner would require additional fans and balancing to overcome introduced pressure drops and flow changes. The proposed system as provided by the manufacturer would require redesign and development to provide for such a change to the $CO_2$ flow if possible.

Therefore, fabric filter technologies are not considered technically feasible for the proposed DTN vertical lime kiln. The next highest level of control would be considered a wet scrubber (i.e., the integral gas washer).

### *1.2 Proposed PM BACT Selection*

Because only one technology has been demonstrated as technically feasible for the control of PM emissions, a top-down ranking and detailed control technology review has not been included. Table 1.2.1 lists the proposed PM BACT emission limit for the natural gas-fired vertical shaft kiln at DTN. This emission rate is based on the best available engineering judgment and a review of other currently permitted similar processes.

**Table 1.2.1 – Proposed PM BACT Emission Limit**

| Emission Unit | BACT Limit | Control Type |
|---|---|---|
| Lime Kiln | $PM/PM_{10}$: 10.97 lb/hr (0.53 lb/ton lime produced)<br><br>3-hour average<br><br>$PM_{2.5}$: 6.63 lb/hr (0.32 lb/ton lime produced)<br><br>3-hour average | Inherent Process Controls (Integral Gas Washer) |

*1.3 RBLC Database Review*

Information concerning recently permitted lime kiln operations (2012 to 2022) was obtained from EPA's BACT/RACT/LAER Clearinghouse (RBLC) database by completing a search for RBLC Process Type Codes 30.231, Kraft Lime Kilns, and 90.019, Lime/Limestone Handling/Kilns/Storage/Manufacturing. No representative sources utilizing the same kiln production process as DTN were found. All natural gas-fired kilns included in the RBLC database vent emissions directly to either a fabric filter baghouse or ESP. As discussed previously, neither a fabric filter baghouse nor ESP are technically feasible for implementation at DTN because of the process design. Therefore, use of inherent process controls in the form of the existing integral gas washer is considered appropriate for BACT.

2.0 BACT for $SO_2$

$SO_2$ emissions from the natural gas-fired kiln would be directly related to the sulfur in the fuel as well as trace amounts of sulfur present in the limerock to be calcined. DTN will combust pipeline quality natural gas, which has an assumed sulfur content of less than 2000 grains per million standard cubic feet ($gr/10^6$ scf). Based on analytical test results of limerock before and after calcination, approximately 0.03% sulfur by weight may be available for emission as $SO_2$.

*2.1 Identification of $SO_2$ Control Technologies*. Given the extremely low levels of $SO_2$ to be emitted from the natural gas-fired lime kiln process, there are no technically feasible add-on $SO_2$ control technologies available to further reduce emissions. Therefore, the use of inherently lower sulfur fuels and good combustion practice are proposed as the only technology feasible technology.

Furthermore, any proposed add on flue gas control for EU28 would need to be evaluated with respect to the inherent $SO_2$ control experienced by normal kiln operations. As the combustion gases pass through the integral gas washer, potential lime dust present in the exhaust gas stream would have the effect of scrubbing out $SO_2$ present in the exhaust gas. It is assumed that a minimum of 75 percent control of $SO_2$ would be achieved by the integral gas washer. Additionally, the majority of combustion gases that pass through the integral gas washer are then routed to the carbonation process where they are bubbled through the sugar juice that is mixed with the lime produced from the kiln. At this point, any remaining

$SO_2$ would be scrubbed by the bubbling process. It is conservatively assumed that an additional 95 percent $SO_2$ control is achieved.

### *2.2 Proposed $SO_2$ BACT Selection*

Because only one technology has been demonstrated as technically feasible for the control of $SO_2$ emissions, a top-down ranking and detailed control technology review has not been included. Table 2.2.1 lists the proposed $SO_2$ BACT emission limit for the natural gas-fired vertical shaft kiln at DTN. This emission rate is based on the best available engineering judgment and a review of other currently permitted similar processes.

**Table 2.2.1 – Proposed $SO_2$ BACT Emission Limit**

| Emission Unit | BACT Limit | Control Type |
|---|---|---|
| Lime Kiln | 3.73 lb/hr (0.18 lb/ton of lime produced)<br><br>3-hour average | Low sulfur fuels and Good Combustion Practice |

### *2.3 RBLC Database Review*

Information concerning recently permitted lime kiln operations (2012 to 2022) was obtained from the RBLC database by completing a search for RBLC Process Type Codes 30.231, Kraft Lime Kilns, and 90.019, Lime/Limestone Handling/Kilns/Storage/Manufacturing. Lime kilns that utilize a primary fuel other than natural gas were eliminated. In this way the review of recently permitted lime kilns was focused to reflect operations similar to the vertical shaft lime kiln at DTN. Table 2.31 provides a summary of the comparable lime kiln permit parameters.

**Table 2.3.1 – RBLC Kiln $SO_2$ BACT Limit Summary**

| RBLCID | Company | Date | Throughput | BACT Limit | Equiv. Limit | Control |
|---|---|---|---|---|---|---|
| AR-0161 | Sun Bio Material Company | 2019 | 225 MMBtu/hr | 20 ppmv | NA | Good Combustion Practice |
| FL-0342 | Jacksonville Lime | 2014 | 660 tpd | 4.2 lb/hr | 0.15 lb/ton | Good Combustion Practice |

As indicated in Table 2.3.1, the proposed $SO_2$ BACT limit for the vertical shaft kiln at DTN is in the same range as other recent BACT determinations and would utilize the same control strategy of Good Combustion Practice and use of inherently low sulfur fuels. Due to the process characteristics, and the fact that the DTN kiln vents through both the balance vent and the carbonation system, it is not possible to make a direct comparison to the ppm limit presented for AR-0161. However, review of the recent performance test completed for the DTN kiln indicates that emissions are on the order of 6.7 ppm from the balance vent and 5.9 ppm from the carbonation vent. In summary, the RBLC data review supports the proposed $SO_2$ BACT limit for the DTN lime kiln.

## 3.0 BACT for $NO_x$

$NO_x$ formation occurs during the combustion process by a combination of fuel nitrogen with oxygen ($O_2$) in the flame zone (fuel $NO_x$), and by a combination of atmospheric nitrogen ($N_2$) and $O_2$ in the combustion air (thermal $NO_x$). Thermal $NO_x$ is the major mechanism of $NO_x$ formation in lime kilns and fuel $NO_x$ is generally considered insignificant.

Thermal $NO_x$ forms at temperatures above 1,000°C. For reasons of lime quality, the burning process in the kiln takes place under oxidizing conditions, under which the partial oxidation of the $N_2$ in the combustion air results in the formation of nitrogen monoxide (NO). Thermal $NO_x$ is produced mainly in the kiln burning zone where it is hot enough to achieve this reaction. The amount of thermal $NO_x$ produced in the burning zone is related to both burning zone temperature and $O_2$ content.

$NO_x$ emissions vary depending on the type of kiln process. In addition to combustion temperatures and excess oxygen, $NO_x$ formation can be influenced by flame shape and temperature, combustion chamber geometry, the reactivity and nitrogen content of the fuel, moisture, and reaction time.

### *3.1 Identification of $NO_x$ Control Technologies*.

$NO_x$ emissions can be controlled at the combustion source through process integrated measures (combustion controls) and through post-combustion control of the flue gas exhaust. The following technologies have been identified for control of $NO_x$ emissions: selective catalytic reduction (SCR), selective non-catalytic reduction (SNCR), and combustion controls. SCR and SNCR are post-combustion controls.

#### Selective Catalytic Reduction

Selective Catalytic Reduction (SCR) systems are an add-on flue gas treatment technology to control $NO_x$ emissions. The SCR process involves the injection of a nitrogen-based reducing agent (reagent) such as ammonia ($NH_3$) or urea to reduce the $NO_x$ in the flue gas to $N_2$ and $H_2O$. The reagent is injected into the flue gas prior to passage through a catalyst bed at a temperature range of about 300 to 400°C. SCR systems generate a small level of $NH_3$ emissions, known as $NH_3$ slip. As the catalyst degrades, $NH_3$ slip will increase, ultimately driving catalyst replacement.

SCR is widely used for $NO_x$ control on other industry sources, such as coal-fired boilers, waste incinerators, and internal combustion engines. However, in the cement and lime production industry, basically two systems are considered marginally technically feasible: a low dust configuration with an SCR system located between a particulate control unit and the stack, and a high dust configuration with an SCR system located between a preheater and a particulate control unit. Low dust exhaust gas systems require additional reheating of the exhaust gases after particulate control, which results in additional energy costs and pressure losses. In practice SCR has only been tested in European applications on preheaters and pilot tested on semi-dry (Lepol) kiln systems. It is theorized that SCR should be applicable for rotary kiln systems. However, no data is available regarding SCR applicability to vertical shaft kilns, such as the natural gas-fired vertical shaft kiln proposed for DTN.

Application of SCR to the natural gas-fired vertical shaft kiln proposed for DTN is not considered technically feasible because the temperature of the kiln exhaust gas would be approximately 175°C, which is well below the effective target temperature for SCR operation. Furthermore after passing through the integral gas washer, the flue gas temperature would be reduced to 40°C.

A review of the EPA's BACT/RACT/LAER Clearinghouse database for kilns of all types did not reveal any documentation of facilities specifying SCR systems for control of $NO_x$ emissions. Therefore, based on the discussion above concerning operating parameters and feasibility of SCR systems employed on vertical shaft kilns, this technology is not considered technically feasible or demonstrated in practice.

Selective Non-Catalytic Reduction

Selective non-catalytic reduction (SNCR) is another method of post-combustion control. Similar to SCR, the SNCR process involves the injection of a nitrogen-based reducing agent (reagent) such as $NH_3$ or urea to reduce the $NO_x$ in the flue gas to $N_2$ and $H_2O$. However, the SNCR process works without the use of a catalyst. Instead, the SNCR process occurs within a combustion unit, which acts as the reaction chamber. Flue gas temperatures in the range of 800 to 1000°C, along with adequate reaction time within this temperature range, are required for this technology.

The design of the vertical shaft kiln and the combustion process is not conducive to the injection of a reagent into the combustion zone. The packed mixture of lime rock would not allow adequate mixing or placement of reagent to complete the necessary reaction. At the outlet of the kiln where it may be possible to effectively inject a reagent, the temperature of the flue gas would be approximately 175°C, which is far below the effective target temperature for SNCR operation. Furthermore, after passing through the integral gas washer, the flue gas temperature would be reduced to 40°C.

Additionally, the use of the lime kiln at DTN to generate $CO_2$ process gas which is routed into the sugar purification process is unique as compared to other industrial processes such as the cement and lime production industries. Because the kiln exhaust gases are used in the sugar purification process, the introduction of $NH_3$ into the exhaust gas would be disruptive to the sugar production process, thus further impacting the feasibility of an SNCR system.

A review of the RBLC database for kilns of all types did not reveal any documentation of facilities specifying SNCR systems for control of $NO_x$ emissions. Therefore, based on the discussion above concerning operating parameters and feasibility of SNCR systems employed on vertical shaft kilns, this technology is not considered technically feasible or demonstrated in practice.

Combustion Controls

As indicated previously, $NO_x$ formation is primarily dependent on combustion zone temperatures, excess $O_2$ and residence time. Combustion controls do not provide the same degree of $NO_x$ control as provided by add-on post combustion control technologies. However, combustion controls do provide a means of optimizing combustion and minimizing emissions. Combustion controls essentially involve management of combustion and process optimization to balance $O_2$ and combustion temperatures.

Combustion controls or, Good Combustion Practice (GCP), is considered a feasible control technology for $NO_x$ emissions.

## *3.2 $NO_x$ Control Technology Summary*

Table 3.2.1 summarizes the different $NO_x$ control technologies and indicates which technologies have been chosen as technically feasible options for the DTN lime kiln.

**Table 3.2.1 – $NO_x$ Control Technology Summary**

| Identified Control Technology | Available and Demonstrated Effective | In Service On Similar Units | Technically Feasible for Pulp Dryer |
|---|---|---|---|
| SCR | Yes | No | No |
| SNCR | Yes | No | No |
| Good Combustion Practice | Yes | Yes | Yes |

## *3.3 Proposed $NO_x$ BACT Selection*

Because only one technology has been demonstrated as technically feasible for the control of $NO_x$ emissions, a top-down ranking and detailed control technology analysis has not been included. Table 3.3.1 lists the $NO_x$ emission limitation proposed as BACT under typical operating ranges for the vertical shaft kiln at DTN. This emission rate is based on the best available engineering judgment and a review of other currently permitted similar processes.

**Table 3.3.1 – Proposed $NO_x$ BACT Emission Limit**

| Emission Unit | BACT Limit | Control Type |
|---|---|---|
| Lime Kiln | 26.8 lb/hr (1.29 lb/ton lime produced)<br><br>3-hour average | Good Combustion Practice |

### *3.4 RBLC Database Review*

Information concerning recently permitted lime kiln operations (2012 to 2022) was obtained from the RBLC database by completing a search for RBLC Process Type Codes 30.231, Kraft Lime Kilns, and 90.019, Lime/Limestone Handling/Kilns/Storage/Manufacturing. Lime kilns that utilize a primary fuel other than natural gas were eliminated. In this way the review of recently permitted lime kilns was focused to reflect operations similar to the vertical shaft kiln proposed for DTN. Table 3.4.1 provides a summary of the comparable lime kiln permit parameters.

**Table 3.4.1 – RBLC Kiln $NO_x$ BACT Limit Summary**

| RBLCID | Company | Date | Throughput | BACT Limit | Equiv. Limit | Control |
|---|---|---|---|---|---|---|
| AR-0161 | Sun Bio Material Company | 2019 | 225 MMBtu/hr | 180 ppmv | NA | Good Combustion Practice |
| AL-0268 | Georgia Pacific LLC | 2014 | 17.7 tph | 31.2 lb/hr | 1.76 lb/ton | Good Combustion Practice |
| TX-0869 | Lhoist North America | 2019 | 27.5 tph | NA | 0.35 lb/ton | Good Combustion Practice |
| WI-0291 | Graymont Western Lime | 2019 | NA | 68.8 lb/hr | 2.68 lb/ton | Good Combustion Practice |
| AL-0313 | Lhoist North America | 2016 | 100 MMBtu/hr | 27.5 lb/hr | 0.5 lb/ton | Good Combustion Practice |
| FL-0342 | Jacksonville Lime | 2014 | 13.8 tph | 8.3 lb/hr | 0.6 lb/ton | Good Combustion Practice |

As indicated in Table 3.4.1, the proposed $NO_x$ BACT limit for the DTN lime kiln is comparable to the other recent BACT determinations and all utilize the same control strategy of Good Combustion Practice. Therefore, the RBLC data review supports the proposed $NO_x$ BACT limit for the DTN lime kiln.

## 4.0 BACT for CO

CO formation occurs primarily through incomplete combustion. The oxidation of CO to $CO_2$ is dependent on temperature, residence time during the combustion process, and the amount of excess $O_2$ present. CO emissions resulting from incomplete combustion in lime kilns generally represent a loss of efficiency. Therefore, proper operation of lime kilns works to limit CO emissions.

However, for vertical shaft kilns, such as the DTN kiln, the CO emission level of the lime kiln does not automatically indicate incomplete combustion resulting from inefficient operation of the kiln. The operating conditions of the lime kiln are driven by the product requirements (i.e., the required properties of calcined lime and process gases). While vertical shaft kilns are generally operated in a way to keep CO emissions as low as possible, the individual final product requirements and production demands will have a bearing on final emission levels.

*4.1 Identification of CO Control Technologies*.

The following sections identify potentially available control technologies for lime kiln combustion processes. Additionally, the feasibility of the control technologies as applied to the operation of the DTN lime kiln is addressed.

CO emissions can be controlled at the combustion source or post-combustion in the flue gas exhaust. The following technologies have been identified for control of CO emissions: catalytic oxidation, thermal oxidation, and combustion controls. Catalytic oxidation and thermal oxidation are post-combustion control designed for the exhaust gas stream.

Catalytic Oxidation

There are a variety of manufacturers who offer oxidation catalysts to control CO emissions. The catalysts are a flue gas treatment technology with a typically honeycomb type of arrangement to allow the maximum surface area exposure to a given gas flow. CO catalysts are generally precious metal based. The use of an oxidation catalyst with sulfur-containing fuels can promote oxidation of $SO_2$ to $SO_3$, which can readily form $H_2SO_4$ in the presence of moisture, causing severe corrosion potential. Oxidation catalysts also require a minimum temperature (>250 $^oC$) for proper operation. High particulate loading of the flue gas stream, which can blind the catalyst, is also a concern for proper operation of any oxidation catalyst. Trace elements present in fuel (i.e., anthracite coal) and resulting combustion gases, in particular chlorine, may foul an oxidation catalyst and dramatically reduce its effectiveness.

Flue gas temperatures exiting the DTN lime kiln are anticipated to be in the range of $175^oC$, which is below the effective temperature of an oxidation catalyst. Furthermore, the particulate loading of the kiln flue gas prior to being routed through the integral gas washer may inhibit proper catalyst operation. Once passing through the integral gas washer, the kiln flue gas will be substantially cooled to less than $40^oC$.

A review of the EPA's BACT/RACT/LAER Clearinghouse database for kilns of all types did not reveal any documentation of facilities specifying oxidation catalysts for control of CO emissions. Therefore, based on the discussion above concerning operating parameters and potential difficulties of catalyst implementation, use of an oxidation catalyst to control CO emissions from the DTN vertical shaft kiln is considered technically infeasible.

Thermal Oxidation

High temperature oxidation is another method for controlling emissions of CO in the flue gas. This type of system would be added at the exit of a particulate control device, such as the integral gas washer, and has been reported to achieve up to 95 percent reduction of CO in the exhaust gas of certain process sources. The application of thermal oxidation would require additional fuel usage and would result in secondary emissions (i.e., $NO_x$, $CO_2$, as well as CO) from the additional combustion process.

Because the proper balance of combustion gases from the lime kiln is an important part of the design of the captive lime kiln/purification/carbonation process at DTN, the addition of a second combustion process that would dramatically increase flue gas flow and temperatures would be disruptive to the carbonation and purification process.

Furthermore, a review of the RBLC database for kilns of all types did not reveal any documentation of facilities specifying thermal oxidation for control of CO emissions. Therefore, based on the discussion above concerning operating parameters and potential carbonation process disruption, use of a thermal oxidation process to control CO emissions from the DTN vertical shaft kiln is considered technically infeasible.

Combustion Controls

As indicated previously CO formation occurs primarily through incomplete combustion. The oxidation of CO to $CO_2$ is dependent on temperature, residence time during the combustion process, and the amount of excess $O_2$ present. CO emissions resulting from incomplete combustion in lime kilns generally represent a loss of efficiency. Therefore, proper operation of lime kilns tends to limit the CO emissions.

Higher CO emissions from vertical shaft kilns generally correspond to a higher energy consumption, therefore, the kilns are usually operated in a way that keeps CO emissions as low as possible. The operating conditions of the lime kiln will ultimately be determined by the product requirements. However, proper operation will help to minimize CO while achieving desired product properties.

Good combustion practice (GPC) is considered a feasible control technology for CO emissions.

### *4.2 CO Control Technology Summary*

Table 4.2.1 summarizes the different CO control technologies and indicates which technologies have been chosen as technically feasible options for the DTN vertical shaft kiln.

**Table 4.2.1 – CO Control Technology Summary**

| Identified Control Technology | Available and Demonstrated Effective | In Service On Similar Units | Technically Feasible for Lime Kiln |
|---|---|---|---|
| Catalytic Oxidation | Yes | No | No |
| Thermal Oxidation | Yes | No | No |
| Combustion Control | Yes | Yes | Yes |

### *4.3 Proposed CO BACT Selection*

Because only one technology has been demonstrated as technically feasible for the control of CO emissions, a top-down ranking and detailed control technology review has not been included. Table 4.3.1 lists the proposed CO BACT emission limit for the DTN vertical shaft kiln. This emission rate is based on the best available engineering judgment and a review of other currently permitted similar processes.

**Table 4.3.1 – Proposed CO BACT Emission Limit**

| Emission Unit | BACT Limit | Control Type |
|---|---|---|
| Lime Kiln | 521 lb/hr (25.0 lb/ton lime produced)<br>3-hour average | Good Combustion Practice |

### *4.4 RBLC Database Review*

Information concerning recently permitted lime kiln operations (2012 to 2022) was obtained from the RBLC database by completing a search for RBLC Process Type Codes 30.231, Kraft Lime Kilns, and 90.019, Lime/Limestone Handling/Kilns/Storage/Manufacturing. Lime kilns that utilize a primary fuel other than natural gas were eliminated. In this way the review of recently permitted lime kilns was focused to reflect operations similar to the vertical shaft lime kiln proposed for DTN. Table 4.4.1 provides a summary of the comparable lime kiln permit parameters.

**Table 4.4.1 – RBLC Kiln CO BACT Limit Summary**

| RBLCID | Company | Date | Throughput | BACT Limit | Equiv. Limit | Control |
|---|---|---|---|---|---|---|
| AR-0161 | Sun Bio Material Company | 2019 | 225 MMBtu/hr | 50 ppmv | NA | Good Combustion Practice |
| WI-0291 | Graymont Western Lime | 2019 | NA | 58.3 lb/hr | 2 lb/ton | Good Combustion Practice |
| AL-0313 | Lhoist North America | 2016 | 100 MMBtu/hr | 36 lb/hr | 1.3 lb/ton | Good Combustion Practice |
| FL-0342 | Jacksonville Lime | 2014 | 13.8 tph | 200 $Mg/Nm^3$ | NA | Good Combustion Practice |

As indicated in Table 4.4.1, limited information was available for comparison to the proposed kiln process at DTN. Both the AR-0161 and FL-0342 BACT limits are based on concentrations related to kiln exhaust. Because the DTN facility utilizes a majority of kiln gases in the production process and vents through the carbonation system, it is not possible to make a direct comparison. The WI-0291 and AL-0313 BACT limits are also for kilns that vent directly to the atmosphere and do not reflect the process demands of DTN where both combustion gases and lime quality/production is required to balance with the sugar production process and carbonation system. However, it is indicated that all of the BACT limits are based on the same control strategy of Good Combustion Practice. Therefore, in lieu of process differences, the RBLC data review supports the proposed CO BACT limit for the DTN lime kiln.

## 5.0 BACT for VOC

The objective of this analysis is to determine BACT for VOC emissions from the DTN vertical shaft lime kiln. VOC formation generally follows the same principles of CO formation in combustion related emission sources. High combustion temperatures, adequate excess air, and good air/fuel mixing during combustion can minimize VOC emissions. Control of VOC emissions can be achieved by application of combustion controls or by treatment of the flue gas after combustion.

### *5.1 Identification of VOC Control Technologies*.

As with CO emissions, the same following technologies have been identified for potential control of VOC emissions: catalytic oxidation, thermal oxidation, and combustion controls. Catalytic oxidation and thermal oxidation are post-combustion controls designed for the exhaust gas stream, and neither are considered technically feasible for control of the DTN vertical shaft lime kiln.

## 5.2 *VOC Control Technology Summary*

Table 5.2.1 summarizes the different VOC control technologies and indicates which technologies have been chosen as technically feasible options for the proposed new lime kiln. The same discussion as presented in the previous section for CO emissions control and feasibility applies to VOC emissions.

**Table 5.2.1 – VOC Control Technology Summary**

| Identified Control Technology | Available and Demonstrated Effective | In Service On Similar Units | Technically Feasible for Lime Kiln |
|---|---|---|---|
| Catalytic Oxidation | No | No | No |
| Thermal Oxidation | No | No | No |
| Combustion Controls | Yes | Yes | Yes |

## 5.3 *Proposed VOC BACT Selection*

Because only one technology has been demonstrated as technically feasible for the control of VOC emissions, a top-down ranking and detailed control technology review has not been included. Table 5.3.1 lists the proposed CO BACT emission limit for the vertical shaft kiln at DTN. This emission rate is based on the best available engineering judgment and a review of other currently permitted similar processes.

**Table 5.3.1 – Proposed VOC BACT Emission Limit**

| Emission Unit | BACT Limit | Control Type |
|---|---|---|
| Lime Kiln | 2.73 lb/hr (0.13 lb/ton lime produced)<br><br>3-hour average | Good combustion practice |

## 5.4 *RBLC Database Review*

Information concerning recently permitted lime kiln operations (2012 to 2022) was obtained from the RBLC database by completing a search for RBLC Process Type Codes 30.231, Kraft Lime Kilns, and 90.019, Lime/Limestone Handling/Kilns/Storage/Manufacturing. Lime kilns that utilize a primary fuel other than natural gas were eliminated. In this way the review of recently permitted lime kilns was focused to reflect operations similar to the vertical shaft lime kiln proposed for DTN. Table 5.4.1 provides a summary of the comparable lime kiln permit parameters.

**Table 5.4.1 – RBLC Kiln VOC BACT Limit Summary**

| RBLCID | Company | Date | Throughput | BACT Limit | Equiv. Limit | Control |
|---|---|---|---|---|---|---|
| AR-0161 | Sun Bio Material Company | 2019 | 225 MMBtu/hr | 25 ppmv | NA | Good Combustion Practice |
| AL-0268 | Georgia Pacific LLC | 2014 | 17.7 tph | 2.4 lb/hr | 0.14 lb/ton | Good Combustion Practice |

As indicated in Table 5.4.1, the proposed VOC BACT limit for DTN is in the same range as other recent BACT determinations and would utilize the same control strategy of Good Combustion Practice. Due to the process characteristics, and the fact that the DTN kiln vents through both the balance vent and the carbonation system, it is not possible to make a direct comparison to the ppm limit presented for AR-0161. In summary, the RBLC data review supports the proposed VOC BACT limit for the DTN lime kiln.

# American Crystal Sugar Company
# Drayton Sugar Beet Processing Facility
# Revised BACT Analysis
# Lime Slaker (EU30)

In July of 2017, the American Crystal Sugar Company (ACSC) Drayton (DTN) facility was issued permit to construct PTC17001, which authorized the installation of a new lime slaker (EU30) with a maximum rated capacity of 307 tons per day of calcined lime.

During the engineering design review of the proposed project, it was determined that a natural gas-fired lime kiln would be installed in lieu of an anthracite/coke-fired kiln. Due to differences in process throughput of the kilns, the lime slaker capacity was increased to 500 tons per day of calcined lime.

PTC17001 was issued based on a Best Available Control Technology (BACT) analysis for a proposed lime slaker with a maximum rated capacity of 307 tons per day. Therefore, to support the as-built construction of EU30, with a total capacity of 500 tons per day, the BACT analysis has been revised.

## 1.0 BACT for PM

The objective of this analysis is to determine BACT for PM emissions from the lime slaker system. The slaking process is a wet process whereby lime produced by the kiln is immediately transferred to the slaker, or hydrator, to produce milk of lime. The introduction of lime to water is an exothermic reaction that releases heat and steam to the atmosphere. The milk of lime produced by the slaking process is directly routed to the sugar production process as a component of juice purification. The slaking process is not actively vented. No exhaust fans are used to vent the steam and heat produced from the hydration process. Instead, passive venting is used to channel the steam and heated air to the atmosphere. There are no combustion related emissions associated with this process.

### *1.1 Identification of PM Control Technologies*

PM control may be achieved through a variety of control technologies, including a fabric filter baghouse, ESP, WESP, wet scrubbers, and/or mechanical separators. Because the exothermic slaking process results in a saturated, low volume exhaust stream the use of dry PM control systems such as a fabric filter baghouse, ESP or mechanical separator would not be technically feasible. The saturated exhaust steam would result in PM deposition on the internal surfaces of the control equipment leading to plugging, malfunction and maintenance concerns. The use of a wet scrubber or WESP would be technically feasible. Table 1.1.1 summarizes the different PM control technologies and indicates which technologies have been chosen as technically feasible options for the lime slaker.

**Table 1.1.1 –PM Control Technology Summary**

| Identified Control Technology | Available and Demonstrated Effective | In Service On Similar Units | Technically Feasible for Slaker |
|---|---|---|---|
| Fabric Filter | Yes | No | No |
| ESP | Yes | No | No |
| WESP | Yes | No | Yes |
| Wet Scrubber | Yes | Yes | Yes |
| Mechanical Separator | Yes | No | No |

## *1.2 Top-Down Ranking*

The PM control technologies that are considered technically feasible for implementation on the slaker have been ranked from most to least effective in terms of emission reduction potential. Table 1.2.1 summarizes the control technology ranking.

**Table 1.2.1 – Top-Down Ranking of PM Control Technologies**

| Identified Control Technology | Percent PM Reduction |
|---|---|
| WESP | 95 |
| Wet Scrubber | 80 |

The relatively low control efficiencies are assumed based on the difficult properties of the flue gas, including inconsistent operations resulting from varying lime quality, bulk mixing, passive venting and demand surges.

## *1.3 Control Technology Evaluation*

Generally, PM emissions from the passive slaking processes are considered insignificant. However, in order to provide a conservative estimate of potential emissions, it was assumed that the process would result in 0.13 lb/ton lime throughput of filterable PM emissions (AP42, Chapter 11.17 emission factor of 0.067 lb/ton multiplied by a safety factor of 200 percent to account for limited emission factor data and widely varied process designs).

For BACT analysis purposes, a conservative 75 percent capacity factor was incorporated into emission estimates to provide a more accurate analysis with respect to annual control effectiveness costs. As indicated previously, typical processing campaigns do not last for an entire year. At maximum capacity of 20.8 tons/hr (500 tons per day), the slaker would result in potential uncontrolled filterable PM emissions of 10.9 tons per year. A summary of the estimated baseline and controlled PM emissions is provided in Table 1.3.1.

**Table 1.3.1 – Lime Slaker Baseline PM Emission Rate**

| Emission Unit Description | Baseline Emissions | | Controlled Emissions | |
|---|---|---|---|---|
| | Baseline Emission Rate (lb/hr)[A] | Annual Emissions (tpy)[B] | BACT Emission Rate (lb/hr)[C] | Annual Emissions (tpy)[B] |
| Lime Slaker/WESP | 2.70 | 8.88 | 0.14 | 0.44 |
| Lime Slaker/Scrubber | 2.70 | 8.88 | 0.54 | 1.78 |

[A] Based on uncontrolled baseline emission levels.
[B] Assumed annual capacity factor of 75 percent.
[C] Based on an assumed control efficiency of 95 and 80 percent, respectively for a WESP and scrubber.

As indicated in Table 1.3.1, the target controlled PM emission rate is 0.14 lb/hr for the WESP and 0.54 lb/hr for the scrubber. This corresponds to approximately 95 and 80 percent control of baseline PM emissions, respectively. Incorporating the 75 percent historical annual capacity factor, the overall reduction in PM emissions would be 8.44 tons per year for the WESP and 7.1 tons per year for the scrubber.

It is assumed that the very small amount of PM control that could be attained for the lime slaker would preclude the application of any control technology on an economic feasibility basis.

### *1.4 Proposed PM BACT Selection*

In light of the previous discussion, good engineering practice is proposed as BACT for the lime slaker. Table 1.4.1 lists the PM emission limitation proposed as BACT under typical operating ranges.

**Table 1.4.1 – Proposed PM BACT Emission Limit**

| Emission Unit | BACT Limit | Control Type |
|---|---|---|
| Lime Slaker | $PM/PM_{10}$: 3.33 lb/hr (0.16 lb/ton of lime)<br><br>3-hour average filterable and condensable.<br><br>$PM_{2.5}$: 1.24 lb/hr (0.06 lb/ton of lime)<br><br>3-hour average filterable and condensable. | Good Engineering Practice |

The BACT analysis for PM focused only on controlling filterable particulate matter based on the feasibility of controlling condensable particulate emissions. However, as indicated in Table 1.4.1 the proposed final particulate matter limit incorporates both condensable and filterable fractions. The combined condensable/filterable limit will provide the most flexibility with regard to compliance demonstrations, in which various test method interferences have indicated the potential for a high degree of variability in results.

## *1.5 RBLC Database Review*

A search of EPA's RACT/BACT/LAER clearinghouse did not reveal any other lime slakers that have undergone BACT.

# American Crystal Sugar Company
# Drayton Sugar Beet Processing Facility
# Revised BACT Analysis
# Pellet Mill/Cooler (EU31)

In July of 2017, the American Crystal Sugar Company (ACSC) Drayton (DTN) facility was issued permit to construct PTC17001, which authorized the installation of a new pellet mill/cooler system (EU31) with a maximum rated capacity of 15 tons per hour.

During the engineering design review of the proposed project, it was determined that significant re-design of the existing pellet mill and cooling system at DTN was necessary to support the proposed modification. Therefore, a new pellet milling system and cooler comprised of the following equipment was constructed:

- Three pellet mills with a nominal capacity of 16 tons per hour each, and
- One pellet cooler with a nominal capacity of 30 tons per hour.

All three pellet mills route to the pellet cooler. Because the pellet cooler has a capacity of 30 tons per hour, it restricts the production of the pellet mills. The three pellet mills provide operational redundancy to allow pellet production of 30 tons per hour when one mill is down for maintenance. The air flow through entire system is routed through one common fabric filter baghouse.

All of the existing pellet mills and the pellet cooler (EU6, EU7, EU8 and EU22) at DTN were removed from service as part of the project.

PTC17001 was issued based on a Best Available Control Technology (BACT) analysis for a proposed pellet mill and cooler with a maximum rated capacity of 15 tons per hour. Therefore, to support the as-built construction of EU31, consisting of three mills and a cooler with a total capacity of 30 tons per hour, the BACT analysis has been revised.

## 1.0 BACT for PM

The objective of this analysis is to determine BACT for PM emissions from the pellet mill and cooling process.

Dried pulp exits the pulp dryers at an average temperature of 248°F. Immediately after exiting one of the two pulp dryers, the pulp is routed to the pellet mills to break up large pieces of pulp and mill it into usable pulp pellets, which are sold as an animal feed supplement. In order to compress the pulp into pellets that will maintain integrity as a solid pellet, additional steam and a limited amount of hot water is applied to facilitate the compression and pelletization. After exiting the pellet mill, the pulp pellets pass through a pellet cooler which uses ambient building air to cool the pellets prior to storage in the pellet bins. Particulate emissions from the process are mainly due to material handling and entrainment of particles in the process air. No combustion process emissions are associated with the milling and pelletizing process.  Exhaust air flow is drawn through the pellet mills into the pellet cooler where it is then exhausted to the atmosphere.

*1.1 Identification of PM Control Technologies*

PM control may be achieved through a variety of control technologies, including a fabric filter baghouse, ESP, WESP, wet scrubbers, and/or mechanical separators.  However, dust generated from the pelletizing and cooling process presents several difficulties with respect to feasible control technologies.  The exhaust gas contains a high degree of moisture due to the steam and hot water applied during the pelletizing process.  Additionally, the organic nature of the collected material results in "heating" as the material cures, which may lead to spontaneous combustion.

Table 1.1.1 summarizes the different PM control technologies and indicates which technologies have been chosen as technically feasible options for the pellet mill and cooler.

**Table 1.1.1 –PM Control Technology Summary**

| Identified Control Technology | Available and Demonstrated Effective | In Service On Similar Units | Technically Feasible for Slaker |
|---|---|---|---|
| Fabric Filter | Yes | Yes | Yes |
| ESP | Yes | No | Yes |
| WESP | Yes | No | Yes |
| Wet Scrubber | Yes | Yes | Yes |
| Mechanical Separator (Cyclone) | Yes | Yes | Yes |

*1.2 Top-Down Ranking*

The PM control technologies that are considered technically feasible for implementation on the pellet mill and cooler have been ranked from most to least effective in terms of emission reduction potential. Table 1.2.1 summarizes the control technology ranking.

**Table 1.2.1 – Top-Down Ranking of PM Control Technologies**

| Identified Control Technology | Percent PM Reduction |
|---|---|
| Fabric Filter | 99 |

| Identified Control Technology | Percent PM Reduction |
|---|---|
| WESP | 95 |
| ESP | 90 |
| Wet Scrubber | 85 |
| Cyclone | 80 |

The relatively low control efficiencies for WESP and ESP controls are assumed based on the unknown resistivity characteristics of the pulp dust.

### *1.3 Proposed PM BACT Selection*

DTN is utilizing a fabric filter baghouse to control emissions from PM from the pellet mill and cooler system (EU31). Because the top level of control was chosen, a detailed control technology review has not been included. Table 1.3.1 lists the proposed PM BACT emission limit for the pellet mill and cooler system at DTN. This emission rate is based on the best available engineering judgement and the manufacturer guaranteed emission rate of 0.005 gr/dscf at a maximum flow rate of 35,000 acfm.

**Table 1.3.1 – Proposed PM BACT Emission Limit**

| Emission Unit | BACT Limit | Control Type |
|---|---|---|
| New Pellet Mill and Cooler System (EU31) | $PM/PM_{10}$: 1.5 lb/hr (0.005 gr/dscf)<br>3-hour average<br><br>$PM_{2.5}$: 0.35 lb/hr (0.001 gr/dscf)<br>3-hour average | Fabric Filter |

### *1.4 RBLC Database Review*

A search of EPA's RACT/BACT/LAER clearinghouse did not reveal any other pellet mill and cooler systems that have undergone BACT.

# Attachment C

# Dispersion Modeling Data:

1) **Modeling Parameters**
2) **Modeling Summary Files**
    a. **$PM_{10}$ Verification Run**
    b. **$PM_{2.5}$ Verification Run**
    c. **$PM_{10}$ Annual Amendment**
    d. **$PM_{2.5}$ Annual and 25-Hour Amendment**
    e. **$PM_{10}$ 24-Hour Increment Amendment**
    f. **$PM_{10}$ Annual Increment Amendment**
    g. **$PM_{2.5}$ 24-Hour Increment Amendment**
    h. **$PM_{2.5}$ Annual Increment Amendment**

**American Crystal Sugar Company**
**Drayton, ND**
**Modeling Source Parameters - PTC Amdendment**

| Emission Point | Description | UTM Coordinates x (m) | UTM Coordinates y (m) | Elev. (m) | Height (m) | Temp (K) | Flow (acfm) | Velocity (m/s) | Dia. (m) | Orient. (vert/horz) | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EP1 | B&W Boiler | 634,538.2 | 5,383,722.1 | 243.8 | 45.72 | 559.3 | 207,000 | 22.5 | 2.35 | Vertical | |
| EP1a | Coal Handling Equipment | 634,518.7 | 5,383,766.2 | 243.8 | 25.91 | 294.3 | 1,700 | 0.001 | 0.001 | Horizontal | |
| EP3 | Pulp Dryer No. 2 | 634,468.5 | 5,383,839.7 | 243.8 | 64.01 | 398.7 | 50,000 | 20.2 | 1.22 | Vertical | |
| EP4 | Pulp Dryer No. 1 | 634,464.9 | 5,383,839.7 | 243.8 | 51.82 | 388.7 | 127,000 | 33.0 | 1.52 | Vertical | Modified as part of current project. |
| ~~PULP~~ | ~~New Pulp Dryer~~ | ~~634,464.9~~ | ~~5,383,839.7~~ | ~~243.8~~ | ~~64.01~~ | ~~353.2~~ | ~~235,000~~ | ~~21.0~~ | ~~2.59~~ | ~~Vertical~~ | Never installed. |
| ~~EP5~~ | ~~Lime Mixing Tank & Kiln Cooler~~ | ~~634,519.2~~ | ~~5,383,802.3~~ | ~~243.8~~ | ~~9.45~~ | ~~399.8~~ | ~~8,500~~ | ~~0.001~~ | ~~0.001~~ | ~~Horizontal~~ | Removed from service as part of current project. |
| ~~EP6~~ | ~~Pellet Mill No. 1~~ | ~~634,476.4~~ | ~~5,383,941.2~~ | ~~243.8~~ | ~~23.77~~ | ~~310.9~~ | ~~7,952~~ | ~~3.21~~ | ~~1.22~~ | ~~Vertical~~ | Removed from service as part of current project. |
| EP30 | New Pulp Pellet Mill & Cooler | 634,495.0 | 5,383,941.4 | 243.8 | 7.01 | 294.3 | 35,000 | 36.22 | 0.76 | Vertical | New emission unit. |
| ~~EP7~~ | ~~Pellet Mill No. 2~~ | ~~634,476.1~~ | ~~5,383,943.9~~ | ~~243.8~~ | ~~23.77~~ | ~~310.9~~ | ~~11,000~~ | ~~4.45~~ | ~~1.22~~ | ~~Vertical~~ | Removed from service as part of current project. |
| ~~EP8~~ | ~~Pellet Mill No. 3~~ | ~~634,481.4~~ | ~~5,383,943.8~~ | ~~243.8~~ | ~~23.77~~ | ~~310.9~~ | ~~11,000~~ | ~~4.45~~ | ~~1.22~~ | ~~Vertical~~ | Removed from service as part of current project. |
| EP9 | Dry Pulp Belt Conveyor | 634,518.0 | 5,383,849.8 | 243.8 | 6.71 | 310.9 | 6,000 | 0.001 | 0.001 | Horizontal | |
| EP10 | Dry Pulp Reclaim System | 634,473.3 | 5,383,946.8 | 243.8 | 7.31 | 310.9 | 3,500 | 0.001 | 0.001 | Horizontal | |
| ~~EP11~~ | ~~Dry Pulp Bucket Elevator~~ | ~~634,518.6~~ | ~~5,383,844.1~~ | ~~243.8~~ | ~~17.37~~ | ~~310.9~~ | ~~3,500~~ | ~~0.001~~ | ~~0.001~~ | ~~Horizontal~~ | Emissions routed to EP9 as part of current project. |
| ~~EP12~~ | ~~Sugar Dryer~~ | ~~634,478.4~~ | ~~5,383,733.8~~ | ~~243.8~~ | ~~27.43~~ | ~~312.0~~ | ~~18,000~~ | ~~0.001~~ | ~~0.76~~ | ~~Horizontal~~ | Removed from service as part of current project. |
| EP28 | Sugar Dryer | 634,478.4 | 5,383,733.8 | 243.8 | 27.43 | 329.2 | 38,000 | 15.38 | 1.22 | Vertical | New emission unit. |
| ~~EP13~~ | ~~Belgian Lime Kiln~~ | ~~634,514.1~~ | ~~5,383,784.2~~ | ~~243.8~~ | ~~38.71~~ | ~~376.5~~ | ~~3,242~~ | ~~21.0~~ | ~~0.30~~ | ~~Vertical~~ | Removed from service as part of current project. |
| EP27a | Kiln Balance Vent | 634,565.9 | 5,383,761.9 | 243.8 | 53.34 | 317.0 | 4,531 | 16.2 | 0.41 | Vertical | New emission unit. |
| EP27b | Kiln Carbonation Vent | 634,512.6 | 5,383,797.1 | 243.8 | 33.53 | 358.1 | 8,662 | 6.3 | 0.91 | Vertical | New emission unit. No particulate emissions. |
| EP27c | Kiln CO2 Pressure Vent | 634,515.9 | 5,383,797.1 | 243.8 | 33.53 | 313.2 | 492 | 4.6 | 0.25 | Vertical | New emission unit. Intermittent operation - not modeled. |
| EP27d | Kiln Startup Bypass | 634,570.9 | 5,383,761.9 | 243.8 | 65.84 | 448.2 | 11,734 | 19.0 | 0.61 | Vertical | New emission unit. Intermittent operation - not modeled. |
| EP14a | MAC2 Flow Headhouse | 634,494.1 | 5,383,726.9 | 243.8 | 26.22 | 302.6 | 20,000 | 0.001 | 0.001 | Horizontal | |
| EP14b | Old Hummer Room Pulsaire | 634,488.6 | 5,383,726.9 | 243.8 | 22.25 | 302.6 | 19,000 | 0.001 | 0.001 | Horizontal | |
| EP14c | Hummer Room MAC | - | - | - | - | - | - | - | - | - | Emission unit vents Internally - no external stack. |
| EP15 | Pulp Pellet Bin No. 1 | 634,440.2 | 5,383,949.1 | 243.8 | 18.90 | 294.3 | NA | 0.001 | 0.001 | Horizontal | Only one emission unit operated at any time. |
| ~~EP16~~ | ~~Pulp Pellet Bin No. 2~~ | ~~634,440.2~~ | ~~5,383,949.1~~ | ~~243.8~~ | ~~18.90~~ | ~~294.3~~ | ~~NA~~ | ~~0.001~~ | ~~0.001~~ | ~~Horizontal~~ | Only one emission unit operated at any time. |
| ~~EP17~~ | ~~Pulp Pellet Bin No. 3~~ | ~~634,440.2~~ | ~~5,383,949.1~~ | ~~243.8~~ | ~~18.90~~ | ~~294.3~~ | ~~NA~~ | ~~0.001~~ | ~~0.001~~ | ~~Horizontal~~ | Only one emission unit operated at any time. |
| EP18 | Sugar Warehouse (Hi-Vac) | - | - | - | - | - | - | - | - | - | Emission unit vents Internally - no external stack. |
| EP19a | Bulk Loading Pulsaire | 634,436.9 | 5,383,673.3 | 243.8 | 4.72 | 294.3 | NA | 0.001 | 0.001 | Horizontal | |
| EP19b | North Bulk Sugar Loadout | - | - | - | - | - | - | - | - | - | Emission unit vents Internally - no external stack. |
| EP19c | South Bulk Sugar Loadout | - | - | - | - | - | - | - | - | - | Emission unit vents Internally - no external stack. |
| EP20 | Main Sugar Warehouse Pulsaire | 634,469.5 | 5,383,641.9 | 243.8 | 12.19 | 294.3 | 10,500 | 0.001 | 0.001 | Horizontal | |
| EP21 | Diesel Fire Suppression Pump | - | - | - | - | - | - | - | - | - | Intermittent/emergency operation - not modeled. |
| ~~EP22~~ | ~~Pulp Pellet Mill & Cooler~~ | ~~634,478.8~~ | ~~5,383,945.3~~ | ~~243.8~~ | ~~24.99~~ | ~~294.3~~ | ~~9,998~~ | ~~28.7~~ | ~~0.46~~ | ~~Vertical~~ | Removed from service as part of current project. |
| EP23 | Pulp Dryer Coal Hopper | 634,497.6 | 5,383,847.8 | 243.8 | 23.16 | 294.3 | 5,200 | 0.001 | 0.001 | Horizontal | |
| EP24 | Flume Lime Slaker | 634,519.2 | 5,383,801.5 | 243.8 | 6.10 | 294.3 | NA | 0.001 | 0.001 | Horizontal | |
| ~~EP25~~ | ~~Lime Slaker~~ | ~~634,519.4~~ | ~~5,383,800.4~~ | ~~243.8~~ | ~~15.24~~ | ~~294.3~~ | ~~4,500~~ | ~~0.001~~ | ~~0.001~~ | ~~Horizontal~~ | Removed from service as part of current project. |
| EP29 | New Lime Slaker | 634,574.4 | 5,383,753.0 | 243.8 | 24.38 | 337.6 | 3,000 | 2.748 | 0.81 | Vertical | New emission unit. |

| Emission Point | Description | UTM Coordinates x (m) | UTM Coordinates y (m) | Elev. (m) | Rel. Ht. (m) | E. Length (m) | N. Length (m) | Angle (°) | Init. Vert. (m) | Note |
|---|---|---|---|---|---|---|---|---|---|---|
| Fug 1 | Pellet Loadout Emissions | 634,446.8 | 5,383,938.7 | 243.8 | 3.66 | 5.0 | 20.0 | -2.0 | 11.77 | Fugitive source. |
| Fug 2 | Coal Handling Emissions | 634,518.2 | 5,383,428.4 | 243.8 | 3.05 | 18.5 | 115.0 | -2.0 | 1.52 | Fugitive source. |
| Fug 3 | Lime Rock Handling Emissions | 634,582.6 | 5,383,680.6 | 243.8 | 1.83 | 45.0 | 60.0 | -2.0 | 0.91 | Fugitive source. |
| Fug 4 | Spent Lime Wind Erosion | 635,097.1 | 5,384,717.2 | 243.8 | 1.83 | 70.0 | 125.0 | -2.0 | 0.91 | Fugitive source. |

**American Crystal Sugar Company**
**Drayton, ND**
**PM/$PM_{10}$/$PM_{2.5}$ Modeling Parameters - PTC Amendment**

| Emission Point | Description | UTM Coordinates x (m) | y (m) | Elev. (m) | Height (m) | Temp (K) | Flow (acfm) | Velocity (m/s) | Dia. (m) | Orient. (vert/horz) | PM (lb/hr) | $PM_{10}$ (lb/hr) | $PM_{10}$ (g/sec) | $PM_{2.5}$ (lb/hr) | $PM_{2.5}$ (g/sec) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EP1 | B&W Boiler | 634,538.2 | 5,383,722.1 | 243.8 | 45.72 | 559.3 | 207,000 | 22.5 | 2.35 | Vertical | 15.60 | 29.80 | 3.75 | 36.29 | 4.57 |
| EP1a | Coal Handling Equipment | 634,518.7 | 5,383,766.2 | 243.8 | 25.91 | 294.3 | 1,700 | 0.001 | 0.001 | Horizontal | 0.29 | 0.29 | 0.04 | 0.07 | 0.01 |
| EP3 | Pulp Dryer No. 2 | 634,468.5 | 5,383,839.7 | 243.8 | 64.01 | 398.7 | 50,000 | 20.2 | 1.22 | Vertical | 41.00 | 75.90 | 9.56 | 48.14 | 6.07 |
| EP4 | Modified Pulp Dryer No. 1 | 634,464.9 | 5,383,839.7 | 243.8 | 51.82 | 384.8 | 127,000 | 33.0 | 1.52 | Vertical | 48.00 | 88.80 | 11.19 | 83.31 | 10.50 |
| EP30 | New Pulp Pellet Mills & Cooler | 634,495.0 | 5,383,941.4 | 243.8 | 7.01 | 294.3 | 35,000 | 36.2 | 0.76 | Vertical | 1.50 | 1.50 | 0.19 | 0.35 | 0.04 |
| EP9 | Dry Pulp Belt Conveyor & Bucket | 634,518.0 | 5,383,849.8 | 243.8 | 6.71 | 310.9 | 6,000 | 0.001 | 0.001 | Horizontal | 0.30 | 0.30 | 0.04 | 0.06 | 0.01 |
| EP10 | Dry Pulp Reclaim System | 634,473.3 | 5,383,946.8 | 243.8 | 7.31 | 310.9 | 3,500 | 0.001 | 0.001 | Horizontal | 0.60 | 0.60 | 0.08 | 0.10 | 0.01 |
| EP28 | Sugar Dryer | 634,478.4 | 5,383,733.8 | 243.8 | 27.43 | 329.2 | 38,000 | 15.4 | 1.22 | Vertical | 2.20 | 2.20 | 0.28 | 0.50 | 0.06 |
| EP27a | Kiln Balance Vent | 634,565.9 | 5,383,761.9 | 243.8 | 53.34 | 317.0 | 4,425 | 16.2 | 0.41 | Vertical | 10.97 | 10.97 | 1.38 | 6.97 | 0.88 |
| EP14a | MAC2 Flow Headhouse | 634,494.1 | 5,383,726.9 | 243.8 | 26.22 | 302.6 | 20,000 | 0.001 | 0.001 | Horizontal | 3.43 | 3.43 | 0.43 | 0.79 | 0.10 |
| EP14b | Old Hummer Room Pulsaire | 634,488.6 | 5,383,726.9 | 243.8 | 22.25 | 302.6 | 19,000 | 0.001 | 0.001 | Horizontal | 3.26 | 3.26 | 0.41 | 0.75 | 0.09 |
| EP15 | Pulp Pellet Bin No. 1 | 634,440.2 | 5,383,949.1 | 243.8 | 18.90 | 294.3 | 2,140 | 0.001 | 0.001 | Horizontal | 0.37 | 0.37 | 0.05 | 0.06 | 0.01 |
| EP19a | Bulk Loading Pulsaire | 634,436.9 | 5,383,673.3 | 243.8 | 4.72 | 294.3 | 2,560 | 0.001 | 0.001 | Horizontal | 0.11 | 0.11 | 0.01 | 0.03 | 0.004 |
| EP20 | Main Sugar Warehouse Pulsaire | 634,469.5 | 5,383,641.9 | 243.8 | 12.19 | 294.3 | 10,500 | 0.001 | 0.001 | Horizontal | 0.45 | 0.45 | 0.06 | 0.10 | 0.01 |
| EP23 | Pulp Dryer Coal Hopper | 634,497.6 | 5,383,847.8 | 243.8 | 23.16 | 294.3 | 5,200 | 0.001 | 0.001 | Horizontal | 0.89 | 0.89 | 0.11 | 0.21 | 0.03 |
| EP24 | Flume Lime Slaker | 634,519.2 | 5,383,801.5 | 243.8 | 6.10 | 294.3 | NA | 0.001 | 0.001 | Horizontal | 0.04 | 0.04 | 0.01 | 0.01 | 0.001 |
| EP29 | New Lime Slaker | 634,574.4 | 5,383,753.0 | 243.8 | 24.38 | 337.6 | 3,000 | 2.7 | 0.81 | Vertical | 3.33 | 3.33 | 0.42 | 1.24 | 0.16 |

| Emission Point | Description | UTM Coordinates x (m) | y (m) | Elev. (m) | Rel. Ht. (m) | E. Length (m) | N. Length (m) | Angle (°) | Init. Vert. (m) | Orient. | PM (lb/hr) | $PM_{10}$ (lb/hr) | $PM_{10}$ (g/sec) | $PM_{2.5}$ (lb/hr) | $PM_{2.5}$ (g/sec) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fug 1 | Pellet Loadout Emissions | 634,446.8 | 5,383,938.7 | 243.8 | 3.66 | 5.0 | 20.0 | -2.0 | 11.77 | Fugitive | 0.45 | 0.45 | 0.06 | 0.01 | 0.001 |
| Fug 2 | Coal Handling Emissions | 634,518.2 | 5,383,428.4 | 243.8 | 3.05 | 18.5 | 115.0 | -2.0 | 1.52 | Fugitive | 0.64 | 0.64 | 0.08 | 0.09 | 0.01 |
| Fug 3 | Lime Rock Handling Emissions | 634,582.6 | 5,383,680.6 | 243.8 | 1.83 | 45.0 | 60.0 | -2.0 | 0.91 | Fugitive | 0.10 | 0.10 | 0.01 | 3.00E-05 | 3.78E-06 |
| Fug 4 | Spent Lime Wind Erosion | 635,097.1 | 5,384,717.2 | 243.8 | 1.83 | 70.0 | 125.0 | -2.0 | 0.91 | Fugitive | 0.25 | 0.25 | 0.03 | 0.04 | 0.01 |

| Emission Point | Description | UTM Coordinates x (m) | y (m) | Elev. (m) | Height (m) | Temp (K) | Flow (acfm) | Velocity (m/s) | Dia. (m) | Orient. (vert/horz) | PM (lb/hr) | $PM_{10}$ (lb/hr) | $PM_{10}$ (g/sec) | $PM_{2.5}$ (lb/hr) | $PM_{2.5}$ (g/sec) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ETH1 | Background - DDG Dryer 1 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 399.8 | 30000 | 21.56 | 0.91 | Vertical | 2.20 | 2.20 | 0.28 | 2.20 | 0.28 |
| ETH2 | Background - Biomass Boiler 1 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 505.4 | 17550 | 12.61 | 0.91 | Vertical | 0.20 | 0.20 | 0.03 | 0.20 | 0.03 |
| ETH3 | Background - Biomass Boiler 2 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 505.4 | 17550 | 12.61 | 0.91 | Vertical | 0.20 | 0.20 | 0.03 | 0.20 | 0.03 |
| ETH4 | Background - DDG Dryer 2 | 617506.8 | 5364866.6 | 251.2 | 10.67 | 410.9 | 13000 | 21.02 | 0.61 | Vertical | 1.11 | 1.11 | 0.14 | 1.11 | 0.14 |
| ETH5 | Background - Grain Handling | 617566.0 | 5364904.7 | 251.2 | 12.19 | 293.0 | NA | 0.01 | 0.30 | Horizontal | 6.25 | 6.25 | 0.79 | 6.25 | 0.79 |
| DEVP | Background - Boiler | 516654.0 | 5363730.0 | 254.5 | 45.72 | 433.0 | 26552 | 2.68 | 2.44 | Vertical | 33.12 | 33.12 | 4.17 | 33.12 | 4.17 |

Note: EP1, EP3, EP4, and EP27a incorporate secondary $PM_{2.5}$ formation adjustment to emission factor based on EPA procedures.

**American Crystal Sugar Company**
**Drayton, ND**
**$PM_{10}$ Baseline Increment Modeling Parameters (Minor Source Baseline Date Jan 13, 1978)**

| Emission Point | Description | UTM Coordinates x (m) | UTM Coordinates y (m) | Elev. (m) | Height (m) | Temp (K) | Flow (acfm) | Velocity (m/s) | Dia. (m) | Orient. (vert/horz) | 24-Hour $PM_{10}$ (lb/hr) | 24-Hour $PM_{10}$ (g/sec) | Annual $PM_{10}$ (lb/hr) | Annual $PM_{10}$ (g/sec) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PEP1 | B&W Boiler | 634,538.2 | 5,383,722.1 | 243.8 | 36.57 | 490.2 | 172,306 | 18.6 | 2.36 | Vertical | -37.52 | -4.73 | -26.34 | -3.32 |
| PEP1a | Coal Handling Equipment | 634,518.7 | 5,383,766.2 | 243.8 | 25.91 | 294.3 | 1,700 | 0.001 | 0.001 | Horizontal | -0.29 | -0.04 | -0.16 | -0.02 |
| PEP2 | Startup Boiler | 634,504.0 | 5,383,770.4 | 243.8 | 30.50 | 566.1 | 19,431 | 14.1 | 0.91 | Vertical | -1.62 | -0.20 | 0.00 | 0.00 |
| PEP3A | Pulp Dryer No. 2 Stack 1 | 634,488.9 | 5,383,845.1 | 243.8 | 24.69 | 373.3 | 14,539 | 5.87 | 1.22 | Vertical | -18.70 | -2.36 | -10.14 | -1.28 |
| PEP3B | Pulp Dryer No. 2 Stack 2 | 634,485.4 | 5,383,845.0 | 243.8 | 24.69 | 373.3 | 14,539 | 5.87 | 1.22 | Vertical | -18.70 | -2.36 | -10.14 | -1.28 |
| PEP3C | Pulp Dryer No. 2 Stack 3 | 634,481.7 | 5,383,844.8 | 243.8 | 24.69 | 373.3 | 14,539 | 5.87 | 1.22 | Vertical | -18.70 | -2.36 | -10.14 | -1.28 |
| PEP3D | Pulp Dryer No. 2 Stack 4 | 634,478.2 | 5,383,844.8 | 243.8 | 24.69 | 373.3 | 14,539 | 5.87 | 1.22 | Vertical | -18.70 | -2.36 | -10.14 | -1.28 |
| PEP4A | Pulp Dryer No. 1 Stack 1 | 634,489.0 | 5,383,841.9 | 243.8 | 24.69 | 380.4 | 19,691 | 7.95 | 1.22 | Vertical | -25.39 | -3.20 | -13.76 | -1.73 |
| PEP4B | Pulp Dryer No. 1 Stack 2 | 634,485.5 | 5,383,841.7 | 243.8 | 24.69 | 380.4 | 19,691 | 7.95 | 1.22 | Vertical | -25.39 | -3.20 | -13.76 | -1.73 |
| PEP4C | Pulp Dryer No. 1 Stack 3 | 634,481.8 | 5,383,841.5 | 243.8 | 24.69 | 380.4 | 19,691 | 7.95 | 1.22 | Vertical | -25.39 | -3.20 | -13.76 | -1.73 |
| PEP4D | Pulp Dryer No. 1 Stack 4 | 634,478.2 | 5,383,841.5 | 243.8 | 24.69 | 380.4 | 19,691 | 7.95 | 1.22 | Vertical | -25.39 | -3.20 | -13.76 | -1.73 |
| PEP4E | Pulp Dryer No. 1 Stack 5 | 634,474.7 | 5,383,841.5 | 243.8 | 24.69 | 380.4 | 19,691 | 7.95 | 1.22 | Vertical | -25.39 | -3.20 | -13.76 | -1.73 |
| PEP5 | Lime Mixing Tank | 634,519.2 | 5,383,802.3 | 243.8 | 9.45 | 399.8 | 8,500 | 0.001 | 0.001 | Horizontal | -0.65 | -0.08 | -0.54 | -0.07 |
| PEP6 | Pellet Mill No. 1 | 634,476.4 | 5,383,941.2 | 243.8 | 23.77 | 310.9 | 11,007 | 4.45 | 1.22 | Vertical | -3.7 | -0.47 | -2.01 | -0.25 |
| PEP7 | Pellet Mill No. 2 | 634,476.1 | 5,383,943.9 | 243.8 | 23.77 | 310.9 | 11,007 | 4.45 | 1.22 | Vertical | -3.7 | -0.47 | -2.01 | -0.25 |
| PEP8 | Pellet Mill No. 3 | 634,481.4 | 5,383,943.8 | 243.8 | 23.77 | 310.9 | 11,007 | 4.45 | 1.22 | Vertical | -3.7 | -0.47 | -2.01 | -0.25 |
| PEP9 | Dry Pulp Belt Conveyor | 634,518.0 | 5,383,849.8 | 243.8 | 20.42 | 310.9 | 3,500 | 0.001 | 0.001 | Horizontal | -0.60 | -0.08 | -0.33 | -0.04 |
| PEP10 | Dry Pulp Reclaim System | 634,473.3 | 5,383,946.8 | 243.8 | 7.31 | 310.9 | 3,500 | 0.001 | 0.001 | Horizontal | -0.60 | -0.08 | -0.33 | -0.04 |
| PEP11 | Dry Pulp Bucket Elevator | 634,518.6 | 5,383,844.1 | 243.8 | 17.37 | 310.9 | 3,500 | 0.001 | 0.001 | Horizontal | -0.60 | -0.08 | -0.33 | -0.04 |
| PEP12 | Sugar Dryer | 634,478.4 | 5,383,733.8 | 243.8 | 27.43 | 312.0 | 18,000 | 0.001 | 0.76 | Horizontal | -1.58 | -0.20 | -0.85 | -0.11 |
| PEP13 | Belgian Lime Kiln | 634,514.1 | 5,383,784.2 | 243.8 | 38.71 | 376.5 | 3,242 | 21.0 | 0.30 | Vertical | -2.97 | -0.37 | -1.61 | -0.20 |
| PEP14 | Weibull Bin | 634,441.5 | 5,383,675.5 | 243.8 | 6.10 | 302.6 | NA | 0.001 | 0.001 | Horizontal | -3.40 | -0.43 | -1.84 | -0.23 |
| PEP15 | Pulp Pellet Bin No. 1, 2, 3 | 634,440.2 | 5,383,949.1 | 243.8 | 18.90 | 294.3 | NA | 0.001 | 0.001 | Horizontal | -0.37 | -0.05 | -0.20 | -0.03 |
| PEP18 | Sugar Warehouse | 634,474.2 | 5,383,675.5 | 243.8 | 10.1 | 294.3 | 6,900 | 17.9 | 0.5 | Vertical | -0.11 | -0.014 | -0.06 | -0.008 |

| Emission Point | Description | UTM Coordinates x (m) | UTM Coordinates y (m) | Elev. (m) | Rel. Ht. (m) | Sigma Y (m) | Sigma Z (m) | $PM_{10}$ (lb/hr) | $PM_{10}$ (g/sec) | $PM_{10}$ (lb/hr) | $PM_{10}$ (g/sec) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PEP19 | Sugar Loadout | 634,436.9 | 5,383,673.3 | 243.8 | 4.72 | 0.23 | 2.20 | -0.11 | -0.01 | -0.06 | -0.01 |
| PEP20 | Sugar Screening | 634,458.6 | 5,383,667.2 | 243.8 | 18.29 | 0.23 | 8.51 | -0.45 | -0.06 | -0.24 | -0.03 |

| Emission Point | Description | UTM Coordinates x (m) | UTM Coordinates y (m) | Elev. (m) | Rel. Ht. (m) | E. Length (m) | N. Length (m) | Angle (°) | Init. Vert. (m) | $PM_{10}$ (lb/hr) | $PM_{10}$ (g/sec) | $PM_{10}$ (lb/hr) | $PM_{10}$ (g/sec) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PFug 1 | Pellet Loadout Emissions | 634,446.8 | 5,383,938.7 | 243.8 | 3.66 | 5.0 | 20.0 | -2.0 | 1.86 | -0.45 | -0.06 | -0.24 | -0.03 |

**American Crystal Sugar Company**
**Drayton, ND**
**$PM_{2.5}$ Baseline Increment Modeling Parameters (Minor Source Baseline Date Aug 23, 2012)**

| Emission Point | Description | UTM Coordinates x (m) | y (m) | Elev. (m) | Height (m) | Temp (K) | Flow (acfm) | Velocity (m/s) | Dia. (m) | Orient. (vert/horz) | 24-Hour $PM_{2.5}$ (lb/hr) | 24-Hour $PM_{2.5}$ (g/sec) | Annual $PM_{2.5}$ (lb/hr) | Annual $PM_{2.5}$ (g/sec) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PEP1 | B&W Boiler | 634,538.2 | 5,383,722.1 | 243.8 | 36.57 | 490.2 | 172,306 | 18.6 | 2.36 | Vertical | -20.92 | -2.64 | -15.31 | -1.93 |
| PEP1a | Coal Handling Equipment | 634,518.7 | 5,383,766.2 | 243.8 | 25.91 | 294.3 | 1,700 | 0.001 | 0.001 | Horizontal | -0.07 | -0.01 | -0.05 | -0.01 |
| PEP2 | Startup Boiler | 634,504.0 | 5,383,770.4 | 243.8 | 30.50 | 566.1 | 19,431 | 14.1 | 0.91 | Vertical | -1.18 | -0.15 | -0.01 | -0.001 |
| PEP3 | Pulp Dryer No. 2 | 634,468.5 | 5,383,839.7 | 243.8 | 51.82 | 398.7 | 50,000 | 20.2 | 1.22 | Vertical | -25.39 | -3.20 | -18.33 | -2.31 |
| PEP4 | Pulp Dryer No. 1 | 634,464.9 | 5,383,839.7 | 243.8 | 51.82 | 388.7 | 85,000 | 22.0 | 1.52 | Vertical | -37.03 | -4.67 | -26.73 | -3.37 |
| PEP5 | Lime Mixing Tank & Kiln Cooler | 634,519.2 | 5,383,802.3 | 243.8 | 9.45 | 399.8 | 8,500 | 0.001 | 0.001 | Horizontal | -1.33 | -0.17 | -0.95 | -0.12 |
| PEP6 | Pellet Mill No. 1 | 634,476.4 | 5,383,941.2 | 243.8 | 23.77 | 310.9 | 7,952 | 3.21 | 1.22 | Vertical | -0.57 | -0.07 | -0.41 | -0.05 |
| PEP7 | Pellet Mill No. 2 | 634,476.1 | 5,383,943.9 | 243.8 | 23.77 | 310.9 | 4,943 | 2.00 | 1.22 | Vertical | -0.57 | -0.07 | -0.41 | -0.05 |
| PEP8 | Pellet Mill No. 3 | 634,481.4 | 5,383,943.8 | 243.8 | 23.77 | 310.9 | 5,881 | 2.38 | 1.22 | Vertical | -0.57 | -0.07 | -0.41 | -0.05 |
| PEP9 | Dry Pulp Belt Conveyor | 634,518.0 | 5,383,849.8 | 243.8 | 17.37 | 310.9 | 3,500 | 0.001 | 0.001 | Horizontal | -0.14 | -0.02 | -0.10 | -0.01 |
| PEP10 | Dry Pulp Reclaim System | 634,473.3 | 5,383,946.8 | 243.8 | 7.31 | 310.9 | 3,500 | 0.001 | 0.001 | Horizontal | -0.14 | -0.02 | -0.10 | -0.01 |
| PEP11 | Dry Pulp Bucket Elevator | 634,518.6 | 5,383,844.1 | 243.8 | 17.37 | 310.9 | 3,500 | 0.001 | 0.001 | Horizontal | -0.14 | -0.02 | -0.10 | -0.01 |
| PEP12 | Sugar Dryer | 634,478.4 | 5,383,733.8 | 243.8 | 27.43 | 312.0 | 18,000 | 0.001 | 0.76 | Horizontal | -0.41 | -0.05 | -0.30 | -0.04 |
| PEP13 | Belgian Lime Kiln | 634,514.1 | 5,383,784.2 | 243.8 | 38.71 | 376.5 | 3,242 | 21.0 | 0.30 | Vertical | -0.31 | -0.04 | -0.22 | -0.03 |
| PEP14a | MAC2 Flow Headhouse | 634,494.1 | 5,383,726.9 | 243.8 | 26.22 | 302.6 | 20,000 | 0.001 | 0.001 | Horizontal | -0.79 | -0.10 | -0.79 | -0.10 |
| PEP14b | Old Hummer Room Pulsaire | 634,488.6 | 5,383,726.9 | 243.8 | 22.25 | 302.6 | 19,000 | 0.001 | 0.001 | Horizontal | -0.77 | -0.10 | -0.77 | -0.10 |
| PEP15 | Pulp Pellet Bin No. 1 | 634,440.2 | 5,383,949.1 | 243.8 | 18.90 | 294.3 | NA | 0.001 | 0.001 | Horizontal | -0.06 | -0.01 | -0.06 | -0.01 |
| PEP19a | Bulk Loading Pulsaire | 634,436.9 | 5,383,673.3 | 243.8 | 4.72 | 294.3 | NA | 0.001 | 0.001 | Horizontal | -0.03 | 0.00 | -0.03 | -0.004 |
| PEP20 | Main Sugar Warehouse Pulsaire | 634,469.5 | 5,383,641.9 | 243.8 | 12.19 | 294.3 | 10,500 | 0.001 | 0.001 | Horizontal | -0.1 | -0.01 | -0.10 | -0.01 |
| PEP22 | Pulp Pellet Mill & Cooler | 634,478.8 | 5,383,945.3 | 243.8 | 24.99 | 294.3 | 9,998 | 28.7 | 0.46 | Vertical | -0.04 | -0.01 | -0.03 | -0.004 |
| PEP23 | Pulp Dryer Coal Hopper | 634,497.6 | 5,383,847.8 | 243.8 | 23.16 | 294.3 | 5,200 | 0.001 | 0.001 | Horizontal | -0.21 | -0.03 | -0.15 | -0.02 |
| PEP25 | Lime Slaker | 634,519.4 | 5,383,800.4 | 243.8 | 15.24 | 294.3 | 4,500 | 0.001 | 0.001 | Horizontal | -0.28 | -0.04 | -0.20 | -0.03 |

| Emission Point | Description | UTM Coordinates x (m) | y (m) | Elev. (m) | Rel. Ht. (m) | E. Length (m) | N. Length (m) | Angle (°) | Init. Vert. (m) | $PM_{2.5}$ (lb/hr) | $PM_{2.5}$ (g/sec) | $PM_{2.5}$ (lb/hr) | $PM_{2.5}$ (g/sec) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PFug 1 | Pellet Loadout Emissions | 634,446.8 | 5,383,938.7 | 243.8 | 3.66 | 5.0 | 20.0 | -2.0 | 1.86 | -0.014 | -0.002 | -0.010 | -0.001 |

# American Crystal Sugar Company – Drayton
# $PM_{10}$ Verification Model Run

*** POINT SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | STACK HEIGHT (METERS) | STACK TEMP. (DEG.K) | STACK EXIT VEL. (M/SEC) | STACK DIAMETER (METERS) | BLDG EXISTS | URBAN SOURCE | CAP/ HOR | EMIS RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EP1 | 0 | 0.37547E+01 | 634538.2 | 5383772.1 | 243.8 | 45.72 | 559.26 | 22.52 | 2.35 | YES | NO | NO | |
| EP1A | 0 | 0.36539E-01 | 634518.7 | 5383766.2 | 243.8 | 25.91 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP3 | 0 | 0.95632E+01 | 634468.5 | 5383839.7 | 243.8 | 64.01 | 398.71 | 20.19 | 1.22 | YES | NO | NO | |
| PULP | 0 | 0.12209E+02 | 634464.9 | 5383839.7 | 243.8 | 64.01 | 353.15 | 21.00 | 2.59 | YES | NO | NO | |
| PELLET | 0 | 0.22680E+00 | 634476.4 | 5383941.2 | 243.8 | 24.99 | 294.30 | 28.39 | 0.46 | YES | NO | NO | |
| EP7 | 0 | 0.46619E+00 | 634476.1 | 5383943.9 | 243.8 | 23.77 | 310.93 | 4.45 | 1.22 | YES | NO | NO | |
| EP8 | 0 | 0.46619E+00 | 634481.4 | 5383943.8 | 243.8 | 23.77 | 310.93 | 4.45 | 1.22 | YES | NO | NO | |
| EP9 | 0 | 0.75599E-01 | 634518.0 | 5383849.8 | 243.8 | 17.37 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| EP10 | 0 | 0.75599E-01 | 634473.3 | 5383946.8 | 243.8 | 7.31 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| EP11 | 0 | 0.75599E-01 | 634518.6 | 5383844.1 | 243.8 | 17.37 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| DRY | 0 | 0.27720E+00 | 634478.4 | 5383733.8 | 243.8 | 27.43 | 329.15 | 15.38 | 1.22 | YES | NO | NO | |
| EP14A | 0 | 0.42839E+00 | 634494.1 | 5383726.9 | 243.8 | 26.21 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |
| EP14B | 0 | 0.41579E+00 | 634488.6 | 5383726.9 | 243.8 | 22.25 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |
| EP151617 | 0 | 0.46619E-01 | 634440.2 | 5383949.1 | 243.8 | 18.90 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP19A | 0 | 0.13860E-01 | 634436.9 | 5383673.3 | 243.8 | 4.72 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP20 | 0 | 0.56699E-01 | 634469.5 | 5383641.9 | 243.8 | 12.19 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP22 | 0 | 0.22680E+00 | 634478.8 | 5383945.3 | 243.8 | 24.99 | 294.26 | 28.74 | 0.46 | YES | NO | NO | |
| EP23 | 0 | 0.11214E+00 | 634497.6 | 5383847.9 | 243.8 | 23.16 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP24 | 0 | 0.50399E-02 | 634519.2 | 5383801.5 | 243.8 | 6.10 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| BALANCE | 0 | 0.13457E+01 | 634565.9 | 5383761.9 | 243.8 | 65.84 | 313.15 | 16.20 | 0.41 | YES | NO | NO | |
| SLAKER | 0 | 0.38555E+00 | 634574.4 | 5383753.0 | 243.8 | 24.38 | 352.59 | 0.45 | 0.81 | YES | NO | NO | |
| ETH1 | 0 | 0.27700E+00 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 399.82 | 21.56 | 0.91 | NO | NO | NO | |
| ETH2 | 0 | 0.25000E-01 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 505.37 | 12.61 | 0.91 | NO | NO | NO | |
| ETH3 | 0 | 0.25000E-01 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 505.37 | 12.61 | 0.91 | NO | NO | NO | |
| ETH4 | 0 | 0.14000E+00 | 617506.8 | 5364866.6 | 251.2 | 10.67 | 410.93 | 21.02 | 0.61 | NO | NO | NO | |
| ETH5 | 0 | 0.78700E+00 | 617566.0 | 5364904.7 | 251.2 | 12.19 | 293.00 | 0.01 | 0.31 | NO | NO | NO | |
| DEVP | 0 | 0.41730E+01 | 616654.0 | 5363730.0 | 254.5 | 45.72 | 433.00 | 2.68 | 2.44 | NO | NO | NO | |

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD001 | 0 | 0.60000E-02 | 634352.7 | 5383079.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD002 | 0 | 0.60000E-02 | 634365.5 | 5383087.4 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD003 | 0 | 0.60000E-02 | 634378.2 | 5383095.2 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD004 | 0 | 0.60000E-02 | 634390.5 | 5383103.8 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD005 | 0 | 0.60000E-02 | 634402.5 | 5383112.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD006 | 0 | 0.60000E-02 | 634414.4 | 5383121.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD007 | 0 | 0.60000E-02 | 634426.4 | 5383131.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD008 | 0 | 0.60000E-02 | 634438.3 | 5383140.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD009 | 0 | 0.60000E-02 | 634450.2 | 5383149.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD010 | 0 | 0.60000E-02 | 634462.2 | 5383158.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD011 | 0 | 0.60000E-02 | 634473.7 | 5383167.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD012 | 0 | 0.60000E-02 | 634484.7 | 5383178.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD013 | 0 | 0.60000E-02 | 634495.7 | 5383188.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD014 | 0 | 0.60000E-02 | 634506.8 | 5383198.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD015 | 0 | 0.60000E-02 | 634516.9 | 5383209.3 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD016 | 0 | 0.60000E-02 | 634524.7 | 5383222.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD017 | 0 | 0.60000E-02 | 634532.6 | 5383234.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD018 | 0 | 0.60000E-02 | 634540.5 | 5383247.6 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD019 | 0 | 0.60000E-02 | 634545.2 | 5383261.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD020 | 0 | 0.60000E-02 | 634549.4 | 5383276.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD021 | 0 | 0.29000E-01 | 634553.6 | 5383290.6 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD022 | 0 | 0.29000E-01 | 634558.4 | 5383304.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD023 | 0 | 0.29000E-01 | 634563.5 | 5383318.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD024 | 0 | 0.29000E-01 | 634568.7 | 5383333.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD025 | 0 | 0.29000E-01 | 634573.8 | 5383347.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD026 | 0 | 0.29000E-01 | 634579.0 | 5383361.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD027 | 0 | 0.29000E-01 | 634583.5 | 5383375.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD028 | 0 | 0.29000E-01 | 634586.8 | 5383390.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD029 | 0 | 0.29000E-01 | 634587.1 | 5383405.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD030 | 0 | 0.29000E-01 | 634587.4 | 5383420.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD031 | 0 | 0.29000E-01 | 634587.8 | 5383435.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD032 | 0 | 0.29000E-01 | 634588.1 | 5383450.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD033 | 0 | 0.29000E-01 | 634588.4 | 5383465.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD034 | 0 | 0.29000E-01 | 634588.7 | 5383480.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD035 | 0 | 0.29000E-01 | 634588.8 | 5383495.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD036 | 0 | 0.29000E-01 | 634588.6 | 5383510.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD037 | 0 | 0.29000E-01 | 634588.5 | 5383525.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD038 | 0 | 0.29000E-01 | 634588.3 | 5383540.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD039 | 0 | 0.29000E-01 | 634588.2 | 5383555.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD040 | 0 | 0.29000E-01 | 634588.0 | 5383570.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD041 | 0 | 0.29000E-01 | 634587.9 | 5383584.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD042 | 0 | 0.29000E-01 | 634587.7 | 5383599.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD043 | 0 | 0.29000E-01 | 634587.6 | 5383614.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD044 | 0 | 0.29000E-01 | 634585.7 | 5383629.7 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD045 | 0 | 0.29000E-01 | 634581.6 | 5383644.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD046 | 0 | 0.29000E-01 | 634574.9 | 5383657.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD047 | 0 | 0.29000E-01 | 634567.1 | 5383670.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD048 | 0 | 0.29000E-01 | 634560.2 | 5383683.5 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD049 | 0 | 0.29000E-01 | 634554.6 | 5383697.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD050 | 0 | 0.29000E-01 | 634551.4 | 5383712.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD051 | 0 | 0.29000E-01 | 634549.7 | 5383726.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD052 | 0 | 0.29000E-01 | 634548.6 | 5383741.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD053 | 0 | 0.29000E-01 | 634547.6 | 5383756.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD054 | 0 | 0.29000E-01 | 634546.5 | 5383771.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD055 | 0 | 0.29000E-01 | 634545.5 | 5383786.7 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD056 | 0 | 0.30239E-02 | 634386.3 | 5384560.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD057 | 0 | 0.30239E-02 | 634389.5 | 5384546.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD058 | 0 | 0.30239E-02 | 634394.8 | 5384532.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD059 | 0 | 0.30239E-02 | 634408.1 | 5384526.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD060 | 0 | 0.30239E-02 | 634422.3 | 5384521.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD061 | 0 | 0.30239E-02 | 634436.1 | 5384516.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD062 | 0 | 0.30239E-02 | 634449.8 | 5384510.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD063 | 0 | 0.30239E-02 | 634462.4 | 5384501.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD064 | 0 | 0.30239E-02 | 634474.1 | 5384492.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD065 | 0 | 0.30239E-02 | 634484.8 | 5384482.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD066 | 0 | 0.30239E-02 | 634494.8 | 5384470.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD067 | 0 | 0.30239E-02 | 634503.6 | 5384458.8 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD068 | 0 | 0.30239E-02 | 634511.3 | 5384446.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD069 | 0 | 0.30239E-02 | 634517.8 | 5384432.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD070 | 0 | 0.30239E-02 | 634523.1 | 5384418.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD071 | 0 | 0.30239E-02 | 634526.7 | 5384403.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD072 | 0 | 0.30239E-02 | 634530.3 | 5384389.3 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD073 | 0 | 0.30239E-02 | 634523.5 | 5384380.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD074 | 0 | 0.30239E-02 | 634511.8 | 5384370.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD075 | 0 | 0.30239E-02 | 634504.0 | 5384358.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD076 | 0 | 0.30239E-02 | 634500.1 | 5384343.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD077 | 0 | 0.30239E-02 | 634498.6 | 5384329.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD078 | 0 | 0.30239E-02 | 634498.8 | 5384314.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD079 | 0 | 0.30239E-02 | 634499.2 | 5384299.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD080 | 0 | 0.30239E-02 | 634499.5 | 5384284.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD081 | 0 | 0.30239E-02 | 634499.8 | 5384269.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD082 | 0 | 0.30239E-02 | 634500.1 | 5384254.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD083 | 0 | 0.30239E-02 | 634500.4 | 5384239.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD084 | 0 | 0.30239E-02 | 634500.7 | 5384224.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD085 | 0 | 0.30239E-02 | 634501.1 | 5384209.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD086 | 0 | 0.30239E-02 | 634501.4 | 5384194.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD087 | 0 | 0.30239E-02 | 634501.7 | 5384179.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD088 | 0 | 0.30239E-02 | 634502.0 | 5384164.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD089 | 0 | 0.30239E-02 | 634502.3 | 5384149.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD090 | 0 | 0.30239E-02 | 634502.6 | 5384134.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD091 | 0 | 0.30239E-02 | 634502.9 | 5384119.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD092 | 0 | 0.30239E-02 | 634503.3 | 5384104.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD093 | 0 | 0.30239E-02 | 634503.6 | 5384089.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD094 | 0 | 0.30239E-02 | 634503.9 | 5384074.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD095 | 0 | 0.30239E-02 | 634504.2 | 5384059.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD096 | 0 | 0.30239E-02 | 634504.5 | 5384044.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD097 | 0 | 0.30239E-02 | 634504.8 | 5384029.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD098 | 0 | 0.30239E-02 | 634512.8 | 5384017.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD099 | 0 | 0.30239E-02 | 634523.9 | 5384007.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD100 | 0 | 0.30239E-02 | 634536.7 | 5383999.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD101 | 0 | 0.30239E-02 | 634549.2 | 5383990.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD102 | 0 | 0.30239E-02 | 634561.1 | 5383981.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD103 | 0 | 0.30239E-02 | 634571.7 | 5383971.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD104 | 0 | 0.30239E-02 | 634579.9 | 5383958.6 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD105 | 0 | 0.30239E-02 | 634589.3 | 5383947.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD106 | 0 | 0.30239E-02 | 634600.6 | 5383937.3 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD107 | 0 | 0.30239E-02 | 634611.5 | 5383927.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD108 | 0 | 0.30239E-02 | 634616.7 | 5383913.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD109 | 0 | 0.30239E-02 | 634617.2 | 5383898.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD110 | 0 | 0.30239E-02 | 634617.5 | 5383883.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD111 | 0 | 0.30239E-02 | 634617.7 | 5383868.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD112 | 0 | 0.30239E-02 | 634618.0 | 5383853.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD113 | 0 | 0.30239E-02 | 634618.2 | 5383844.3 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD114 | 0 | 0.20000E-02 | 634987.7 | 5384600.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD115 | 0 | 0.20000E-02 | 634973.6 | 5384595.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD116 | 0 | 0.20000E-02 | 634958.6 | 5384594.4 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD117 | 0 | 0.20000E-02 | 634943.7 | 5384593.3 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD118 | 0 | 0.20000E-02 | 634928.7 | 5384592.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD119 | 0 | 0.20000E-02 | 634913.7 | 5384592.2 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD120 | 0 | 0.20000E-02 | 634898.7 | 5384591.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD121 | 0 | 0.20000E-02 | 634883.7 | 5384591.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD122 | 0 | 0.20000E-02 | 634868.7 | 5384591.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD123 | 0 | 0.20000E-02 | 634853.7 | 5384590.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD124 | 0 | 0.20000E-02 | 634838.7 | 5384590.3 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD125 | 0 | 0.20000E-02 | 634823.7 | 5384589.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD126 | 0 | 0.20000E-02 | 634808.7 | 5384589.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD127 | 0 | 0.20000E-02 | 634793.7 | 5384589.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD128 | 0 | 0.20000E-02 | 634779.0 | 5384586.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD129 | 0 | 0.20000E-02 | 634766.6 | 5384578.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD130 | 0 | 0.20000E-02 | 634757.5 | 5384566.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD131 | 0 | 0.20000E-02 | 634753.2 | 5384552.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD132 | 0 | 0.20000E-02 | 634751.3 | 5384537.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD133 | 0 | 0.20000E-02 | 634751.5 | 5384522.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD134 | 0 | 0.20000E-02 | 634752.0 | 5384507.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD135 | 0 | 0.20000E-02 | 634752.4 | 5384492.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD136 | 0 | 0.20000E-02 | 634752.9 | 5384477.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD137 | 0 | 0.20000E-02 | 634753.3 | 5384462.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD138 | 0 | 0.20000E-02 | 634754.1 | 5384447.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD139 | 0 | 0.20000E-02 | 634759.7 | 5384434.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD140 | 0 | 0.20000E-02 | 634772.4 | 5384426.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD141 | 0 | 0.20000E-02 | 634786.0 | 5384420.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD142 | 0 | 0.20000E-02 | 634799.5 | 5384414.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD143 | 0 | 0.20000E-02 | 634812.5 | 5384406.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD144 | 0 | 0.20000E-02 | 634824.7 | 5384398.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD145 | 0 | 0.20000E-02 | 634837.0 | 5384389.4 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD146 | 0 | 0.20000E-02 | 634847.9 | 5384379.2 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD147 | 0 | 0.20000E-02 | 634858.3 | 5384368.4 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD148 | 0 | 0.20000E-02 | 634867.3 | 5384356.4 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD149 | 0 | 0.20000E-02 | 634875.6 | 5384344.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD150 | 0 | 0.20000E-02 | 634882.8 | 5384330.8 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD151 | 0 | 0.20000E-02 | 634888.9 | 5384317.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD152 | 0 | 0.20000E-02 | 634894.1 | 5384303.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD153 | 0 | 0.20000E-02 | 634897.7 | 5384288.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD154 | 0 | 0.20000E-02 | 634899.6 | 5384273.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD155 | 0 | 0.20000E-02 | 634900.3 | 5384258.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD156 | 0 | 0.20000E-02 | 634900.9 | 5384243.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD157 | 0 | 0.20000E-02 | 634901.6 | 5384228.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD158 | 0 | 0.20000E-02 | 634901.7 | 5384213.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD159 | 0 | 0.20000E-02 | 634901.9 | 5384198.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD160 | 0 | 0.20000E-02 | 634902.1 | 5384183.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD161 | 0 | 0.20000E-02 | 634902.3 | 5384168.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD162 | 0 | 0.20000E-02 | 634902.5 | 5384153.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD163 | 0 | 0.20000E-02 | 634902.7 | 5384138.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD164 | 0 | 0.20000E-02 | 634902.8 | 5384123.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD165 | 0 | 0.20000E-02 | 634903.0 | 5384108.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD166 | 0 | 0.20000E-02 | 634903.2 | 5384093.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD167 | 0 | 0.20000E-02 | 634903.4 | 5384078.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD168 | 0 | 0.20000E-02 | 634903.6 | 5384063.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD169 | 0 | 0.20000E-02 | 634903.8 | 5384048.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD170 | 0 | 0.20000E-02 | 634904.0 | 5384033.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD171 | 0 | 0.20000E-02 | 634904.1 | 5384018.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD172 | 0 | 0.20000E-02 | 634904.3 | 5384003.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD173 | 0 | 0.20000E-02 | 634904.6 | 5383988.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD174 | 0 | 0.20000E-02 | 634904.8 | 5383973.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD175 | 0 | 0.20000E-02 | 634905.1 | 5383958.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD176 | 0 | 0.20000E-02 | 634905.4 | 5383943.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD177 | 0 | 0.20000E-02 | 634905.7 | 5383928.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD178 | 0 | 0.20000E-02 | 634906.0 | 5383913.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD179 | 0 | 0.20000E-02 | 634905.7 | 5383898.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD180 | 0 | 0.20000E-02 | 634905.3 | 5383883.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD181 | 0 | 0.20000E-02 | 634904.9 | 5383868.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD182 | 0 | 0.20000E-02 | 634904.5 | 5383853.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD183 | 0 | 0.20000E-02 | 634904.3 | 5383846.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |

*** AREA SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC /METER**2) | COORD (SW CORNER) X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | X-DIM OF AREA (METERS) | Y-DIM OF AREA (METERS) | ORIENT. OF AREA (DEG.) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FUG1 | 0 | 0.56699E-03 | 634446.8 | 5383938.7 | 243.8 | 3.66 | 5.00 | 20.00 | -2.00 | 11.77 | NO | |
| FUG2 | 0 | 0.37903E-04 | 634518.2 | 5383428.4 | 243.8 | 3.05 | 18.50 | 115.00 | -2.00 | 1.52 | NO | |
| FUG3 | 0 | 0.18666E-05 | 634582.6 | 5383680.6 | 243.8 | 1.83 | 45.00 | 60.00 | -2.00 | 0.91 | NO | |
| FUG4 | 0 | 0.35999E-05 | 635097.1 | 5384717.2 | 243.8 | 1.83 | 70.00 | 125.00 | -2.00 | 0.91 | NO | |

*** THE SUMMARY OF HIGHEST 24-HR RESULTS ***
** CONC OF PM-10 IN MICROGRAMS/M**3 **

| GROUP ID | | AVERAGE CONC | DATE (YYMMDDHH) | RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG) | OF TYPE | NETWORK GRID-ID |
|---|---|---|---|---|---|---|
| **ALL** | **HIGH 6TH HIGH VALUE IS** | **118.18399** | **ON 10030424: AT** | **( 634314.60, 5383999.60, 243.43, 243.43, 0.00)** | **DC** | |

**American Crystal Sugar Company – Drayton**
**$PM_{2.5}$ Verification Model Run**

*** POINT SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | STACK HEIGHT (METERS) | STACK TEMP. (DEG.K) | STACK EXIT VEL. (M/SEC) | STACK DIAMETER (METERS) | BLDG EXISTS | URBAN SOURCE | CAP/ HOR | EMIS RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EP1 | 0 | 0.45725E+01 | 634538.2 | 5383772.1 | 243.8 | 45.72 | 559.26 | 22.52 | 2.35 | YES | NO | NO | |
| EP1A | 0 | 0.88199E-02 | 634518.7 | 5383766.2 | 243.8 | 25.91 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP3 | 0 | 0.60655E+01 | 634468.5 | 5383839.7 | 243.8 | 64.01 | 398.71 | 20.19 | 1.22 | YES | NO | NO | |
| PULP | 0 | 0.79643E+01 | 634464.9 | 5383839.7 | 243.8 | 64.01 | 353.15 | 21.00 | 2.59 | YES | NO | NO | |
| PELLET | 0 | 0.35279E-01 | 634476.4 | 5383941.2 | 243.8 | 24.99 | 294.30 | 28.39 | 0.46 | YES | NO | NO | |
| EP7 | 0 | 0.75599E-01 | 634476.1 | 5383943.9 | 243.8 | 23.77 | 310.93 | 4.45 | 1.22 | YES | NO | NO | |
| EP8 | 0 | 0.75599E-01 | 634481.4 | 5383943.8 | 243.8 | 23.77 | 310.93 | 4.45 | 1.22 | YES | NO | NO | |
| EP9 | 0 | 0.12600E-01 | 634518.0 | 5383849.8 | 243.8 | 17.37 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| EP10 | 0 | 0.12600E-01 | 634473.3 | 5383946.8 | 243.8 | 7.31 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| EP11 | 0 | 0.12600E-01 | 634518.6 | 5383844.1 | 243.8 | 17.37 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| DRY | 0 | 0.62999E-01 | 634478.4 | 5383733.8 | 243.8 | 27.43 | 329.15 | 15.38 | 1.22 | YES | NO | NO | |
| EP14A | 0 | 0.10080E+00 | 634494.1 | 5383726.9 | 243.8 | 26.21 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |
| EP14B | 0 | 0.10080E+00 | 634488.6 | 5383726.9 | 243.8 | 22.25 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |
| EP151617 | 0 | 0.75599E-02 | 634440.2 | 5383949.1 | 243.8 | 18.90 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP19A | 0 | 0.37799E-02 | 634436.9 | 5383673.3 | 243.8 | 4.72 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP20 | 0 | 0.12600E-01 | 634469.5 | 5383641.9 | 243.8 | 12.19 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP22 | 0 | 0.35279E-01 | 634478.8 | 5383945.3 | 243.8 | 24.99 | 294.26 | 28.74 | 0.46 | YES | NO | NO | |
| EP23 | 0 | 0.26460E-01 | 634497.6 | 5383847.9 | 243.8 | 23.16 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP24 | 0 | 0.12600E-02 | 634519.2 | 5383801.5 | 243.8 | 6.10 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| BALANCE | 0 | 0.11289E+01 | 634565.9 | 5383761.9 | 243.8 | 65.84 | 313.15 | 16.20 | 0.41 | YES | NO | NO | |
| SLAKER | 0 | 0.14490E+00 | 634574.4 | 5383753.0 | 243.8 | 24.38 | 352.59 | 0.45 | 0.81 | YES | NO | NO | |
| ETH1 | 0 | 0.27700E+00 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 399.82 | 21.56 | 0.91 | NO | NO | NO | |
| ETH2 | 0 | 0.25000E-01 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 505.37 | 12.61 | 0.91 | NO | NO | NO | |
| ETH3 | 0 | 0.25000E-01 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 505.37 | 12.61 | 0.91 | NO | NO | NO | |
| ETH4 | 0 | 0.14000E+00 | 617506.8 | 5364866.6 | 251.2 | 10.67 | 410.93 | 21.02 | 0.61 | NO | NO | NO | |
| ETH5 | 0 | 0.78700E+00 | 617566.0 | 5364904.7 | 251.2 | 12.19 | 293.00 | 0.01 | 0.31 | NO | NO | NO | |
| DEVP | 0 | 0.41730E+01 | 616654.0 | 5363730.0 | 254.5 | 45.72 | 433.00 | 2.68 | 2.44 | NO | NO | NO | |

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD001 | 0 | 0.60000E-03 | 634352.7 | 5383079.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD002 | 0 | 0.60000E-03 | 634365.5 | 5383087.4 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD003 | 0 | 0.60000E-03 | 634378.2 | 5383095.2 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD004 | 0 | 0.60000E-03 | 634390.5 | 5383103.8 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD005 | 0 | 0.60000E-03 | 634402.5 | 5383112.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD006 | 0 | 0.60000E-03 | 634414.4 | 5383121.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD007 | 0 | 0.60000E-03 | 634426.4 | 5383131.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD008 | 0 | 0.60000E-03 | 634438.3 | 5383140.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD009 | 0 | 0.60000E-03 | 634450.2 | 5383149.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD010 | 0 | 0.60000E-03 | 634462.2 | 5383158.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD011 | 0 | 0.60000E-03 | 634473.7 | 5383167.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD012 | 0 | 0.60000E-03 | 634484.7 | 5383178.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD013 | 0 | 0.60000E-03 | 634495.7 | 5383188.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD014 | 0 | 0.60000E-03 | 634506.8 | 5383198.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD015 | 0 | 0.60000E-03 | 634516.9 | 5383209.3 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD016 | 0 | 0.60000E-03 | 634524.7 | 5383222.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD017 | 0 | 0.60000E-03 | 634532.6 | 5383234.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD018 | 0 | 0.60000E-03 | 634540.5 | 5383247.6 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD019 | 0 | 0.60000E-03 | 634545.2 | 5383261.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD020 | 0 | 0.60000E-03 | 634549.4 | 5383276.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD021 | 0 | 0.29000E-02 | 634553.6 | 5383290.6 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD022 | 0 | 0.29000E-02 | 634558.4 | 5383304.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD023 | 0 | 0.29000E-02 | 634563.5 | 5383318.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD024 | 0 | 0.29000E-02 | 634568.7 | 5383333.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD025 | 0 | 0.29000E-02 | 634573.8 | 5383347.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD026 | 0 | 0.29000E-02 | 634579.0 | 5383361.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD027 | 0 | 0.29000E-02 | 634583.5 | 5383375.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD028 | 0 | 0.29000E-02 | 634586.8 | 5383390.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD029 | 0 | 0.29000E-02 | 634587.1 | 5383405.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD030 | 0 | 0.29000E-02 | 634587.4 | 5383420.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD031 | 0 | 0.29000E-02 | 634587.8 | 5383435.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD032 | 0 | 0.29000E-02 | 634588.1 | 5383450.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD033 | 0 | 0.29000E-02 | 634588.4 | 5383465.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD034 | 0 | 0.29000E-02 | 634588.7 | 5383480.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD035 | 0 | 0.29000E-02 | 634588.8 | 5383495.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD036 | 0 | 0.29000E-02 | 634588.6 | 5383510.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD037 | 0 | 0.29000E-02 | 634588.5 | 5383525.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD038 | 0 | 0.29000E-02 | 634588.3 | 5383540.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD039 | 0 | 0.29000E-02 | 634588.2 | 5383555.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD040 | 0 | 0.29000E-02 | 634588.0 | 5383570.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD041 | 0 | 0.29000E-02 | 634587.9 | 5383584.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD042 | 0 | 0.29000E-02 | 634587.7 | 5383599.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD043 | 0 | 0.29000E-02 | 634587.6 | 5383614.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD044 | 0 | 0.29000E-02 | 634585.7 | 5383629.7 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD045 | 0 | 0.29000E-02 | 634581.6 | 5383644.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD046 | 0 | 0.29000E-02 | 634574.9 | 5383657.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD047 | 0 | 0.29000E-02 | 634567.1 | 5383670.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD048 | 0 | 0.29000E-02 | 634560.2 | 5383683.5 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD049 | 0 | 0.29000E-02 | 634554.6 | 5383697.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD050 | 0 | 0.29000E-02 | 634551.4 | 5383712.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD051 | 0 | 0.29000E-02 | 634549.7 | 5383726.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD052 | 0 | 0.29000E-02 | 634548.6 | 5383741.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD053 | 0 | 0.29000E-02 | 634547.6 | 5383756.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD054 | 0 | 0.29000E-02 | 634546.5 | 5383771.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD055 | 0 | 0.29000E-02 | 634545.5 | 5383786.7 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD056 | 0 | 0.30239E-03 | 634386.3 | 5384560.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD057 | 0 | 0.30239E-03 | 634389.5 | 5384546.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD058 | 0 | 0.30239E-03 | 634394.8 | 5384532.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD059 | 0 | 0.30239E-03 | 634408.1 | 5384526.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD060 | 0 | 0.30239E-03 | 634422.3 | 5384521.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD061 | 0 | 0.30239E-03 | 634436.1 | 5384516.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD062 | 0 | 0.30239E-03 | 634449.8 | 5384510.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD063 | 0 | 0.30239E-03 | 634462.4 | 5384501.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD064 | 0 | 0.30239E-03 | 634474.1 | 5384492.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD065 | 0 | 0.30239E-03 | 634484.8 | 5384482.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD066 | 0 | 0.30239E-03 | 634494.8 | 5384470.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD067 | 0 | 0.30239E-03 | 634503.6 | 5384458.8 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD068 | 0 | 0.30239E-03 | 634511.3 | 5384446.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD069 | 0 | 0.30239E-03 | 634517.8 | 5384432.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD070 | 0 | 0.30239E-03 | 634523.1 | 5384418.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD071 | 0 | 0.30239E-03 | 634526.7 | 5384403.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD072 | 0 | 0.30239E-03 | 634530.3 | 5384389.3 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD073 | 0 | 0.30239E-03 | 634523.5 | 5384380.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD074 | 0 | 0.30239E-03 | 634511.8 | 5384370.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD075 | 0 | 0.30239E-03 | 634504.0 | 5384358.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD076 | 0 | 0.30239E-03 | 634500.1 | 5384343.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD077 | 0 | 0.30239E-03 | 634498.6 | 5384329.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD078 | 0 | 0.30239E-03 | 634498.8 | 5384314.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD079 | 0 | 0.30239E-03 | 634499.2 | 5384299.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD080 | 0 | 0.30239E-03 | 634499.5 | 5384284.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD081 | 0 | 0.30239E-03 | 634499.8 | 5384269.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD082 | 0 | 0.30239E-03 | 634500.1 | 5384254.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD083 | 0 | 0.30239E-03 | 634500.4 | 5384239.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD084 | 0 | 0.30239E-03 | 634500.7 | 5384224.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD085 | 0 | 0.30239E-03 | 634501.1 | 5384209.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD086 | 0 | 0.30239E-03 | 634501.4 | 5384194.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD087 | 0 | 0.30239E-03 | 634501.7 | 5384179.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD088 | 0 | 0.30239E-03 | 634502.0 | 5384164.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD089 | 0 | 0.30239E-03 | 634502.3 | 5384149.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD090 | 0 | 0.30200E-03 | 634502.6 | 5384134.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD091 | 0 | 0.30239E-03 | 634502.9 | 5384119.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD092 | 0 | 0.30239E-03 | 634503.3 | 5384104.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD093 | 0 | 0.30239E-03 | 634503.6 | 5384089.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD094 | 0 | 0.30239E-03 | 634503.9 | 5384074.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD095 | 0 | 0.30239E-03 | 634504.2 | 5384059.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD096 | 0 | 0.30239E-03 | 634504.5 | 5384044.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD097 | 0 | 0.30239E-03 | 634504.8 | 5384029.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD098 | 0 | 0.30239E-03 | 634512.8 | 5384017.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD099 | 0 | 0.30239E-03 | 634523.9 | 5384007.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD100 | 0 | 0.30239E-03 | 634536.7 | 5383999.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD101 | 0 | 0.30239E-03 | 634549.2 | 5383990.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD102 | 0 | 0.30239E-03 | 634561.1 | 5383981.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD103 | 0 | 0.30239E-03 | 634571.7 | 5383971.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD104 | 0 | 0.30239E-03 | 634579.9 | 5383958.6 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD105 | 0 | 0.30239E-03 | 634589.3 | 5383947.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD106 | 0 | 0.30239E-03 | 634600.6 | 5383937.3 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD107 | 0 | 0.30239E-03 | 634611.5 | 5383927.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD108 | 0 | 0.30239E-03 | 634616.7 | 5383913.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD109 | 0 | 0.30239E-03 | 634617.2 | 5383898.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD110 | 0 | 0.30239E-03 | 634617.5 | 5383883.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD111 | 0 | 0.30239E-03 | 634617.7 | 5383868.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD112 | 0 | 0.30239E-03 | 634618.0 | 5383853.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD113 | 0 | 0.30239E-03 | 634618.2 | 5383844.3 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD114 | 0 | 0.20000E-03 | 634987.7 | 5384600.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD115 | 0 | 0.20000E-03 | 634973.6 | 5384595.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD116 | 0 | 0.20000E-03 | 634958.6 | 5384594.4 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD117 | 0 | 0.20000E-03 | 634943.7 | 5384593.3 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD118 | 0 | 0.20000E-03 | 634928.7 | 5384592.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD119 | 0 | 0.20000E-03 | 634913.7 | 5384592.2 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD120 | 0 | 0.20000E-03 | 634898.7 | 5384591.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD121 | 0 | 0.20000E-03 | 634883.7 | 5384591.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD122 | 0 | 0.20000E-03 | 634868.7 | 5384591.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD123 | 0 | 0.20000E-03 | 634853.7 | 5384590.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD124 | 0 | 0.20000E-03 | 634838.7 | 5384590.3 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD125 | 0 | 0.20000E-03 | 634823.7 | 5384589.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD126 | 0 | 0.20000E-03 | 634808.7 | 5384589.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD127 | 0 | 0.20000E-03 | 634793.7 | 5384589.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD128 | 0 | 0.20000E-03 | 634779.0 | 5384586.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD129 | 0 | 0.20000E-03 | 634766.6 | 5384578.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD130 | 0 | 0.20000E-03 | 634757.5 | 5384566.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD131 | 0 | 0.20000E-03 | 634753.2 | 5384552.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD132 | 0 | 0.20000E-03 | 634751.3 | 5384537.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD133 | 0 | 0.20000E-03 | 634751.5 | 5384522.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD134 | 0 | 0.20000E-03 | 634752.0 | 5384507.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD135 | 0 | 0.20000E-03 | 634752.4 | 5384492.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD136 | 0 | 0.20000E-03 | 634752.9 | 5384477.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD137 | 0 | 0.20000E-03 | 634753.3 | 5384462.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD138 | 0 | 0.20000E-03 | 634754.1 | 5384447.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD139 | 0 | 0.20000E-03 | 634759.7 | 5384434.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD140 | 0 | 0.20000E-03 | 634772.4 | 5384426.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD141 | 0 | 0.20000E-03 | 634786.0 | 5384420.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD142 | 0 | 0.20000E-03 | 634799.5 | 5384414.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD143 | 0 | 0.20000E-03 | 634812.5 | 5384406.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD144 | 0 | 0.20000E-03 | 634824.7 | 5384398.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD145 | 0 | 0.20000E-03 | 634837.0 | 5384389.4 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD146 | 0 | 0.20000E-03 | 634847.9 | 5384379.2 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD147 | 0 | 0.20000E-03 | 634858.3 | 5384368.4 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD148 | 0 | 0.20000E-03 | 634867.3 | 5384356.4 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD149 | 0 | 0.20000E-03 | 634875.6 | 5384344.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD150 | 0 | 0.20000E-03 | 634882.8 | 5384330.8 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD151 | 0 | 0.20000E-03 | 634888.9 | 5384317.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD152 | 0 | 0.20000E-03 | 634894.1 | 5384303.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD153 | 0 | 0.20000E-03 | 634897.7 | 5384288.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD154 | 0 | 0.20000E-03 | 634899.6 | 5384273.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD155 | 0 | 0.20000E-03 | 634900.3 | 5384258.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD156 | 0 | 0.20000E-03 | 634900.9 | 5384243.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD157 | 0 | 0.20000E-03 | 634901.6 | 5384228.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD158 | 0 | 0.20000E-03 | 634901.7 | 5384213.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD159 | 0 | 0.20000E-03 | 634901.9 | 5384198.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD160 | 0 | 0.20000E-03 | 634902.1 | 5384183.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD161 | 0 | 0.20000E-03 | 634902.3 | 5384168.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD162 | 0 | 0.20000E-03 | 634902.5 | 5384153.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD163 | 0 | 0.20000E-03 | 634902.7 | 5384138.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD164 | 0 | 0.20000E-03 | 634902.8 | 5384123.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD165 | 0 | 0.20000E-03 | 634903.0 | 5384108.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD166 | 0 | 0.20000E-03 | 634903.2 | 5384093.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD167 | 0 | 0.20000E-03 | 634903.4 | 5384078.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD168 | 0 | 0.20000E-03 | 634903.6 | 5384063.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD169 | 0 | 0.20000E-03 | 634903.8 | 5384048.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD170 | 0 | 0.20000E-03 | 634904.0 | 5384033.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD171 | 0 | 0.20000E-03 | 634904.1 | 5384018.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD172 | 0 | 0.20000E-03 | 634904.3 | 5384003.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD173 | 0 | 0.20000E-03 | 634904.6 | 5383988.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD174 | 0 | 0.20000E-03 | 634904.8 | 5383973.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |

**American Crystal Sugar Company – Drayton**
**$PM_{2.5}$ Verification Model Run**

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD175 | 0 | 0.20000E-03 | 634905.1 | 5383958.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD176 | 0 | 0.20000E-03 | 634905.4 | 5383943.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD177 | 0 | 0.20000E-03 | 634905.7 | 5383928.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD178 | 0 | 0.20000E-03 | 634906.0 | 5383913.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD179 | 0 | 0.20000E-03 | 634905.7 | 5383898.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD180 | 0 | 0.20000E-03 | 634905.3 | 5383883.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD181 | 0 | 0.20000E-03 | 634904.9 | 5383868.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD182 | 0 | 0.20000E-03 | 634904.5 | 5383853.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD183 | 0 | 0.20000E-03 | 634904.3 | 5383846.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |

*** AREA SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC /METER**2) | COORD (SW CORNER) X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | X-DIM OF AREA (METERS) | Y-DIM OF AREA (METERS) | ORIENT. OF AREA (DEG.) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FUG1 | 0 | 0.12600E-04 | 634446.8 | 5383938.7 | 243.8 | 3.66 | 5.00 | 20.00 | -2.00 | 11.77 | NO | |
| FUG2 | 0 | 0.53301E-05 | 634518.2 | 5383428.4 | 243.8 | 3.05 | 18.50 | 115.00 | -2.00 | 1.52 | NO | |
| FUG3 | 0 | 0.23333E-08 | 634582.6 | 5383680.6 | 243.8 | 1.83 | 45.00 | 60.00 | -2.00 | 0.91 | NO | |
| FUG4 | 0 | 0.57599E-06 | 635097.1 | 5384717.2 | 243.8 | 1.83 | 70.00 | 125.00 | -2.00 | 0.91 | NO | |

*** THE SUMMARY OF MAXIMUM 8TH-HIGHEST 24-HR RESULTS AVERAGED OVER 5 YEARS ***
** CONC OF PM-2.5 IN MICROGRAMS/M**3 **

| GROUP ID | | AVERAGE CONC | RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG) | OF TYPE | NETWORK GRID-ID |
|---|---|---|---|---|---|
| **ALL** | **1ST HIGHEST VALUE IS** | **15.54029 AT** | **( 634676.30, 5383058.20, 243.64, 243.64, 0.00)** | **DC** | |

*** THE SUMMARY OF MAXIMUM ANNUAL RESULTS AVERAGED OVER 1 YEARS ***
** CONC OF PM-2.5 IN MICROGRAMS/M**3 **

| GROUP ID | | AVERAGE CONC | RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG) | OF TYPE | NETWORK GRID-ID |
|---|---|---|---|---|---|
| 2009 | 1ST HIGHEST VALUE IS | 3.40434 AT | ( 634686.10, 5383058.50, 243.50, 243.50, 0.00) | DC | |
| 2010 | 1ST HIGHEST VALUE IS | 3.29705 AT | ( 634315.20, 5383969.60, 243.64, 243.64, 0.00) | DC | |
| 2011 | 1ST HIGHEST VALUE IS | 3.01318 AT | ( 634392.30, 5384601.20, 243.32, 243.32, 0.00) | DC | |
| 2012 | 1ST HIGHEST VALUE IS | 2.84527 AT | ( 634307.90, 5384329.40, 243.75, 243.75, 0.00) | DC | |
| **2013** | **1ST HIGHEST VALUE IS** | **3.72350 AT** | **( 634686.10, 5383058.50, 243.75, 243.75, 0.00)** | **DC** | |

*** POINT SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | STACK HEIGHT (METERS) | STACK TEMP. (DEG.K) | STACK EXIT VEL. (M/SEC) | STACK DIAMETER (METERS) | BLDG EXISTS | URBAN SOURCE | CAP/ HOR | EMIS RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EP1 | 0 | 0.37547E+01 | 634538.2 | 5383772.1 | 243.8 | 45.72 | 559.26 | 22.52 | 2.35 | YES | NO | NO | |
| EP1A | 0 | 0.36539E-01 | 634518.7 | 5383766.2 | 243.8 | 25.91 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP3 | 0 | 0.95632E+01 | 634468.5 | 5383839.7 | 243.8 | 64.01 | 398.71 | 20.19 | 1.22 | YES | NO | NO | |
| EP4 | 0 | 0.11189E+02 | 634464.9 | 5383839.7 | 243.8 | 51.82 | 384.80 | 33.03 | 1.52 | YES | NO | NO | |
| EP30 | 0 | 0.18900E+00 | 634495.0 | 5383941.4 | 243.8 | 7.01 | 294.30 | 36.41 | 0.76 | YES | NO | NO | |
| EP9 | 0 | 0.37799E-01 | 634518.0 | 5383849.8 | 243.8 | 6.71 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| EP10 | 0 | 0.75599E-01 | 634473.3 | 5383946.8 | 243.8 | 7.31 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| EP28 | 0 | 0.27720E+00 | 634478.4 | 5383733.8 | 243.8 | 27.43 | 329.15 | 15.38 | 1.22 | YES | NO | NO | |
| EP14A | 0 | 0.42839E+00 | 634494.1 | 5383726.9 | 243.8 | 26.21 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |
| EP14B | 0 | 0.41579E+00 | 634488.6 | 5383726.9 | 243.8 | 22.25 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |
| EP151617 | 0 | 0.46619E-01 | 634440.2 | 5383949.1 | 243.8 | 18.90 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP19A | 0 | 0.13860E-01 | 634436.9 | 5383673.3 | 243.8 | 4.72 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP20 | 0 | 0.56699E-01 | 634469.5 | 5383641.9 | 243.8 | 12.19 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP23 | 0 | 0.11214E+00 | 634497.6 | 5383847.9 | 243.8 | 23.16 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP24 | 0 | 0.50399E-02 | 634519.2 | 5383801.5 | 243.8 | 6.10 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP27A | 0 | 0.13822E+01 | 634565.9 | 5383761.9 | 243.8 | 53.34 | 317.00 | 16.20 | 0.41 | YES | NO | NO | |
| EP29 | 0 | 0.41957E+00 | 634574.4 | 5383753.0 | 243.8 | 24.38 | 352.59 | 2.75 | 0.81 | YES | NO | NO | |
| ETH1 | 0 | 0.27700E+00 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 399.82 | 21.56 | 0.91 | NO | NO | NO | |
| ETH2 | 0 | 0.25000E-01 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 505.37 | 12.61 | 0.91 | NO | NO | NO | |
| ETH3 | 0 | 0.25000E-01 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 505.37 | 12.61 | 0.91 | NO | NO | NO | |
| ETH4 | 0 | 0.14000E+00 | 617506.8 | 5364866.6 | 251.2 | 10.67 | 410.93 | 21.02 | 0.61 | NO | NO | NO | |
| ETH5 | 0 | 0.78700E+00 | 617566.0 | 5364904.7 | 251.2 | 12.19 | 293.00 | 0.01 | 0.31 | NO | NO | NO | |
| DEVP | 0 | 0.41730E+01 | 616654.0 | 5363730.0 | 254.5 | 45.72 | 433.00 | 2.68 | 2.44 | NO | NO | NO | |

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD001 | 0 | 0.60000E-02 | 634352.7 | 5383079.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD002 | 0 | 0.60000E-02 | 634365.5 | 5383087.4 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD003 | 0 | 0.60000E-02 | 634378.2 | 5383095.2 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD004 | 0 | 0.60000E-02 | 634390.5 | 5383103.8 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD005 | 0 | 0.60000E-02 | 634402.5 | 5383112.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD006 | 0 | 0.60000E-02 | 634414.4 | 5383121.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD007 | 0 | 0.60000E-02 | 634426.4 | 5383131.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD008 | 0 | 0.60000E-02 | 634438.3 | 5383140.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD009 | 0 | 0.60000E-02 | 634450.2 | 5383149.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD010 | 0 | 0.60000E-02 | 634462.2 | 5383158.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD011 | 0 | 0.60000E-02 | 634473.7 | 5383167.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD012 | 0 | 0.60000E-02 | 634484.7 | 5383178.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD013 | 0 | 0.60000E-02 | 634495.7 | 5383188.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD014 | 0 | 0.60000E-02 | 634506.8 | 5383198.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD015 | 0 | 0.60000E-02 | 634516.9 | 5383209.3 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD016 | 0 | 0.60000E-02 | 634524.7 | 5383222.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD017 | 0 | 0.60000E-02 | 634532.6 | 5383234.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD018 | 0 | 0.60000E-02 | 634540.5 | 5383247.6 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD019 | 0 | 0.60000E-02 | 634545.2 | 5383261.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD020 | 0 | 0.60000E-02 | 634549.4 | 5383276.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD021 | 0 | 0.29000E-01 | 634553.6 | 5383290.6 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD022 | 0 | 0.29000E-01 | 634558.4 | 5383304.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD023 | 0 | 0.29000E-01 | 634563.5 | 5383318.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD024 | 0 | 0.29000E-01 | 634568.7 | 5383333.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD025 | 0 | 0.29000E-01 | 634573.8 | 5383347.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD026 | 0 | 0.29000E-01 | 634579.0 | 5383361.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD027 | 0 | 0.29000E-01 | 634583.5 | 5383375.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD028 | 0 | 0.29000E-01 | 634586.8 | 5383390.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD029 | 0 | 0.29000E-01 | 634587.1 | 5383405.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD030 | 0 | 0.29000E-01 | 634587.4 | 5383420.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD031 | 0 | 0.29000E-01 | 634587.8 | 5383435.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD032 | 0 | 0.29000E-01 | 634588.1 | 5383450.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD033 | 0 | 0.29000E-01 | 634588.4 | 5383465.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD034 | 0 | 0.29000E-01 | 634588.7 | 5383480.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD035 | 0 | 0.29000E-01 | 634588.8 | 5383495.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD036 | 0 | 0.29000E-01 | 634588.6 | 5383510.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD037 | 0 | 0.29000E-01 | 634588.5 | 5383525.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD038 | 0 | 0.29000E-01 | 634588.3 | 5383540.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD039 | 0 | 0.29000E-01 | 634588.2 | 5383555.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD040 | 0 | 0.29000E-01 | 634588.0 | 5383570.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD041 | 0 | 0.29000E-01 | 634587.9 | 5383584.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD042 | 0 | 0.29000E-01 | 634587.7 | 5383599.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD043 | 0 | 0.29000E-01 | 634587.6 | 5383614.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD044 | 0 | 0.29000E-01 | 634585.7 | 5383629.7 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD045 | 0 | 0.29000E-01 | 634581.6 | 5383644.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD046 | 0 | 0.29000E-01 | 634574.9 | 5383657.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD047 | 0 | 0.29000E-01 | 634567.1 | 5383670.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD048 | 0 | 0.29000E-01 | 634560.2 | 5383683.5 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD049 | 0 | 0.29000E-01 | 634554.6 | 5383697.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD050 | 0 | 0.29000E-01 | 634551.4 | 5383712.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD051 | 0 | 0.29000E-01 | 634549.7 | 5383726.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD052 | 0 | 0.29000E-01 | 634548.6 | 5383741.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD053 | 0 | 0.29000E-01 | 634547.6 | 5383756.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD054 | 0 | 0.29000E-01 | 634546.5 | 5383771.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD055 | 0 | 0.29000E-01 | 634545.5 | 5383786.7 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD056 | 0 | 0.30239E-02 | 634386.3 | 5384560.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD057 | 0 | 0.30239E-02 | 634389.5 | 5384546.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD058 | 0 | 0.30239E-02 | 634394.8 | 5384532.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD059 | 0 | 0.30239E-02 | 634408.1 | 5384526.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD060 | 0 | 0.30239E-02 | 634422.3 | 5384521.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD061 | 0 | 0.30239E-02 | 634436.1 | 5384516.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD062 | 0 | 0.30239E-02 | 634449.8 | 5384510.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD063 | 0 | 0.30239E-02 | 634462.4 | 5384501.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD064 | 0 | 0.30239E-02 | 634474.1 | 5384492.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD065 | 0 | 0.30239E-02 | 634484.8 | 5384482.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD066 | 0 | 0.30239E-02 | 634494.8 | 5384470.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD067 | 0 | 0.30239E-02 | 634503.6 | 5384458.8 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD068 | 0 | 0.30239E-02 | 634511.3 | 5384446.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD069 | 0 | 0.30239E-02 | 634517.8 | 5384432.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD070 | 0 | 0.30239E-02 | 634523.1 | 5384418.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD071 | 0 | 0.30239E-02 | 634526.7 | 5384403.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD072 | 0 | 0.30239E-02 | 634530.3 | 5384389.3 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD073 | 0 | 0.30239E-02 | 634523.5 | 5384380.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD074 | 0 | 0.30239E-02 | 634511.8 | 5384370.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD075 | 0 | 0.30239E-02 | 634504.0 | 5384358.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD076 | 0 | 0.30239E-02 | 634500.1 | 5384343.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD077 | 0 | 0.30239E-02 | 634498.6 | 5384329.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD078 | 0 | 0.30239E-02 | 634498.8 | 5384314.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD079 | 0 | 0.30239E-02 | 634499.2 | 5384299.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD080 | 0 | 0.30239E-02 | 634499.5 | 5384284.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD081 | 0 | 0.30239E-02 | 634499.8 | 5384269.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD082 | 0 | 0.30239E-02 | 634500.1 | 5384254.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD083 | 0 | 0.30239E-02 | 634500.4 | 5384239.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD084 | 0 | 0.30239E-02 | 634500.7 | 5384224.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD085 | 0 | 0.30239E-02 | 634501.1 | 5384209.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD086 | 0 | 0.30239E-02 | 634501.4 | 5384194.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD087 | 0 | 0.30239E-02 | 634501.7 | 5384179.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD088 | 0 | 0.30239E-02 | 634502.0 | 5384164.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD089 | 0 | 0.30239E-02 | 634502.3 | 5384149.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD090 | 0 | 0.30239E-02 | 634502.6 | 5384134.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD091 | 0 | 0.30239E-02 | 634502.9 | 5384119.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD092 | 0 | 0.30239E-02 | 634503.3 | 5384104.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD093 | 0 | 0.30239E-02 | 634503.6 | 5384089.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD094 | 0 | 0.30239E-02 | 634503.9 | 5384074.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD095 | 0 | 0.30239E-02 | 634504.2 | 5384059.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD096 | 0 | 0.30239E-02 | 634504.5 | 5384044.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |

## American Crystal Sugar Company – Drayton
## $PM_{10}$ PTC Amendment Model Run

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD097 | 0 | 0.30239E-02 | 634504.8 | 5384029.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD098 | 0 | 0.30239E-02 | 634512.8 | 5384017.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD099 | 0 | 0.30239E-02 | 634523.9 | 5384007.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD100 | 0 | 0.30239E-02 | 634536.7 | 5383999.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD101 | 0 | 0.30239E-02 | 634549.2 | 5383990.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD102 | 0 | 0.30239E-02 | 634561.1 | 5383981.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD103 | 0 | 0.30239E-02 | 634571.7 | 5383971.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD104 | 0 | 0.30239E-02 | 634579.9 | 5383958.6 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD105 | 0 | 0.30239E-02 | 634589.3 | 5383947.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD106 | 0 | 0.30239E-02 | 634600.6 | 5383937.3 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD107 | 0 | 0.30239E-02 | 634611.5 | 5383927.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD108 | 0 | 0.30239E-02 | 634616.7 | 5383913.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD109 | 0 | 0.30239E-02 | 634617.2 | 5383898.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD110 | 0 | 0.30239E-02 | 634617.5 | 5383883.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD111 | 0 | 0.30239E-02 | 634617.7 | 5383868.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD112 | 0 | 0.30239E-02 | 634618.0 | 5383853.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD113 | 0 | 0.30239E-02 | 634618.2 | 5383844.3 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD114 | 0 | 0.20000E-02 | 634987.7 | 5384600.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD115 | 0 | 0.20000E-02 | 634973.6 | 5384595.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD116 | 0 | 0.20000E-02 | 634958.6 | 5384594.4 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD117 | 0 | 0.20000E-02 | 634943.7 | 5384593.3 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD118 | 0 | 0.20000E-02 | 634928.7 | 5384592.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD119 | 0 | 0.20000E-02 | 634913.7 | 5384592.2 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD120 | 0 | 0.20000E-02 | 634898.7 | 5384591.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD121 | 0 | 0.20000E-02 | 634883.7 | 5384591.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD122 | 0 | 0.20000E-02 | 634868.7 | 5384591.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD123 | 0 | 0.20000E-02 | 634853.7 | 5384590.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD124 | 0 | 0.20000E-02 | 634838.7 | 5384590.3 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD125 | 0 | 0.20000E-02 | 634823.7 | 5384589.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD126 | 0 | 0.20000E-02 | 634808.7 | 5384589.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD127 | 0 | 0.20000E-02 | 634793.7 | 5384589.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD128 | 0 | 0.20000E-02 | 634779.0 | 5384586.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD129 | 0 | 0.20000E-02 | 634766.6 | 5384578.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD130 | 0 | 0.20000E-02 | 634757.5 | 5384566.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD131 | 0 | 0.20000E-02 | 634753.2 | 5384552.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD132 | 0 | 0.20000E-02 | 634751.3 | 5384537.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD133 | 0 | 0.20000E-02 | 634751.5 | 5384522.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD134 | 0 | 0.20000E-02 | 634752.0 | 5384507.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD135 | 0 | 0.20000E-02 | 634752.4 | 5384492.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD136 | 0 | 0.20000E-02 | 634752.9 | 5384477.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD137 | 0 | 0.20000E-02 | 634753.3 | 5384462.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD138 | 0 | 0.20000E-02 | 634754.1 | 5384447.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD139 | 0 | 0.20000E-02 | 634759.7 | 5384434.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD140 | 0 | 0.20000E-02 | 634772.4 | 5384426.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD141 | 0 | 0.20000E-02 | 634786.0 | 5384420.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD142 | 0 | 0.20000E-02 | 634799.5 | 5384414.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD143 | 0 | 0.20000E-02 | 634812.5 | 5384406.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD144 | 0 | 0.20000E-02 | 634824.7 | 5384398.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD145 | 0 | 0.20000E-02 | 634837.0 | 5384389.4 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD146 | 0 | 0.20000E-02 | 634847.9 | 5384379.2 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD147 | 0 | 0.20000E-02 | 634858.3 | 5384368.4 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD148 | 0 | 0.20000E-02 | 634867.3 | 5384356.4 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD149 | 0 | 0.20000E-02 | 634875.6 | 5384344.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD150 | 0 | 0.20000E-02 | 634882.8 | 5384330.8 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD151 | 0 | 0.20000E-02 | 634888.9 | 5384317.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD152 | 0 | 0.20000E-02 | 634894.1 | 5384303.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD153 | 0 | 0.20000E-02 | 634897.7 | 5384288.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD154 | 0 | 0.20000E-02 | 634899.6 | 5384273.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD155 | 0 | 0.20000E-02 | 634900.3 | 5384258.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD156 | 0 | 0.20000E-02 | 634900.9 | 5384243.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD157 | 0 | 0.20000E-02 | 634901.6 | 5384228.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD158 | 0 | 0.20000E-02 | 634901.7 | 5384213.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD159 | 0 | 0.20000E-02 | 634901.9 | 5384198.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD160 | 0 | 0.20000E-02 | 634902.1 | 5384183.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD161 | 0 | 0.20000E-02 | 634902.3 | 5384168.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD162 | 0 | 0.20000E-02 | 634902.5 | 5384153.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD163 | 0 | 0.20000E-02 | 634902.7 | 5384138.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD164 | 0 | 0.20000E-02 | 634902.8 | 5384123.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD165 | 0 | 0.20000E-02 | 634903.0 | 5384108.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD166 | 0 | 0.20000E-02 | 634903.2 | 5384093.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD167 | 0 | 0.20000E-02 | 634903.4 | 5384078.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD168 | 0 | 0.20000E-02 | 634903.6 | 5384063.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD169 | 0 | 0.20000E-02 | 634903.8 | 5384048.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD170 | 0 | 0.20000E-02 | 634904.0 | 5384033.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD171 | 0 | 0.20000E-02 | 634904.1 | 5384018.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD172 | 0 | 0.20000E-02 | 634904.3 | 5384003.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD173 | 0 | 0.20000E-02 | 634904.6 | 5383988.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD174 | 0 | 0.20000E-02 | 634904.8 | 5383973.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD175 | 0 | 0.20000E-02 | 634905.1 | 5383958.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD176 | 0 | 0.20000E-02 | 634905.4 | 5383943.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD177 | 0 | 0.20000E-02 | 634905.7 | 5383928.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD178 | 0 | 0.20000E-02 | 634906.0 | 5383913.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD179 | 0 | 0.20000E-02 | 634905.7 | 5383898.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD180 | 0 | 0.20000E-02 | 634905.3 | 5383883.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD181 | 0 | 0.20000E-02 | 634904.9 | 5383868.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD182 | 0 | 0.20000E-02 | 634904.5 | 5383853.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD183 | 0 | 0.20000E-02 | 634904.3 | 5383846.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |

*** AREA SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC /METER**2) | COORD (SW CORNER) X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | X-DIM OF AREA (METERS) | Y-DIM OF AREA (METERS) | ORIENT. OF AREA (DEG.) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FUG1 | 0 | 0.56699E-03 | 634446.8 | 5383938.7 | 243.8 | 3.66 | 5.00 | 20.00 | -2.00 | 11.77 | NO | |
| FUG2 | 0 | 0.37903E-04 | 634518.2 | 5383428.4 | 243.8 | 3.05 | 18.50 | 115.00 | -2.00 | 1.52 | NO | |
| FUG3 | 0 | 0.46670E-05 | 634582.6 | 5383680.6 | 243.8 | 1.83 | 45.00 | 60.00 | -2.00 | 0.91 | NO | |
| FUG4 | 0 | 0.35999E-05 | 635097.1 | 5384717.2 | 243.8 | 1.83 | 70.00 | 125.00 | -2.00 | 0.91 | NO | |

*** THE SUMMARY OF HIGHEST 24-HR RESULTS ***

** CONC OF PM-10 IN MICROGRAMS/M**3 **

| GROUP ID | | | AVERAGE CONC | DATE (YYMMDDHH) | RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG) | OF TYPE | NETWORK GRID-ID |
|---|---|---|---|---|---|---|---|
| **ALL** | **HIGH** | **6TH HIGH VALUE IS** | **111.87194** | **ON 10030424:** | **AT ( 634315.80, 5383939.70, 243.50, 243.50, 0.00)** | **DC** | |

# American Crystal Sugar Company – Drayton
# $PM_{2.5}$ PTC Amendment Model Run

*** POINT SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | STACK HEIGHT (METERS) | STACK TEMP. (DEG.K) | STACK EXIT VEL. (M/SEC) | STACK DIAMETER (METERS) | BLDG EXISTS | URBAN SOURCE | CAP/ HOR | EMIS RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EP1 | 0 | 0.45725E+01 | 634538.2 | 5383772.1 | 243.8 | 45.72 | 559.26 | 22.52 | 2.35 | YES | NO | NO | |
| EP1A | 0 | 0.88199E-02 | 634518.7 | 5383766.2 | 243.8 | 25.91 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP3 | 0 | 0.60655E+01 | 634468.5 | 5383839.7 | 243.8 | 64.01 | 398.71 | 20.19 | 1.22 | YES | NO | NO | |
| EP4 | 0 | 0.10500E+02 | 634464.9 | 5383839.7 | 243.8 | 51.82 | 384.82 | 33.03 | 1.52 | YES | NO | NO | |
| EP30 | 0 | 0.44099E-01 | 634495.0 | 5383941.4 | 243.8 | 7.01 | 294.30 | 36.22 | 0.76 | YES | NO | NO | |
| EP9 | 0 | 0.75599E-02 | 634518.0 | 5383849.8 | 243.8 | 6.71 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| EP10 | 0 | 0.12600E-01 | 634473.3 | 5383946.8 | 243.8 | 7.31 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| EP28 | 0 | 0.62999E-01 | 634478.4 | 5383733.8 | 243.8 | 27.43 | 329.15 | 15.38 | 1.22 | YES | NO | NO | |
| EP14A | 0 | 0.99538E-01 | 634494.1 | 5383726.9 | 243.8 | 26.21 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |
| EP14B | 0 | 0.94498E-01 | 634488.6 | 5383726.9 | 243.8 | 22.25 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |
| EP151617 | 0 | 0.75599E-02 | 634440.2 | 5383949.1 | 243.8 | 18.90 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP19A | 0 | 0.37799E-02 | 634436.9 | 5383673.3 | 243.8 | 4.72 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP20 | 0 | 0.12600E-01 | 634469.5 | 5383641.9 | 243.8 | 12.19 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP23 | 0 | 0.26460E-01 | 634497.6 | 5383847.9 | 243.8 | 23.16 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP24 | 0 | 0.12600E-02 | 634519.2 | 5383801.5 | 243.8 | 6.10 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP27A | 0 | 0.83159E+00 | 634565.9 | 5383761.9 | 243.8 | 53.34 | 317.04 | 16.20 | 0.41 | YES | NO | NO | |
| EP29 | 0 | 0.15624E+00 | 634574.4 | 5383753.0 | 243.8 | 24.38 | 337.59 | 2.75 | 0.81 | YES | NO | NO | |
| ETH1 | 0 | 0.27700E+00 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 399.82 | 21.56 | 0.91 | NO | NO | NO | |
| ETH2 | 0 | 0.25000E-01 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 505.37 | 12.61 | 0.91 | NO | NO | NO | |
| ETH3 | 0 | 0.25000E-01 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 505.37 | 12.61 | 0.91 | NO | NO | NO | |
| ETH4 | 0 | 0.14000E+00 | 617506.8 | 5364866.6 | 251.2 | 10.67 | 410.93 | 21.02 | 0.61 | NO | NO | NO | |
| ETH5 | 0 | 0.78700E+00 | 617566.0 | 5364904.7 | 251.2 | 12.19 | 293.00 | 0.01 | 0.31 | NO | NO | NO | |
| DEVP | 0 | 0.41730E+01 | 616654.0 | 5363730.0 | 254.5 | 45.72 | 433.00 | 2.68 | 2.44 | NO | NO | NO | |

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD001 | 0 | 0.60000E-03 | 634352.7 | 5383079.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD002 | 0 | 0.60000E-03 | 634365.5 | 5383087.4 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD003 | 0 | 0.60000E-03 | 634378.2 | 5383095.2 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD004 | 0 | 0.60000E-03 | 634390.5 | 5383103.8 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD005 | 0 | 0.60000E-03 | 634402.5 | 5383112.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD006 | 0 | 0.60000E-03 | 634414.4 | 5383121.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD007 | 0 | 0.60000E-03 | 634426.4 | 5383131.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD008 | 0 | 0.60000E-03 | 634438.3 | 5383140.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD009 | 0 | 0.60000E-03 | 634450.2 | 5383149.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD010 | 0 | 0.60000E-03 | 634462.2 | 5383158.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD011 | 0 | 0.60000E-03 | 634473.7 | 5383167.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD012 | 0 | 0.60000E-03 | 634484.7 | 5383178.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD013 | 0 | 0.60000E-03 | 634495.7 | 5383188.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD014 | 0 | 0.60000E-03 | 634506.8 | 5383198.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD015 | 0 | 0.60000E-03 | 634516.9 | 5383209.3 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD016 | 0 | 0.60000E-03 | 634524.7 | 5383222.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD017 | 0 | 0.60000E-03 | 634532.6 | 5383234.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD018 | 0 | 0.60000E-03 | 634540.5 | 5383247.6 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD019 | 0 | 0.60000E-03 | 634545.2 | 5383261.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD020 | 0 | 0.60000E-03 | 634549.4 | 5383276.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD021 | 0 | 0.29000E-02 | 634553.6 | 5383290.6 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD022 | 0 | 0.29000E-02 | 634558.4 | 5383304.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD023 | 0 | 0.29000E-02 | 634563.5 | 5383318.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD024 | 0 | 0.29000E-02 | 634568.7 | 5383333.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD025 | 0 | 0.29000E-02 | 634573.8 | 5383347.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD026 | 0 | 0.29000E-02 | 634579.0 | 5383361.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD027 | 0 | 0.29000E-02 | 634583.5 | 5383375.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD028 | 0 | 0.29000E-02 | 634586.8 | 5383390.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD029 | 0 | 0.29000E-02 | 634587.1 | 5383405.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD030 | 0 | 0.29000E-02 | 634587.4 | 5383420.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD031 | 0 | 0.29000E-02 | 634587.8 | 5383435.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD032 | 0 | 0.29000E-02 | 634588.1 | 5383450.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD033 | 0 | 0.29000E-02 | 634588.4 | 5383465.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD034 | 0 | 0.29000E-02 | 634588.7 | 5383480.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD035 | 0 | 0.29000E-02 | 634588.8 | 5383495.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD036 | 0 | 0.29000E-02 | 634588.6 | 5383510.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD037 | 0 | 0.29000E-02 | 634588.5 | 5383525.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD038 | 0 | 0.29000E-02 | 634588.3 | 5383540.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD039 | 0 | 0.29000E-02 | 634588.2 | 5383555.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD040 | 0 | 0.29000E-02 | 634588.0 | 5383570.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD041 | 0 | 0.29000E-02 | 634587.9 | 5383584.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD042 | 0 | 0.29000E-02 | 634587.7 | 5383599.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD043 | 0 | 0.29000E-02 | 634587.6 | 5383614.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD044 | 0 | 0.29000E-02 | 634585.7 | 5383629.7 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD045 | 0 | 0.29000E-02 | 634581.6 | 5383644.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD046 | 0 | 0.29000E-02 | 634574.9 | 5383657.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD047 | 0 | 0.29000E-02 | 634567.1 | 5383670.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD048 | 0 | 0.29000E-02 | 634560.2 | 5383683.5 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD049 | 0 | 0.29000E-02 | 634554.6 | 5383697.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD050 | 0 | 0.29000E-02 | 634551.4 | 5383712.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD051 | 0 | 0.29000E-02 | 634549.7 | 5383726.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD052 | 0 | 0.29000E-02 | 634548.6 | 5383741.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD053 | 0 | 0.29000E-02 | 634547.6 | 5383756.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD054 | 0 | 0.29000E-02 | 634546.5 | 5383771.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD055 | 0 | 0.29000E-02 | 634545.5 | 5383786.7 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |

**American Crystal Sugar Company – Drayton**
**$PM_{2.5}$ PTC Amendment Model Run**

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD056 | 0 | 0.30239E-03 | 634386.3 | 5384560.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD057 | 0 | 0.30239E-03 | 634389.5 | 5384546.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD058 | 0 | 0.30239E-03 | 634394.8 | 5384532.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD059 | 0 | 0.30239E-03 | 634408.1 | 5384526.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD060 | 0 | 0.30239E-03 | 634422.3 | 5384521.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD061 | 0 | 0.30239E-03 | 634436.1 | 5384516.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD062 | 0 | 0.30239E-03 | 634449.8 | 5384510.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD063 | 0 | 0.30239E-03 | 634462.4 | 5384501.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD064 | 0 | 0.30239E-03 | 634474.1 | 5384492.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD065 | 0 | 0.30239E-03 | 634484.8 | 5384482.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD066 | 0 | 0.30239E-03 | 634494.8 | 5384470.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD067 | 0 | 0.30239E-03 | 634503.6 | 5384458.8 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD068 | 0 | 0.30239E-03 | 634511.3 | 5384446.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD069 | 0 | 0.30239E-03 | 634517.8 | 5384432.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD070 | 0 | 0.30239E-03 | 634523.1 | 5384418.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD071 | 0 | 0.30239E-03 | 634526.7 | 5384403.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD072 | 0 | 0.30239E-03 | 634530.3 | 5384389.3 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD073 | 0 | 0.30239E-03 | 634523.5 | 5384380.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD074 | 0 | 0.30239E-03 | 634511.8 | 5384370.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD075 | 0 | 0.30239E-03 | 634504.0 | 5384358.4 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD076 | 0 | 0.30239E-03 | 634500.1 | 5384343.9 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD077 | 0 | 0.30239E-03 | 634498.6 | 5384329.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD078 | 0 | 0.30239E-03 | 634498.8 | 5384314.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD079 | 0 | 0.30239E-03 | 634499.2 | 5384299.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD080 | 0 | 0.30239E-03 | 634499.5 | 5384284.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD081 | 0 | 0.30239E-03 | 634499.8 | 5384269.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD082 | 0 | 0.30239E-03 | 634500.1 | 5384254.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD083 | 0 | 0.30239E-03 | 634500.4 | 5384239.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD084 | 0 | 0.30239E-03 | 634500.7 | 5384224.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD085 | 0 | 0.30239E-03 | 634501.1 | 5384209.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD086 | 0 | 0.30239E-03 | 634501.4 | 5384194.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD087 | 0 | 0.30239E-03 | 634501.7 | 5384179.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD088 | 0 | 0.30239E-03 | 634502.0 | 5384164.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD089 | 0 | 0.30239E-03 | 634502.3 | 5384149.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD090 | 0 | 0.30200E-03 | 634502.6 | 5384134.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD091 | 0 | 0.30239E-03 | 634502.9 | 5384119.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD092 | 0 | 0.30239E-03 | 634503.3 | 5384104.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD093 | 0 | 0.30239E-03 | 634503.6 | 5384089.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD094 | 0 | 0.30239E-03 | 634503.9 | 5384074.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD095 | 0 | 0.30239E-03 | 634504.2 | 5384059.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD096 | 0 | 0.30239E-03 | 634504.5 | 5384044.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD097 | 0 | 0.30239E-03 | 634504.8 | 5384029.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD098 | 0 | 0.30239E-03 | 634512.8 | 5384017.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD099 | 0 | 0.30239E-03 | 634523.9 | 5384007.0 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD100 | 0 | 0.30239E-03 | 634536.7 | 5383999.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD101 | 0 | 0.30239E-03 | 634549.2 | 5383990.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD102 | 0 | 0.30239E-03 | 634561.1 | 5383981.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD103 | 0 | 0.30239E-03 | 634571.7 | 5383971.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD104 | 0 | 0.30239E-03 | 634579.9 | 5383958.6 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD105 | 0 | 0.30239E-03 | 634589.3 | 5383947.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD106 | 0 | 0.30239E-03 | 634600.6 | 5383937.3 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD107 | 0 | 0.30239E-03 | 634611.5 | 5383927.1 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD108 | 0 | 0.30239E-03 | 634616.7 | 5383913.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD109 | 0 | 0.30239E-03 | 634617.2 | 5383898.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD110 | 0 | 0.30239E-03 | 634617.5 | 5383883.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD111 | 0 | 0.30239E-03 | 634617.7 | 5383868.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD112 | 0 | 0.30239E-03 | 634618.0 | 5383853.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD113 | 0 | 0.30239E-03 | 634618.2 | 5383844.3 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD114 | 0 | 0.20000E-03 | 634987.7 | 5384600.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD115 | 0 | 0.20000E-03 | 634973.6 | 5384595.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD116 | 0 | 0.20000E-03 | 634958.6 | 5384594.4 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD117 | 0 | 0.20000E-03 | 634943.7 | 5384593.3 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD118 | 0 | 0.20000E-03 | 634928.7 | 5384592.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD119 | 0 | 0.20000E-03 | 634913.7 | 5384592.2 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD120 | 0 | 0.20000E-03 | 634898.7 | 5384591.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD121 | 0 | 0.20000E-03 | 634883.7 | 5384591.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD122 | 0 | 0.20000E-03 | 634868.7 | 5384591.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD123 | 0 | 0.20000E-03 | 634853.7 | 5384590.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD124 | 0 | 0.20000E-03 | 634838.7 | 5384590.3 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD125 | 0 | 0.20000E-03 | 634823.7 | 5384589.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD126 | 0 | 0.20000E-03 | 634808.7 | 5384589.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD127 | 0 | 0.20000E-03 | 634793.7 | 5384589.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD128 | 0 | 0.20000E-03 | 634779.0 | 5384586.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD129 | 0 | 0.20000E-03 | 634766.6 | 5384578.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD130 | 0 | 0.20000E-03 | 634757.5 | 5384566.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD131 | 0 | 0.20000E-03 | 634753.2 | 5384552.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD132 | 0 | 0.20000E-03 | 634751.3 | 5384537.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD133 | 0 | 0.20000E-03 | 634751.5 | 5384522.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD134 | 0 | 0.20000E-03 | 634752.0 | 5384507.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD135 | 0 | 0.20000E-03 | 634752.4 | 5384492.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD136 | 0 | 0.20000E-03 | 634752.9 | 5384477.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD137 | 0 | 0.20000E-03 | 634753.3 | 5384462.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD138 | 0 | 0.20000E-03 | 634754.1 | 5384447.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD139 | 0 | 0.20000E-03 | 634759.7 | 5384434.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD140 | 0 | 0.20000E-03 | 634772.4 | 5384426.9 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD141 | 0 | 0.20000E-03 | 634786.0 | 5384420.6 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |

# American Crystal Sugar Company – Drayton
# $PM_{2.5}$ PTC Amendment Model Run

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| RD142 | 0 | 0.20000E-03 | 634799.5 | 5384414.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD143 | 0 | 0.20000E-03 | 634812.5 | 5384406.7 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD144 | 0 | 0.20000E-03 | 634824.7 | 5384398.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD145 | 0 | 0.20000E-03 | 634837.0 | 5384389.4 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD146 | 0 | 0.20000E-03 | 634847.9 | 5384379.2 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD147 | 0 | 0.20000E-03 | 634858.3 | 5384368.4 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD148 | 0 | 0.20000E-03 | 634867.3 | 5384356.4 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD149 | 0 | 0.20000E-03 | 634875.6 | 5384344.0 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD150 | 0 | 0.20000E-03 | 634882.8 | 5384330.8 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD151 | 0 | 0.20000E-03 | 634888.9 | 5384317.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD152 | 0 | 0.20000E-03 | 634894.1 | 5384303.1 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD153 | 0 | 0.20000E-03 | 634897.7 | 5384288.5 | 243.8 | 3.40 | 6.98 | 3.16 | NO | MONTH |
| RD154 | 0 | 0.20000E-03 | 634899.6 | 5384273.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD155 | 0 | 0.20000E-03 | 634900.3 | 5384258.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD156 | 0 | 0.20000E-03 | 634900.9 | 5384243.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD157 | 0 | 0.20000E-03 | 634901.6 | 5384228.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD158 | 0 | 0.20000E-03 | 634901.7 | 5384213.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD159 | 0 | 0.20000E-03 | 634901.9 | 5384198.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD160 | 0 | 0.20000E-03 | 634902.1 | 5384183.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD161 | 0 | 0.20000E-03 | 634902.3 | 5384168.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD162 | 0 | 0.20000E-03 | 634902.5 | 5384153.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD163 | 0 | 0.20000E-03 | 634902.7 | 5384138.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD164 | 0 | 0.20000E-03 | 634902.8 | 5384123.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD165 | 0 | 0.20000E-03 | 634903.0 | 5384108.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD166 | 0 | 0.20000E-03 | 634903.2 | 5384093.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD167 | 0 | 0.20000E-03 | 634903.4 | 5384078.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD168 | 0 | 0.20000E-03 | 634903.6 | 5384063.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD169 | 0 | 0.20000E-03 | 634903.8 | 5384048.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD170 | 0 | 0.20000E-03 | 634904.0 | 5384033.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD171 | 0 | 0.20000E-03 | 634904.1 | 5384018.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD172 | 0 | 0.20000E-03 | 634904.3 | 5384003.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD173 | 0 | 0.20000E-03 | 634904.6 | 5383988.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD174 | 0 | 0.20000E-03 | 634904.8 | 5383973.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD175 | 0 | 0.20000E-03 | 634905.1 | 5383958.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD176 | 0 | 0.20000E-03 | 634905.4 | 5383943.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD177 | 0 | 0.20000E-03 | 634905.7 | 5383928.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD178 | 0 | 0.20000E-03 | 634906.0 | 5383913.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD179 | 0 | 0.20000E-03 | 634905.7 | 5383898.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD180 | 0 | 0.20000E-03 | 634905.3 | 5383883.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD181 | 0 | 0.20000E-03 | 634904.9 | 5383868.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD182 | 0 | 0.20000E-03 | 634904.5 | 5383853.8 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |
| RD183 | 0 | 0.20000E-03 | 634904.3 | 5383846.2 | 243.8 | 3.40 | 6.98 | 11.77 | NO | MONTH |

**American Crystal Sugar Company – Drayton**
**$PM_{2.5}$ PTC Amendment Model Run**

*** AREA SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC /METER**2) | COORD (SW CORNER) X (METERS) | COORD (SW CORNER) Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | X-DIM OF AREA (METERS) | Y-DIM OF AREA (METERS) | ORIENT. OF AREA (DEG.) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FUG1 | 0 | 0.12600E-04 | 634446.8 | 5383938.7 | 243.8 | 3.66 | 5.00 | 20.00 | -2.00 | 11.77 | NO | |
| FUG2 | 0 | 0.53301E-05 | 634518.2 | 5383428.4 | 243.8 | 3.05 | 18.50 | 115.00 | -2.00 | 1.52 | NO | |
| FUG3 | 0 | 0.10000E-08 | 634582.6 | 5383680.6 | 243.8 | 1.83 | 45.00 | 60.00 | -2.00 | 0.91 | NO | |
| FUG4 | 0 | 0.57599E-06 | 635097.1 | 5384717.2 | 243.8 | 1.83 | 70.00 | 125.00 | -2.00 | 0.91 | NO | |

*** THE SUMMARY OF MAXIMUM 8TH-HIGHEST 24-HR RESULTS AVERAGED OVER 5 YEARS ***

** CONC OF PM-2.5 IN MICROGRAMS/M**3 **

| GROUP ID | | AVERAGE CONC | RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG) | NETWORK OF TYPE GRID-ID |
|---|---|---|---|---|
| **ALL** | **1ST HIGHEST VALUE IS** | **21.11973 AT (** | **634686.10, 5383058.50, 243.50, 243.50, 0.00)** | **DC** |

*** THE SUMMARY OF MAXIMUM ANNUAL RESULTS AVERAGED OVER 1 YEARS ***

** CONC OF PM-2.5 IN MICROGRAMS/M**3 **

| GROUP ID | | AVERAGE CONC | RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG) | NETWORK OF TYPE GRID-ID |
|---|---|---|---|---|
| 2009 | 1ST HIGHEST VALUE IS | 4.21248 AT ( | 634751.00, 53830060.00, 243.50, 243.50, 0.00) | DC |
| 2010 | 1ST HIGHEST VALUE IS | 3.41884 AT ( | 634666.50, 53830058.00, 243.50, 243.50, 0.00) | DC |
| 2011 | 1ST HIGHEST VALUE IS | 3.22923 AT ( | 634751.00, 53830060.00, 243.50, 243.50, 0.00) | DC |
| 2012 | 1ST HIGHEST VALUE IS | 3.44777 AT ( | 634751.00, 53830060.00, 243.50, 243.50, 0.00) | DC |
| **2013** | **1ST HIGHEST VALUE IS** | **4.61915 AT (** | **634686.10, 53830058.50, 243.50, 243.50, 0.00)** | **DC** |

# American Crystal Sugar Company – Drayton
# $PM_{10}$ 24-Hour Increment PTC Amendment Model Run

*** POINT SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | STACK HEIGHT (METERS) | STACK TEMP. (DEG.K) | STACK EXIT VEL. (M/SEC) | STACK DIAMETER (METERS) | BLDG EXISTS | URBAN SOURCE | CAP/ HOR | EMIS RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EP1 | 0 | 0.37547E+01 | 634538.2 | 5383772.1 | 243.8 | 45.72 | 559.26 | 22.52 | 2.35 | YES | NO | NO | |
| EP1A | 0 | 0.36539E-01 | 634518.7 | 5383766.2 | 243.8 | 25.91 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP3 | 0 | 0.95632E+01 | 634468.5 | 5383839.7 | 243.8 | 64.01 | 398.71 | 20.19 | 1.22 | YES | NO | NO | |
| EP4 | 0 | 0.11189E+02 | 634464.9 | 5383839.7 | 243.8 | 51.82 | 384.80 | 33.03 | 1.52 | YES | NO | NO | |
| EP30 | 0 | 0.18900E+00 | 634495.0 | 5383941.4 | 243.8 | 7.01 | 294.30 | 36.41 | 0.76 | YES | NO | NO | |
| EP9 | 0 | 0.37799E-01 | 634518.0 | 5383849.8 | 243.8 | 6.71 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| EP10 | 0 | 0.75599E-01 | 634473.3 | 5383946.8 | 243.8 | 7.31 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| EP28 | 0 | 0.27720E+00 | 634478.4 | 5383733.8 | 243.8 | 27.43 | 329.15 | 15.38 | 1.22 | YES | NO | NO | |
| EP14A | 0 | 0.42839E+00 | 634494.1 | 5383726.9 | 243.8 | 26.21 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |
| EP14B | 0 | 0.41579E+00 | 634488.6 | 5383726.9 | 243.8 | 22.25 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |
| EP151617 | 0 | 0.46619E-01 | 634440.2 | 5383949.1 | 243.8 | 18.90 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP19A | 0 | 0.13860E-01 | 634436.9 | 5383673.3 | 243.8 | 4.72 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP20 | 0 | 0.56699E-01 | 634469.5 | 5383641.9 | 243.8 | 12.19 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP23 | 0 | 0.11214E+00 | 634497.6 | 5383847.9 | 243.8 | 23.16 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP24 | 0 | 0.50399E-02 | 634519.2 | 5383801.5 | 243.8 | 6.10 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP27A | 0 | 0.13822E+01 | 634565.9 | 5383761.9 | 243.8 | 53.34 | 317.00 | 16.20 | 0.41 | YES | NO | NO | |
| EP29 | 0 | 0.41957E+00 | 634574.4 | 5383753.0 | 243.8 | 24.38 | 352.59 | 2.75 | 0.81 | YES | NO | NO | |
| ETH1 | 0 | 0.27700E+00 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 399.82 | 21.56 | 0.91 | NO | NO | NO | |
| ETH2 | 0 | 0.25000E-01 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 505.37 | 12.61 | 0.91 | NO | NO | NO | |
| ETH3 | 0 | 0.25000E-01 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 505.37 | 12.61 | 0.91 | NO | NO | NO | |
| ETH4 | 0 | 0.14000E+00 | 617506.8 | 5364866.6 | 251.2 | 10.67 | 410.93 | 21.02 | 0.61 | NO | NO | NO | |
| ETH5 | 0 | 0.78700E+00 | 617566.0 | 5364904.7 | 251.2 | 12.19 | 293.00 | 0.01 | 0.31 | NO | NO | NO | |
| DEVP | 0 | 0.41730E+01 | 616654.0 | 5363730.0 | 254.5 | 45.72 | 433.00 | 2.68 | 2.44 | NO | NO | NO | |
| PEP1 | 0 | -.47300E+01 | 634538.2 | 5383772.1 | 243.8 | 36.57 | 490.20 | 18.75 | 2.35 | YES | NO | NO | |
| PEP1A | 0 | -.36539E-01 | 634518.7 | 5383766.2 | 243.8 | 25.92 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| PEP2 | 0 | -.20412E+00 | 634504.0 | 5383770.4 | 243.8 | 30.50 | 566.10 | 14.10 | 0.91 | YES | NO | NO | |
| PEP3A | 0 | -.23600E+01 | 634488.9 | 5383845.1 | 243.8 | 24.69 | 373.30 | 5.87 | 1.22 | YES | NO | NO | |
| PEP3B | 0 | -.23600E+01 | 634485.4 | 5383845.0 | 243.8 | 24.69 | 373.30 | 5.87 | 1.22 | YES | NO | NO | |
| PEP3C | 0 | -.23600E+01 | 634481.7 | 5383844.8 | 243.8 | 24.69 | 373.30 | 5.87 | 1.22 | YES | NO | NO | |
| PEP3D | 0 | -.23600E+01 | 634478.2 | 5383844.8 | 243.8 | 24.69 | 373.30 | 5.87 | 1.22 | YES | NO | NO | |
| PEP4A | 0 | -.32000E+01 | 634489.0 | 5383841.9 | 243.8 | 24.69 | 380.40 | 7.95 | 1.22 | YES | NO | NO | |
| PEP4B | 0 | -.32000E+01 | 634485.5 | 5383841.7 | 243.8 | 24.69 | 380.40 | 7.95 | 1.22 | YES | NO | NO | |
| PEP4C | 0 | -.32000E+01 | 634481.8 | 5383841.5 | 243.8 | 24.69 | 380.40 | 7.95 | 1.22 | YES | NO | NO | |
| PEP4D | 0 | -.32000E+01 | 634478.2 | 5383841.5 | 243.8 | 24.69 | 380.40 | 7.95 | 1.22 | YES | NO | NO | |
| PEP4E | 0 | -.32000E+01 | 634474.7 | 5383841.5 | 243.8 | 24.69 | 380.40 | 7.95 | 1.22 | YES | NO | NO | |
| PEP5 | 0 | -.80000E-01 | 634519.2 | 5383802.3 | 243.8 | 9.45 | 399.80 | 0.00 | 0.00 | YES | NO | NO | |
| PEP6 | 0 | -.47000E+00 | 634476.4 | 5383941.2 | 243.8 | 23.77 | 310.93 | 4.55 | 1.22 | YES | NO | NO | |
| PEP7 | 0 | -.47000E+00 | 634476.1 | 5383943.9 | 243.8 | 23.77 | 310.93 | 4.45 | 1.22 | YES | NO | NO | |
| PEP8 | 0 | -.47000E+00 | 634481.4 | 5383943.8 | 243.8 | 23.77 | 310.93 | 4.45 | 1.22 | YES | NO | NO | |
| PEP9 | 0 | -.75599E-01 | 634518.0 | 5383849.8 | 243.8 | 17.37 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |

# American Crystal Sugar Company – Drayton
# $PM_{10}$ 24-Hour Increment PTC Amendment Model Run

*** POINT SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | STACK HEIGHT (METERS) | STACK TEMP. (DEG.K) | STACK EXIT VEL. (M/SEC) | STACK DIAMETER (METERS) | BLDG EXISTS | URBAN SOURCE | CAP/ HOR | EMIS RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PEP10 | 0 | -.75599E-01 | 634473.3 | 5383946.8 | 243.8 | 7.32 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| PEP11 | 0 | -.75599E-01 | 634518.6 | 5383844.1 | 243.8 | 17.37 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| PEP12 | 0 | -.20000E+00 | 634478.4 | 5383733.8 | 243.8 | 27.43 | 312.00 | 0.00 | 0.00 | YES | NO | NO | |
| PEP13 | 0 | -.37000E+00 | 634514.1 | 5383784.2 | 243.8 | 38.71 | 376.48 | 20.97 | 0.30 | YES | NO | NO | |
| PEP14 | 0 | -.43000E+00 | 634441.5 | 5383675.5 | 243.8 | 6.10 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |
| PEP15 | 0 | -.50000E-01 | 634440.2 | 5383949.1 | 243.8 | 18.90 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| PEP18 | 0 | -.14000E-01 | 634474.2 | 5383675.5 | 243.8 | 10.10 | 294.30 | 16.59 | 0.50 | YES | NO | NO | |

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| PEP19 | 0 | -.13860E-01 | 634436.9 | 5383673.3 | 243.8 | 4.72 | 0.23 | 2.20 | NO | |
| PEP20 | 0 | -.56699E-01 | 634469.5 | 5383641.9 | 243.8 | 18.29 | 0.23 | 8.51 | NO | |

*** AREA SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC /METER**2) | COORD (SW CORNER) X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | X-DIM OF AREA (METERS) | Y-DIM OF AREA (METERS) | ORIENT. OF AREA (DEG.) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FUG1 | 0 | 0.56699E-03 | 634446.8 | 5383938.7 | 243.8 | 3.66 | 5.00 | 20.00 | -2.00 | 11.77 | NO | |
| PFUG1 | 0 | -.56699E-03 | 634446.8 | 5383938.7 | 243.8 | 3.66 | 5.00 | 20.00 | -2.00 | 1.86 | NO | |

*** THE SUMMARY OF HIGHEST 24-HR RESULTS ***

** CONC OF PM_10 IN MICROGRAMS/M**3 **

| GROUP ID | | | AVERAGE CONC | DATE (YYMMDDHH) | RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG) | | | | | OF TYPE | NETWORK GRID-ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2009 | HIGH | 2ND HIGH VALUE IS | 17.47411 | ON 09122324: AT ( | 634319.60, | 5383749.80, | 243.71, | 243.71, | 0.00) | DC | |
| **2010** | **HIGH** | **2ND HIGH VALUE IS** | **24.95512** | **ON 10051724: AT (** | **634317.00,** | **5383879.70,** | **243.78,** | **243.78,** | **0.00)** | **DC** | |
| 2011 | HIGH | 2ND HIGH VALUE IS | 12.47770 | ON 11052024: AT ( | 634320.40, | 5383709.80, | 243.73, | 243.73, | 0.00) | DC | |
| 2012 | HIGH | 2ND HIGH VALUE IS | 13.86517 | ON 12013024: AT ( | 634316.00, | 5383929.70, | 243.51, | 243.51, | 0.00) | DC | |
| 2013 | HIGH | 2ND HIGH VALUE IS | 11.00174 | ON 13060824: AT ( | 634316.40, | 5383909.70, | 243.59, | 243.59, | 0.00) | DC | |

## American Crystal Sugar Company – Drayton
## $PM_{10}$ Annual Increment PTC Amendment Model Run

*** POINT SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | STACK HEIGHT (METERS) | STACK TEMP. (DEG.K) | STACK EXIT VEL. (M/SEC) | STACK DIAMETER (METERS) | BLDG EXISTS | URBAN SOURCE | CAP/ HOR | EMIS RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EP1 | 0 | 0.37547E+01 | 634538.2 | 5383772.1 | 243.8 | 45.72 | 559.26 | 22.52 | 2.35 | YES | NO | NO | |
| EP1A | 0 | 0.36539E-01 | 634518.7 | 5383766.2 | 243.8 | 25.91 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP3 | 0 | 0.95632E+01 | 634468.5 | 5383839.7 | 243.8 | 64.01 | 398.71 | 20.19 | 1.22 | YES | NO | NO | |
| EP4 | 0 | 0.11189E+02 | 634464.9 | 5383839.7 | 243.8 | 51.82 | 384.80 | 33.03 | 1.52 | YES | NO | NO | |
| EP30 | 0 | 0.18900E+00 | 634495.0 | 5383941.4 | 243.8 | 7.01 | 294.30 | 36.41 | 0.76 | YES | NO | NO | |
| EP9 | 0 | 0.37799E-01 | 634518.0 | 5383849.8 | 243.8 | 6.71 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| EP10 | 0 | 0.75599E-01 | 634473.3 | 5383946.8 | 243.8 | 7.31 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| EP28 | 0 | 0.27720E+00 | 634478.4 | 5383733.8 | 243.8 | 27.43 | 329.15 | 15.38 | 1.22 | YES | NO | NO | |
| EP14A | 0 | 0.42839E+00 | 634494.1 | 5383726.9 | 243.8 | 26.21 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |
| EP14B | 0 | 0.41579E+00 | 634488.6 | 5383726.9 | 243.8 | 22.25 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |
| EP151617 | 0 | 0.46619E-01 | 634440.2 | 5383949.1 | 243.8 | 18.90 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP19A | 0 | 0.13860E-01 | 634436.9 | 5383673.3 | 243.8 | 4.72 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP20 | 0 | 0.56699E-01 | 634469.5 | 5383641.9 | 243.8 | 12.19 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP23 | 0 | 0.11214E+00 | 634497.6 | 5383847.9 | 243.8 | 23.16 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP24 | 0 | 0.50399E-02 | 634519.2 | 5383801.5 | 243.8 | 6.10 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP27A | 0 | 0.13822E+01 | 634565.9 | 5383761.9 | 243.8 | 53.34 | 317.00 | 16.20 | 0.41 | YES | NO | NO | |
| EP29 | 0 | 0.41957E+00 | 634574.4 | 5383753.0 | 243.8 | 24.38 | 352.59 | 2.75 | 0.81 | YES | NO | NO | |
| ETH1 | 0 | 0.27700E+00 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 399.82 | 21.56 | 0.91 | NO | NO | NO | |
| ETH2 | 0 | 0.25000E-01 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 505.37 | 12.61 | 0.91 | NO | NO | NO | |
| ETH3 | 0 | 0.25000E-01 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 505.37 | 12.61 | 0.91 | NO | NO | NO | |
| ETH4 | 0 | 0.14000E+00 | 617506.8 | 5364866.6 | 251.2 | 10.67 | 410.93 | 21.02 | 0.61 | NO | NO | NO | |
| ETH5 | 0 | 0.78700E+00 | 617566.0 | 5364904.7 | 251.2 | 12.19 | 293.00 | 0.01 | 0.31 | NO | NO | NO | |
| DEVP | 0 | 0.41730E+01 | 616654.0 | 5363730.0 | 254.5 | 45.72 | 433.00 | 2.68 | 2.44 | NO | NO | NO | |
| PEP1 | 0 | -.33188E+01 | 634538.2 | 5383772.1 | 243.8 | 36.57 | 490.20 | 18.75 | 2.35 | YES | NO | NO | |
| PEP1A | 0 | -.20160E-01 | 634518.7 | 5383766.2 | 243.8 | 25.92 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| PEP2 | 0 | 0.00000E+00 | 634504.0 | 5383770.4 | 243.8 | 30.50 | 566.10 | 14.10 | 0.91 | YES | NO | NO | |
| PEP3A | 0 | -.12776E+01 | 634488.9 | 5383845.1 | 243.8 | 24.69 | 373.30 | 5.87 | 1.22 | YES | NO | NO | |
| PEP3B | 0 | -.12776E+01 | 634485.4 | 5383845.0 | 243.8 | 24.69 | 373.30 | 5.87 | 1.22 | YES | NO | NO | |
| PEP3C | 0 | -.12776E+01 | 634481.7 | 5383844.8 | 243.8 | 24.69 | 373.30 | 5.87 | 1.22 | YES | NO | NO | |
| PEP3D | 0 | -.12776E+01 | 634478.2 | 5383844.8 | 243.8 | 24.69 | 373.30 | 5.87 | 1.22 | YES | NO | NO | |
| PEP4A | 0 | -.17337E+01 | 634489.0 | 5383841.9 | 243.8 | 24.69 | 380.40 | 7.95 | 1.22 | YES | NO | NO | |
| PEP4B | 0 | -.17337E+01 | 634485.5 | 5383841.7 | 243.8 | 24.69 | 380.40 | 7.95 | 1.22 | YES | NO | NO | |
| PEP4C | 0 | -.17337E+01 | 634481.8 | 5383841.5 | 243.8 | 24.69 | 380.40 | 7.95 | 1.22 | YES | NO | NO | |
| PEP4D | 0 | -.17337E+01 | 634478.2 | 5383841.5 | 243.8 | 24.69 | 380.40 | 7.95 | 1.22 | YES | NO | NO | |
| PEP4E | 0 | -.17337E+01 | 634474.7 | 5383841.5 | 243.8 | 24.69 | 380.40 | 7.95 | 1.22 | YES | NO | NO | |
| PEP5 | 0 | -.68039E-01 | 634519.2 | 5383802.3 | 243.8 | 9.45 | 399.80 | 0.00 | 0.00 | YES | NO | NO | |
| PEP6 | 0 | -.25326E+00 | 634476.4 | 5383941.2 | 243.8 | 23.77 | 310.93 | 4.55 | 1.22 | YES | NO | NO | |
| PEP7 | 0 | -.25326E+00 | 634476.1 | 5383943.9 | 243.8 | 23.77 | 310.93 | 4.45 | 1.22 | YES | NO | NO | |
| PEP8 | 0 | -.25326E+00 | 634481.4 | 5383943.8 | 243.8 | 23.77 | 310.93 | 4.45 | 1.22 | YES | NO | NO | |
| PEP9 | 0 | -.41579E-01 | 634518.0 | 5383849.8 | 243.8 | 17.37 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |

# American Crystal Sugar Company – Drayton
# $PM_{10}$ Annual Increment PTC Amendment Model Run

*** POINT SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | STACK HEIGHT (METERS) | STACK TEMP. (DEG.K) | STACK EXIT VEL. (M/SEC) | STACK DIAMETER (METERS) | BLDG EXISTS | URBAN SOURCE | CAP/ HOR | EMIS RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PEP10 | 0 | -.41579E-01 | 634473.3 | 5383946.8 | 243.8 | 7.32 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| PEP11 | 0 | -.41579E-01 | 634518.6 | 5383844.1 | 243.8 | 17.37 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| PEP12 | 0 | -.10710E+00 | 634478.4 | 5383733.8 | 243.8 | 27.43 | 312.00 | 0.00 | 0.00 | YES | NO | NO | |
| PEP13 | 0 | -.20286E+00 | 634514.1 | 5383784.2 | 243.8 | 38.71 | 376.48 | 20.97 | 0.30 | YES | NO | NO | |
| PEP14 | 0 | -.23184E+00 | 634441.5 | 5383675.5 | 243.8 | 6.10 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |
| PEP15 | 0 | -.25200E-01 | 634440.2 | 5383949.1 | 243.8 | 18.90 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| PEP18 | 0 | -.75599E-02 | 634474.2 | 5383675.5 | 243.8 | 10.10 | 294.30 | 16.59 | 0.50 | YES | NO | NO | |

*** VOLUME SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | INIT. SY (METERS) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|
| PEP19 | 0 | -.75599E-02 | 634436.9 | 5383673.3 | 243.8 | 4.72 | 0.23 | 2.20 | NO | |
| PEP20 | 0 | -.30239E-01 | 634469.5 | 5383641.9 | 243.8 | 18.29 | 0.23 | 8.51 | NO | |

*** THE SUMMARY OF MAXIMUM ANNUAL RESULTS AVERAGED OVER 1 YEARS ***

** CONC OF PM_10 IN MICROGRAMS/M**3 **

| GROUP ID | | AVERAGE CONC | RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG) | OF TYPE | NETWORK GRID-ID |
|---|---|---|---|---|---|
| 2009 | 1ST HIGHEST VALUE IS | 0.08024 | AT ( 624000.00, 5373000.00, 246.41, 246.41, 0.00) | DC | |
| **2010** | **1ST HIGHEST VALUE IS** | **0.08178** | **AT ( 625500.00, 5373000.00, 247.10, 247.10, 0.00)** | **DC** | |
| 2011 | 1ST HIGHEST VALUE IS | 0.07579 | AT ( 624500.00, 5373000.00, 247.82, 247.82, 0.00) | DC | |
| 2012 | 1ST HIGHEST VALUE IS | 0.07073 | AT ( 624000.00, 5373000.00, 246.41, 246.41, 0.00) | DC | |
| 2013 | 1ST HIGHEST VALUE IS | 0.07554 | AT ( 624000.00, 5373000.00, 246.41, 246.41, 0.00) | DC | |

## American Crystal Sugar Company – Drayton
## $PM_{2.5}$ 24-Hour Increment PTC Amendment Model Run

*** POINT SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | STACK HEIGHT (METERS) | STACK TEMP. (DEG.K) | STACK EXIT VEL. (M/SEC) | STACK DIAMETER (METERS) | BLDG EXISTS | URBAN SOURCE | CAP/ HOR | EMIS RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EP1 | 0 | 0.45700E+01 | 634538.2 | 5383772.1 | 243.8 | 45.72 | 559.26 | 22.52 | 2.35 | YES | NO | NO | |
| EP1A | 0 | 0.88199E-02 | 634518.7 | 5383766.2 | 243.8 | 25.91 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP3 | 0 | 0.60655E+01 | 634468.5 | 5383839.7 | 243.8 | 64.01 | 398.71 | 20.19 | 1.22 | YES | NO | NO | |
| EP4 | 0 | 0.10498E+02 | 634464.9 | 5383839.7 | 243.8 | 51.82 | 384.80 | 33.03 | 1.52 | YES | NO | NO | |
| EP30 | 0 | 0.44099E-01 | 634495.0 | 5383941.4 | 243.8 | 7.01 | 294.30 | 36.41 | 0.76 | YES | NO | NO | |
| EP9 | 0 | 0.75599E-02 | 634518.0 | 5383849.8 | 243.8 | 6.71 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| EP10 | 0 | 0.12600E-01 | 634473.3 | 5383946.8 | 243.8 | 7.31 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| EP28 | 0 | 0.62999E-01 | 634478.4 | 5383733.8 | 243.8 | 27.43 | 329.15 | 15.38 | 1.22 | YES | NO | NO | |
| EP14A | 0 | 0.99538E-01 | 634494.1 | 5383726.9 | 243.8 | 26.21 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |
| EP14B | 0 | 0.94498E-01 | 634488.6 | 5383726.9 | 243.8 | 22.25 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |
| EP151617 | 0 | 0.75599E-02 | 634440.2 | 5383949.1 | 243.8 | 18.90 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP19A | 0 | 0.37799E-02 | 634436.9 | 5383673.3 | 243.8 | 4.72 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP20 | 0 | 0.12600E-01 | 634469.5 | 5383641.9 | 243.8 | 12.19 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP23 | 0 | 0.26460E-01 | 634497.6 | 5383847.9 | 243.8 | 23.16 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP24 | 0 | 0.12600E-02 | 634519.2 | 5383801.5 | 243.8 | 6.10 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP27A | 0 | 0.87821E+00 | 634565.9 | 5383761.9 | 243.8 | 53.34 | 317.00 | 16.20 | 0.41 | YES | NO | NO | |
| EP29 | 0 | 0.15624E+00 | 634574.4 | 5383753.0 | 243.8 | 24.38 | 352.59 | 2.75 | 0.81 | YES | NO | NO | |
| ETH1 | 0 | 0.27700E+00 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 399.82 | 21.56 | 0.91 | NO | NO | NO | |
| ETH2 | 0 | 0.25000E-01 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 505.37 | 12.61 | 0.91 | NO | NO | NO | |
| ETH3 | 0 | 0.25000E-01 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 505.37 | 12.61 | 0.91 | NO | NO | NO | |
| ETH4 | 0 | 0.14000E+00 | 617506.8 | 5364866.6 | 251.2 | 10.67 | 410.93 | 21.02 | 0.61 | NO | NO | NO | |
| ETH5 | 0 | 0.78700E+00 | 617566.0 | 5364904.7 | 251.2 | 12.19 | 293.00 | 0.01 | 0.31 | NO | NO | NO | |
| DEVP | 0 | 0.41730E+01 | 616654.0 | 5363730.0 | 254.5 | 45.72 | 433.00 | 2.68 | 2.44 | NO | NO | NO | |
| PEP1 | 0 | -.26359E+01 | 634538.2 | 5383772.1 | 243.8 | 36.57 | 490.20 | 18.75 | 2.35 | YES | NO | NO | |
| PEP1A | 0 | -.88199E-02 | 634518.7 | 5383766.2 | 243.8 | 25.92 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| PEP2 | 0 | -.14868E+00 | 634504.0 | 5383770.4 | 243.8 | 30.50 | 566.10 | 14.10 | 0.91 | YES | NO | NO | |
| PEP3 | 0 | -.31991E+01 | 634468.5 | 5383839.7 | 243.8 | 51.82 | 398.71 | 20.19 | 1.22 | YES | NO | NO | |
| PEP4 | 0 | -.46657E+01 | 634464.9 | 5383839.7 | 243.8 | 51.82 | 388.70 | 22.11 | 1.52 | YES | NO | NO | |
| PEP5 | 0 | -.16758E+00 | 634519.2 | 5383802.3 | 243.8 | 9.45 | 399.80 | 0.00 | 0.00 | YES | NO | NO | |
| PEP6 | 0 | -.71810E-01 | 634476.4 | 5383941.2 | 243.8 | 23.77 | 310.93 | 4.55 | 1.22 | YES | NO | NO | |
| PEP7 | 0 | -.71819E-01 | 634476.1 | 5383943.9 | 243.8 | 23.77 | 310.93 | 4.45 | 1.22 | YES | NO | NO | |
| PEP8 | 0 | -.71819E-01 | 634481.4 | 5383943.8 | 243.8 | 23.77 | 310.93 | 4.45 | 1.22 | YES | NO | NO | |
| PEP9 | 0 | -.17640E-01 | 634518.0 | 5383849.8 | 243.8 | 17.37 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| PEP10 | 0 | -.17640E-01 | 634473.3 | 5383946.8 | 243.8 | 7.32 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| PEP11 | 0 | -.17640E-01 | 634518.6 | 5383844.1 | 243.8 | 17.37 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| PEP12 | 0 | -.51659E-01 | 634478.4 | 5383733.8 | 243.8 | 27.43 | 312.00 | 0.00 | 0.00 | YES | NO | NO | |
| PEP13 | 0 | -.39059E-01 | 634514.1 | 5383784.2 | 243.8 | 38.71 | 376.48 | 20.97 | 0.30 | YES | NO | NO | |
| PEP14A | 0 | -.99538E-01 | 634441.5 | 5383675.5 | 243.8 | 26.22 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |
| PEP15 | 0 | -.75599E-02 | 634440.2 | 5383949.1 | 243.8 | 18.90 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| PEP14B | 0 | -.97018E-01 | 634488.6 | 5383726.9 | 243.8 | 22.25 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |

# American Crystal Sugar Company – Drayton
# $PM_{2.5}$ 24-Hour Increment PTC Amendment Model Run

*** POINT SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | STACK HEIGHT (METERS) | STACK TEMP. (DEG.K) | STACK EXIT VEL. (M/SEC) | STACK DIAMETER (METERS) | BLDG EXISTS | URBAN SOURCE | CAP/ HOR | EMIS RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PEP19A | 0 | -.37799E-02 | 634436.9 | 5383673.3 | 243.8 | 4.72 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| PEP20 | 0 | -.12600E-01 | 634469.5 | 5383641.9 | 243.8 | 12.19 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| PEP22 | 0 | -.50399E-02 | 634478.8 | 5383945.3 | 243.8 | 24.99 | 294.30 | 28.39 | 0.46 | YES | NO | NO | |
| PEP23 | 0 | -.26460E-01 | 634497.6 | 5383847.8 | 243.8 | 23.16 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| PEP25 | 0 | -.35279E-01 | 634519.4 | 5383800.4 | 234.8 | 15.24 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |

*** AREA SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC /METER**2) | COORD (SW CORNER) X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | X-DIM OF AREA (METERS) | Y-DIM OF AREA (METERS) | ORIENT. OF AREA (DEG.) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FUG1 | 0 | 0.10000E-04 | 634446.8 | 5383938.7 | 243.8 | 3.66 | 5.00 | 20.00 | -2.00 | 11.77 | NO | |
| PFUG1 | 0 | -.17640E-04 | 634446.8 | 5383938.7 | 243.8 | 3.66 | 5.00 | 20.00 | -2.00 | 1.86 | NO | |

*** THE SUMMARY OF HIGHEST 24-HR RESULTS ***

** CONC OF PM_2.5 IN MICROGRAMS/M**3 **

| GROUP ID | | | AVERAGE CONC | DATE (YYMMDDHH) | RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG) | | | | | OF TYPE | NETWORK GRID-ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2009 | HIGH | 2ND HIGH VALUE IS | 5.32303 | ON 09060524: AT ( | 634800.00, | 5382800.00, | 243.40, | 243.40, | 0.00) | DC | |
| **2010** | **HIGH** | **2ND HIGH VALUE IS** | **6.49184** | **ON 10090924: AT (** | **633900.00,** | **5384250.00,** | **243.74,** | **243.74,** | **0.00)** | **DC** | |
| 2011 | HIGH | 2ND HIGH VALUE IS | 5.56787c | ON 11060824: AT ( | 634700.00, | 5382850.00, | 243.45, | 243.45, | 0.00) | DC | |
| 2012 | HIGH | 2ND HIGH VALUE IS | 5.55643c | ON 12062524: AT ( | 634200.00, | 5384600.00, | 244.13, | 244.13, | 0.00) | DC | |
| 2013 | HIGH | 2ND HIGH VALUE IS | 5.20991 | ON 13050124: AT ( | 635118.60, | 5383067.50, | 246.17, | 246.17, | 0.00) | DC | |

## American Crystal Sugar Company – Drayton
## $PM_{2.5}$ Annual Increment PTC Amendment Model Run

*** POINT SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | STACK HEIGHT (METERS) | STACK TEMP. (DEG.K) | STACK EXIT VEL. (M/SEC) | STACK DIAMETER (METERS) | BLDG EXISTS | URBAN SOURCE | CAP/ HOR | EMIS RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EP1 | 0 | 0.45700E+01 | 634538.2 | 5383772.1 | 243.8 | 45.72 | 559.26 | 22.52 | 2.35 | YES | NO | NO | |
| EP1A | 0 | 0.88199E-02 | 634518.7 | 5383766.2 | 243.8 | 25.91 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP3 | 0 | 0.60655E+01 | 634468.5 | 5383839.7 | 243.8 | 64.01 | 398.71 | 20.19 | 1.22 | YES | NO | NO | |
| EP4 | 0 | 0.10498E+02 | 634464.9 | 5383839.7 | 243.8 | 51.82 | 384.80 | 33.03 | 1.52 | YES | NO | NO | |
| EP30 | 0 | 0.44099E-01 | 634495.0 | 5383941.4 | 243.8 | 7.01 | 294.30 | 36.41 | 0.76 | YES | NO | NO | |
| EP9 | 0 | 0.75599E-02 | 634518.0 | 5383849.8 | 243.8 | 6.71 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| EP10 | 0 | 0.12600E-01 | 634473.3 | 5383946.8 | 243.8 | 7.31 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| EP28 | 0 | 0.62999E-01 | 634478.4 | 5383733.8 | 243.8 | 27.43 | 329.15 | 15.38 | 1.22 | YES | NO | NO | |
| EP14A | 0 | 0.99538E-01 | 634494.1 | 5383726.9 | 243.8 | 26.21 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |
| EP14B | 0 | 0.94498E-01 | 634488.6 | 5383726.9 | 243.8 | 22.25 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |
| EP151617 | 0 | 0.75599E-02 | 634440.2 | 5383949.1 | 243.8 | 18.90 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP19A | 0 | 0.37799E-02 | 634436.9 | 5383673.3 | 243.8 | 4.72 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP20 | 0 | 0.12600E-01 | 634469.5 | 5383641.9 | 243.8 | 12.19 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| EP23 | 0 | 0.26460E-01 | 634497.6 | 5383847.9 | 243.8 | 23.16 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP24 | 0 | 0.12600E-02 | 634519.2 | 5383801.5 | 243.8 | 6.10 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| EP27A | 0 | 0.87821E+00 | 634565.9 | 5383761.9 | 243.8 | 53.34 | 317.00 | 16.20 | 0.41 | YES | NO | NO | |
| EP29 | 0 | 0.15624E+00 | 634574.4 | 5383753.0 | 243.8 | 24.38 | 352.59 | 2.75 | 0.81 | YES | NO | NO | |
| ETH1 | 0 | 0.27700E+00 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 399.82 | 21.56 | 0.91 | NO | NO | NO | |
| ETH2 | 0 | 0.25000E-01 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 505.37 | 12.61 | 0.91 | NO | NO | NO | |
| ETH3 | 0 | 0.25000E-01 | 617538.1 | 5364872.0 | 251.2 | 24.38 | 505.37 | 12.61 | 0.91 | NO | NO | NO | |
| ETH4 | 0 | 0.14000E+00 | 617506.8 | 5364866.6 | 251.2 | 10.67 | 410.93 | 21.02 | 0.61 | NO | NO | NO | |
| ETH5 | 0 | 0.78700E+00 | 617566.0 | 5364904.7 | 251.2 | 12.19 | 293.00 | 0.01 | 0.31 | NO | NO | NO | |
| DEVP | 0 | 0.41730E+01 | 616654.0 | 5363730.0 | 254.5 | 45.72 | 433.00 | 2.68 | 2.44 | NO | NO | NO | |
| PEP1 | 0 | -.19290E+01 | 634538.2 | 5383772.1 | 243.8 | 36.57 | 490.20 | 18.75 | 2.35 | YES | NO | NO | |
| PEP1A | 0 | -.62999E-02 | 634518.7 | 5383766.2 | 243.8 | 25.92 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| PEP2 | 0 | -.12600E-02 | 634504.0 | 5383770.4 | 243.8 | 30.50 | 566.10 | 14.10 | 0.91 | YES | NO | NO | |
| PEP3 | 0 | -.23095E+01 | 634468.5 | 5383839.7 | 243.8 | 51.82 | 398.71 | 20.19 | 1.22 | YES | NO | NO | |
| PEP4 | 0 | -.33679E+01 | 634464.9 | 5383839.7 | 243.8 | 51.82 | 388.70 | 22.11 | 1.52 | YES | NO | NO | |
| PEP5 | 0 | -.11970E+00 | 634519.2 | 5383802.3 | 243.8 | 9.45 | 399.80 | 0.00 | 0.00 | YES | NO | NO | |
| PEP6 | 0 | -.51659E-01 | 634476.4 | 5383941.2 | 243.8 | 23.77 | 310.93 | 4.55 | 1.22 | YES | NO | NO | |
| PEP7 | 0 | -.51659E-01 | 634476.1 | 5383943.9 | 243.8 | 23.77 | 310.93 | 4.45 | 1.22 | YES | NO | NO | |
| PEP8 | 0 | -.51659E-01 | 634481.4 | 5383943.8 | 243.8 | 23.77 | 310.93 | 4.45 | 1.22 | YES | NO | NO | |
| PEP9 | 0 | -.12600E-01 | 634518.0 | 5383849.8 | 243.8 | 17.37 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| PEP10 | 0 | -.12600E-01 | 634473.3 | 5383946.8 | 243.8 | 7.32 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| PEP11 | 0 | -.12600E-01 | 634518.6 | 5383844.1 | 243.8 | 17.37 | 310.93 | 0.00 | 0.00 | YES | NO | NO | |
| PEP12 | 0 | -.37799E-01 | 634478.4 | 5383733.8 | 243.8 | 27.43 | 312.00 | 0.00 | 0.00 | YES | NO | NO | |
| PEP13 | 0 | -.27720E-01 | 634514.1 | 5383784.2 | 243.8 | 38.71 | 376.48 | 20.97 | 0.30 | YES | NO | NO | |
| PEP14A | 0 | -.99538E-01 | 634441.5 | 5383675.5 | 243.8 | 26.22 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |
| PEP15 | 0 | -.75599E-02 | 634440.2 | 5383949.1 | 243.8 | 18.90 | 294.26 | 0.00 | 0.00 | YES | NO | NO | |
| PEP14B | 0 | -.97018E-01 | 634488.6 | 5383726.9 | 243.8 | 22.25 | 302.59 | 0.00 | 0.00 | YES | NO | NO | |

# American Crystal Sugar Company – Drayton
# $PM_{2.5}$ Annual Increment PTC Amendment Model Run

*** POINT SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC) | X (METERS) | Y (METERS) | BASE ELEV. (METERS) | STACK HEIGHT (METERS) | STACK TEMP. (DEG.K) | STACK EXIT VEL. (M/SEC) | STACK DIAMETER (METERS) | BLDG EXISTS | URBAN SOURCE | CAP/ HOR | EMIS RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PEP19A | 0 | -.37799E-02 | 634436.9 | 5383673.3 | 243.8 | 4.72 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| PEP20 | 0 | -.12600E-01 | 634469.5 | 5383641.9 | 243.8 | 12.19 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| PEP22 | 0 | -.37799E-02 | 634478.8 | 5383945.3 | 243.8 | 24.99 | 294.30 | 28.39 | 0.46 | YES | NO | NO | |
| PEP23 | 0 | -.18900E-01 | 634497.6 | 5383847.8 | 243.8 | 23.16 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |
| PEP25 | 0 | -.25200E-01 | 634519.4 | 5383800.4 | 234.8 | 15.24 | 294.30 | 0.00 | 0.00 | YES | NO | NO | |

*** AREA SOURCE DATA ***

| SOURCE ID | NUMBER PART. CATS. | EMISSION RATE (GRAMS/SEC /METER**2) | COORD (SW CORNER) X (METERS) | Y (METERS) | BASE ELEV. (METERS) | RELEASE HEIGHT (METERS) | X-DIM OF AREA (METERS) | Y-DIM OF AREA (METERS) | ORIENT. OF AREA (DEG.) | INIT. SZ (METERS) | URBAN SOURCE | EMISSION RATE SCALAR VARY BY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FUG1 | 0 | 0.10000E-04 | 634446.8 | 5383938.7 | 243.8 | 3.66 | 5.00 | 20.00 | -2.00 | 11.77 | NO | |
| PFUG1 | 0 | -.10000E-04 | 634446.8 | 5383938.7 | 243.8 | 3.66 | 5.00 | 20.00 | -2.00 | 1.86 | NO | |

*** THE SUMMARY OF MAXIMUM ANNUAL RESULTS AVERAGED OVER 1 YEARS ***

** CONC OF PM_2.5 IN MICROGRAMS/M**3 **

| GROUP ID | | AVERAGE CONC | | RECEPTOR (XR, | YR, | ZELEV, | ZHILL, | ZFLAG) | NETWORK OF TYPE | GRID-ID |
|---|---|---|---|---|---|---|---|---|---|---|
| 2009 | 1ST HIGHEST VALUE IS | 0.86255 | AT ( | 634759.00, | 5383060.20, | 243.71, | 243.71, | 0.00) | DC | |
| 2010 | 1ST HIGHEST VALUE IS | 0.62191 | AT ( | 634250.00, | 5384400.00, | 243.98, | 243.98, | 0.00) | DC | |
| 2011 | 1ST HIGHEST VALUE IS | 0.72683 | AT ( | 634250.00, | 5384600.00, | 243.86, | 243.86, | 0.00) | DC | |
| 2012 | 1ST HIGHEST VALUE IS | 0.86110 | AT ( | 634788.90, | 5383060.80, | 243.58, | 243.58, | 0.00) | DC | |
| **2013** | **1ST HIGHEST VALUE IS** | **0.98566** | **AT (** | **634759.00,** | **5383060.20,** | **243.71,** | **243.71,** | **0.00)** | **DC** | |