Stantec Consulting Services Inc.
7669 West Riverside Drive Suite 101
Boise ID 83714-6183
Tel: (208) 853-0883
Fax: (208) 853-0884

RECEIVED
JAN 21 2016
DEPARTMENT OF ENVIRONMENTAL QUALITY
STATE AQ PROGRAM

Wet Signature Rec'd -

January 13, 2016

Mr. William Rogers
Air Quality Permitting Coordinator
Idaho Department of Environmental Quality
1410 N. Hilton Street
Boise, Idaho 83706

Re: Gem State Processing, Inc., Heyburn, Idaho
PTC Modification Application for Dehydration and Drum Dryer Units

Dear Mr. Rogers,

Stantec Consulting Services, Inc. (Stantec), on behalf of Gem State Processing, Inc. – Heyburn (Gem State), is submitting a permit application to modify Permit to Construct (PTC) of permit P-2010.0183, Project 61247, issued March 5, 2015. The purpose of this modification is to increase the permitted throughput of the two dehydration dryer units with corresponding air makeup units. In addition, drum dryer stack parameters are updated due to a Federal Aviation Administration determination regarding the maximum stack heights of the dryers.

This submittal includes the PTC application, a detailed emissions inventory and appropriate modeling files. Where applicable, both hardcopy and electronic versions have been supplied.

Pursuant to IDAPA.01.01.123, all information contained within this application has been certified to be true, accurate and complete by Bill Schow of Gem State.

Should you have any questions please do not hesitate to call Bill Schow at (208) 678-6440 or myself at the number below.

Sincerely,
Stantec Consulting Services, Inc.

Eric Clark, PE
Environmental Engineer
(208) 853-0883
Enclosures: PTC Application, CD containing all modeling and emissions data in electronic format

App fee Rcvd 1/14/16

Permit-to-Construct Modification Application

Gem State Processing, LLC
Heyburn Facility

Prepared for:
Gem State Processing
951 Highway 30
Heyburn, ID 83336
Contact: Bill Schow
Ph: 208-631-1680

Prepared by:
Stantec Consulting Services
7669 W. Riverside Drive, Suite 101
Boise, ID 83714
Contact: Eric Clark
Ph: 208-853-0883

January 13, 2016

Sign-off Sheet

This document entitled Permit-to-Construct Modification Application was prepared by Stantec Consulting Services Inc. ("Stantec") for the account of Gem State Processing, LLC (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by Eric E. Clark
(signature)

Eric Clark

Reviewed by Daniel Heiser
(signature)

Daniel Heiser

Stantec

Table of Contents

1.0 INTRODUCTION 1.1

2.0 PROCESS DESCRIPTION 2.1
2.1 EMISSIONS SOURCES 2.2
2.3 THROUGHPUT & STACK PARAMETER UPDATES 2.5
2.3.1 Dehydration Units 2.5
2.3.2 Drum Dryers and Agglomerator 2.6
2.3.3 Dispersion Technique 2.7

3.0 REGULATORY APPLICABILITY 3.1
3.1 STATE REGULATORY APPLICABILITY 3.1
3.1.1 Certification of Documents 3.1
3.1.2 Excess Emissions 3.1
3.1.3 Ambient Air Quality Standards for Specific air Pollutants 3.2
3.1.4 Toxic Air Pollutants 3.2
3.1.5 New Source Performance Standards 3.2
3.1.6 National Emission Standards for Hazardous Air Pollutants 3.2
3.1.7 Open Burning 3.3
3.1.8 Visible Emissions 3.3
3.1.9 Rules for Control of Fugitive Dust 3.3
3.1.10 Fuel Burning Equipment - Particulate Matter 3.4
3.1.11 Particulate Matter - Process Weight Limitations 3.4
3.1.12 Odors 3.5
3.2 FEDERAL REGULATORY APPLICABILITY 3.5
3.2.1 National Ambient Air Quality Standards (NAAQS) 3.6
3.2.2 Title V (Part 70) Operating Permit 3.6
3.2.3 National Emission Standards for Hazardous Air Pollutants (NESHAPs) 3.7
3.2.4 New Source Review (NSR) Requirements 3.7
3.2.5 New Source Performance Standards (NSPS) 3.7
3.2.6 Acid Rain Requirements 3.7
3.2.7 Risk Management Programs for Chemical Accidental Release Prevention 3.7

4.0 EMMISSIONS SUMMARY 4.1
4.2 TOXIC AIR POLLUTANTS 4.2

5.0 AMBIENT AIR QUALITY ANALYSES 5.1

LIST OF TABLES

Table 2-1 Dehydration Dryer Stack Parameters 2.6
Table 2-2 Drum Dryer Stack Parameters 2.6
Table 3-1 State Regulatory Applicability Summary 3.1

Table 3-2 Grain Loading Emissions for Natural Gas Combustion 3.4
Table 3-3 Process Weight Calculations 3.5
Table 3-4 Federal Regulatory Applicability Summary 3.5
Table 4-1 Facility Criteria Pollutant PTE Difference 4.2
Table 4-2 TAPs Emissions Increase 4.2

LIST OF APPENDICES

APPENDIX A SITE SELECTION MAP A.1

APPENDIX B DEQ PTC FORMS AND CHECKLISTS B.1

APPENDIX C EMISSION INVENTORY C.1

APPENDIX D AIR VENTILATION INFORMATION & SCHEMATIC D.1

APPENDIX E AMBIENT AIR ANALYSIS E.1

APPENDIX F DEHYDRATOR OCTOBER 2015 SOURCE TEST F.2

APPENDIX G AMBIENT AIR BOUNDARY MEMO G.3

1.0 INTRODUCTION

Gem State Processing, LLC (Gem State) is proposing to revise their current Permit to Construct (PTC), Permit No. P-2010.0183, Project 61406, issued March 5, 2015 to operate a potato processing facility in the Burley Industrial Park in Heyburn, ID. It was determined that the current contains an incorrect throughput for the dehydrator units. This occurred due an error in the application. Therefore part of this application is to ensure the proper throughput is allowed. Associated with that, several parameters associated with the eight (8) exhaust stacks are proposing to be updated as well. In addition, Gem State was notified on January 5, 2015 from the Federal Aviation Administration (FAA) that there may be potential obstruction concerns due to close proximity of the Burley Airport. Due to previous consent orders, prior permit indicated that the drum dryer and agglomerator stacks needed to be constructed to 100 feet above ground level no later than February 21, 2015. As a result of the FAA review, a 90 day extension was requested and granted by the Idaho Department of Environmental Quality (IDEQ) to May 22, 2015.

The FAA findings suggested that the 100 feet stacks were not a viable option as they would remain an obstruction using both visible and instrumentation methodologies. It was determined that by reducing the stacks to 82 feet above ground level and adjusting the approach angle used by the airport, the obstructions would no longer be an issue. This information was received by Gem State in November, 2015. Although Gem State was previously on schedule to meet a February 21, 2015 construction date that was extended to May 22, 2015, complete construction was obviously not completed during that timeframe. Gem State has worked extensively with the Twin Falls regional office and kept them apprised of the entire situation.

Gem State requests that IDEQ take all the extenuating circumstances into consideration and know that Gem State has demonstrated a good faith effort to expedite construction as much as possible. It should be noted that stack parameters changes described in this document will likely delay construction due the need to order new equipment. Shipping times may take several weeks.

All changes associated with this application include only the dehydration units, drum dryers and agglomerator line. No other equipment is changing due to this permitting action.

Gem State was also notified that it is small possibility that the city of Burley airport may close down. If that is the case, all proposed parameter modifications to the agglomerator line and drum dryers will not be necessary. Thus, for those sources, the March 5, 2015 permit is remains unchanged.

Facility-wide modeling was conducted for $PM_{2.5}$, PM_{10}, SO_2 and NO_2 for both a continued operational Burley airport scenario and one which is the airport is closed.

2.0 PROCESS DESCRIPTION

Gem State Processing, LLC is a potato processing company that processes, dehydrates and packs various potato products. The Heyburn facility will produce dehydrated potato flakes, seasoned agglomerated flakes, and other dehydrated potato products. Potatoes may be steam peeled, dry scrubbed, sorted, sliced, blanched, cooled, steam cooked, air chilled and dried. Products are dried to approximately 8% moisture and are broken up and ground to customer specifications, packaged or stored, and then sold. The process includes natural gas fired boilers, steam drum dryers (flakers), fluidized bed dryers and utilizes pneumatic equipment to transport their products from production to storage or packaging.

Raw potatoes are delivered to the facility and unloaded inside the potato receiving area of the facility building. The potatoes then go through a rock trap where they are rinsed with water to remove any large debris. Conveyors transfer the wet potatoes to storage bins until they are ready to be processed. The potatoes are transferred from the potato storage bin through an additional washing process and then are transferred via vertical conveyor belt to the steam peelers. After the peels are separated from the potato in the steam peeler, the potatoes are transferred to the brush scrubber and washer where the peel and any remaining dirt and debris are removed. Following inspection of the peeled and washed potatoes, they are transferred via vertical auger to the slicer and then into a blancher where they are cooked. The potatoes are then cooled in water and transferred to the steam cooker. Following the steam cooker, the cooked potatoes are transferred through a ricer plate. The riced pieces are then transferred via auger into steam powered drum dryers (flakers). The drum dryers reduce the moisture in the potatoes from approximately 80% to 8%. Dried flakes are then either transferred to the packaging lines and silos or through the agglomeration line where oil and flavorings are added. The seasoned flakes from the agglomeration line are then transferred to the fluidized bed dryer (agglomeration line) and subsequently to the packaging lines. Steam for the steam peelers and drum dryers will be supplied by boilers operating on natural gas.

The new dehydrator units will dry potato slices, dices and shreds rather than flakes. The process is the same as the potato flake process through the cooled in water step and then instead of going through a steam cooker they are either directed to one of the new dehydrator units, or air chilled and then to one of the dehydrator units. Finished product is typically dried to 7% plus or minus 1% moisture content and then loaded into corrugated tote bins.

2.1 EMISSIONS SOURCES

Emissions sources at the facility will include the following:

Boilers

The Gem State facility utilizes one 1600 hp and two 1200 hp natural gas fired boilers to produce steam for the various potato processing equipment installed at the facility. The boilers have low NO_x burners for control of NO_x and CO. The boilers are a source of natural gas combustion emissions. Emission factors from AP-42, Section 1.4 were used to calculate natural gas combustion emissions. Emission factors for NO_x and CO were provided by the manufacturer. There are no emission changes to these units from the current permit.

Air Makeup Units (AMUs)

Five 9.0 MMBtu/hr and one10.0 MMBtu/hr Reyco Air Makeup Unit are used to provide fresh air into the facility, provide heating for employee comfort, and maintain positive pressure inside the processing areas. The air makeup unit burners are natural gas fired and exhaust into the facility building. During the warmer spring, summer and fall months, the facility does not need to be heated and the air makeup burners only run a limited number of hours. Gem State estimates that the air makeup burners will run 20% of the time in May, June, and September, 5% of the time in July and August, 50% of the time in October, and 100% of the time when the facility is operating in the remaining months of the year, for a total of 5270.4 operating hours per year. This is a conservative estimate because the burners may actually be shut off in mid-June through the end of August, when heat is not required for employee comfort. The air makeup unit fans run on electric power, and run whenever the facility is operating. The facility exhaust system, consisting of several rooftop exhaust stacks, is used to exhaust excess air from the air makeup unit burners. The air makeup unit burners are a source of natural gas combustion emissions. Emission factors from AP-42, Section 1.4 were used to calculate natural gas combustion emissions. There are no emission changes to these units from the current permit.

Bubble Sheet Dryers

The Gem State facility utilizes two natural gas fired bubble sheet dryers (fluidized bed dryers) for operation of the processing agglomeration line. Oils and other flavorings are added to the flakes coming out of the drum dryers. The flakes then pass through the bubble sheet dryers. The dryers are a source of both natural gas combustion emissions and process particulates.

An emission rate of 0.71 lb/hr was established during the previous permitting action and remains unchanged here. This rate was determined using previous performance test results and mathematical calculations as derived by Idaho DEQ.

Drum Dryers (Flakers)

Gem State operates six steam powered drum dryers. Emissions from the drum dryers include process particulate and exhaust through the drum fan hood or snifter fan drum exhausts. The primary purpose of the snifter fan drum is to pull moisture off of the drum dryers. Only a very small portion, approximately 0.05% of flakes passing through the drum dryer, enters the snifter fan drum. Emissions from the snifter fan drums are controlled by a Snifter Fan Collection System, designed and manufactured by Idaho Steel. Idaho Steel guarantees a collection efficiency of 80% of 10 micron or larger particles. Any particulate not captured by the Snifter Fan Collection System exhausts through the snifter fan hood rooftop exhausts.

Equipment and process at the Gem State facility were originally thought to be similar to those at the Idahoan Foods, Lewisville facility. Emissions factors for the Gem State drum dryers were based on source tests from Flaker Line 1 and Flaker Line 2 at the Idahoan Lewisville facility. The Idahoan facility tested Flaker Line 1 twice and calculated emission factors of 0.69 lb PM_{10}/ton and 0.75 lb PM_{10}/ton based on the test data (Method 5/202, 12/1/2005). To conservatively estimate the emissions, the Gem State facility was using an emissions factor of 0.82 lb PM_{10}/hr for the drum dryers.

However, a performance test conducted on July 19, 2011 indicated that the Gem State drum dryer emission rate is 0.63 lb PM_{10}/ton (0.71 lb/hr). Also, the snifter stacks assumed an emission rate of 0.013 lb PM_{10}/hr, but performance test results indicate the emission rate is 0.02 lb PM_{10}/hr. All rates are consistent with the previous permitting analysis, but aggregated together due to combining of the drum dryer and snifter. Thus, the input particulate emission rate for the flakers is 0.73 lb/hr.

Baghouses

Baghouses are used to convey the dried flakes to the different packaging areas, and include a pneumatic conveying line (conveys flakes from the drum dryers), six plant receiver baghouses, planned truck loadout baghouse, rail load baghouse, and four silo bin vent baghouses (only one of the four silo bin vent baghouses will operate at a time). There are also three negative air baghouses that are associated with the plant receiver baghouses. These baghouses are used as process equipment but also control PM_{10} emissions. With the exception of the silo bin vent baghouses and the planned truck loadout baghouse, all the above listed baghouses initially discharged into the facility building. The railcar baghouse routes product from the baghouse to external railcars. A nuisance dust collector baghouse used to control fugitive emissions from process equipment and the above mentioned indoor discharging baghouses will now be exhausted outside the building. An emission factor of 0.007 grain/dscf (manufacturer's guarantee) was assumed for the indoor discharge baghouses, silo bin vent baghouses and rail load baghouse. Emissions from the nuisance dust collector were calculated by assuming 99.9% control of emissions from the indoor discharging baghouses. The manufacturer control guarantee for the nuisance dust collector baghouse is included in previous permitting submittals.

Dehydration Dryer Units

Gem State is proposing to add two new dehydration dryer units on site. Gem State is currently evaluating dryers from two different manufacturers, and it is requested that the permit reflect the option to install either of the two. One is a four stage dryer by Buhler with a total capacity of 14.9 MMBtu/hr per dryer. The total throughput on a dry basis is 65,000 lb/day amongst the four stages. The other option is a three stage dryer by Wolverine with a capacity of 26.2 MMBtu/hr. The throughput associated with the Wolverine dryers is 65,000 dry lb/day. Note that the 65,000 lb/day passes through all three stages of each unit. The new dehydration dryer units, will operate on the same schedule as the other natural gas units, which is 8,520 hr/yr.

Process emissions factors for both the Wolverine dryers are based on performance test results for the currently constructed dehydrator conducted on October 1, 2015. However, to ensure conservatism, emissions estimates for the Wolverine dryers were increased by 20%. Stage A, Stack 1 and 2 have an aggregated calculated lb/ton emission factor of 0.196 or 9.81E-05 lb PM/lb dry throughput. Similarly, Stage B and Stage C is 5.85E-05 and 1.12E-04 lb PM/lb dry throughput, respectively. See Appendix F for details.

2.2 AIR POLLUTION CONTROL EQUIPMENT

In a November 27, 1995 letter from David Solomon, USEPA Office of Air Quality Planning and Standards to Timothy J. Mohin, Government Affairs Manager, Intel Government Affairs, Mr. Solomon address criteria for determining whether equipment is air pollution control equipment or process equipment. Mr. Solomon outlines three questions that should be considered in determining whether certain devices or practices should be treated as pollution controls or are inherent to the process. The questions are listed below.

1. *Is the primary purpose of the equipment to control air pollution?*

2. *Where the equipment is recovering product, how do the cost savings from the product recovery compare to the cost of the equipment?*

3. *Would the equipment be installed if no air quality regulations are in place?*

Responses to each question as they apply to the Gem State Potato Processing facility in Heyburn, ID are given below.

1. The Gem State facility will utilize a total of 24 baghouses at the facility in Heyburn. These baghouses include six plant receiver baghouses, four bin vent baghouses, three negative air baghouses, three packaging baghouses, one blend back baghouse, one sanitation baghouse, three baghouses associated with the agglomerator line, one proposed truck loadout baghouse, one rail load baghouse, one pneumatic conveying line baghouse and one nuisance dust collector. With the exception of the nuisance dust collector, all of the above listed baghouses are used to convey or transfer product from one point in the process to the next or from the

process or storage to the different shipping methods. The nuisance dust collector will be used to control dust and particulate from the process and indoor discharging baghouses. Therefore, with the exception of the nuisance dust collector, the primary purpose of the baghouses is not to control air pollution.

2. The baghouse equipment installed at the facility will not be used to recover product.

3. As described in #1 above, the primary purpose of the baghouses (with the exception of the nuisance dust collector) is to convey product. Therefore, the equipment would be installed if no air quality regulations were in place.

Based on the responses and explanations given in numbers one through three above, it is the opinion of Stantec and Gem State that the baghouses installed at the Gem State facility in Heyburn, with the exception of the nuisance dust collector, should be considered inherent to the process, and should not be considered as pollution control equipment.

The three natural gas fired boilers will be equipped with Low NOx burners for control of NOx and CO. Manufacturer guaranteed emissions factors for NOx and CO have been included in previous submittals.

2.3 THROUGHPUT & STACK PARAMETER UPDATES

The current permit allows for 902.8 lb/hr dried potato product throughput into each dehydration unit. The request of this modification is to increase that to 2,708 lb/hr or 65,000 lb/day for each unit. To ensure National Ambient Air Quality Standards (NAAQS) compliance, adjustments are needed for each dehydrator stack.

2.3.1 Dehydration Units

The height of each stack is to be elevated from 42 feet from ground level to 60 feet. It should be noted that the stack heights are only be increased as precaution. During the October 1, 2015 test, there appeared to be mechanical issue with Stage C. The resulting emission rate and emission factor are likely overestimated. Stage B and C should have similar emissions. However, to be consistent with the test results, heights were increased accordingly. The diameters, temperature and exit velocity remain unchanged from the current permit. The table 2-1 below supplies the expected diameters, exit velocities and temperatures for each unit. All parameters were either provided directly by the manufacturer or calculated based on data supplied by the manufacturer.

Table 2-1 Dehydration Dryer Stack Parameters

Stack	Stack Height (ft)	Temperature (°F)	Stack Diameter (inches)	Exit Velocity (ft/sec)
Wolv 1 (Stage A Stack 1)	60	225	32	43.77
Wolv 2 (Stage A Stack 2)	60	232	36	45.07
Wolv 3 (Stage B)	60	186	32	44.18
Wolv 4 (Stage C)	60	176	22	39.55

2.3.2 Drum Dryers and Agglomerator

The FAA has determined that the currently permitted height of 100 feet is not going to be viable due to close proximity of the Burley Airport and obstruction of flights paths. Therefore, each of the seven (7) stacks will be reduced by 18 feet to 82 feet from ground level. Associated with that reduction are changes to exhaust flow rates and diameters. The exhaust flow rates are increased by approximately 10,000 acfm each. The diameters of the drum dryers are decreased by 6 inches to 36 inches or three feet. The increase of flow will be supported by adjustments to the ventilation plan and routing air flow to other areas of the plant. An updated ventilation schematic is included in this application (see Appendix D).

To ensure the proper air flow is obtained, Gem State proposes to install six 60 hp (402 QSL) fans. Drum dyer parameters are shown in Table 2-2.

Table 2-2 Drum Dryer Stack Parameters

Stack	Stack Height (ft)	Temperature (°F)	Stack Diameter (inches)	Velocity (m/s)	Flow Rate (acfm)
Stack #1	82	119	36	32.3	45,000
Stack #2	82	119	36	32.3	45,000
Stack #3	82	119	36	32.3	45,000
Stack #4	82	119	36	30.5	45,500
Stack #5	82	119	36	32.3	45,000
Stack #6	82	119	36	32.3	45,000
Agglomerator	82	131	32	31.8	35,000

2.3.2.1 Airport Closure Parameters

Gem State was notified last week that there was a small chance of the City of Burley closing the airport and moving its location. If that is the case, the parameters associated with the six drum dryers and the agglomerator line will remain unchanged from the march 5, 2015 permit. This

includes stack heights of 100 feet from ground level. Drum dryer diameters will remain 3.5 feet (42 inches) and not be reduced to 3.0 feet. The agglomerator diameter remains 2.67 feet (32 inches) regardless of the airport status. Additionally, exit velocities will remain at 18.48 m/s and 22.68 m/s for the drums and agglomerator, respectively. Lastly, extra fans will not need installed. Note that there was an error in the March 5, 2015 permit indicated the exit velocity of drum dryer #4 was 17.16 m/s. The actual flow would be 18.48 m/s which are consistent with all other drums.

2.3.3 Dispersion Technique

IDAPA 58.01.01.510 through 516 outlines the applicability and definition of a dispersion technique. As discussed previously, the original intent of the drum dryers and agglomerator line was to increase the stack height of each to 100 feet. Section 512.03 identifies any height from ground level to the base of the stack 65 meters or less to meet the good engineering practice height requirement (512.01(a)). Therefore, the initial plan was acceptable by DEQ. However, due to restraints placed on the facility from the FAA the stack height requires lowering. To ensure that an equivalent plume rise results an increase of flow is necessary.

Section 512.01(b) identifies a dispersion technique when the emission rate is variable. All emission rates associated with the drum dryers are constant; therefore section (b) does not apply to Gem State.

The original intent of the rules was to ensure that major emitters of criteria pollutants such as CO or NO_2 did not modify their exhaust rates such that the plume height increased artificially. This would allow the surrounding airshed to be inundated with pollutants, but would likely demonstrate NAAQS compliance at local receptors. Additionally, section 512.01(c) appears to state that a facility that does not exceed 5,000 tons/yr of SO_2 is exempt from the dispersion technique limitation. The rule is not intended for small facilities like Gem State. IDEQ modeling personnel has declared in verbal discussions that is appears contradictory to allow a 100 foot stack that creates a particular plume, but modification of other parameters that would create a similar plume may be considered a dispersion technique.

In addition, if the drum dryers were being designed with auxiliary fans prior to installation, it is likely to be considered an appropriate approach. Gem State is of the opinion that if a design would be acceptable prior to construction that the identical approach should be accepted to ensure consistency during the permitting process.

3.0 REGULATORY APPLICABILITY

A review of applicable State and Federal Rules for each emissions unit is provided in Sections 3.1 and 3.2 below.

3.1 STATE REGULATORY APPLICABILITY

A review of applicable requirements of the Rules for the Control of Air Pollution in Idaho is provided in Table 3-1. Each regulation is described in the sections following the table.

Table 3-1 State Regulatory Applicability Summary

Section	Description	Regulatory Citation	Applicable?
3.1.1	Certification of Documents	IDAPA 58.01.01.123	Yes
3.1.2	Excess Emissions	IDAPA 58.01.01.130-136	Yes
3.1.3	Ambient Air Quality Standards for Specific Air Pollutants	IDAPA 58.01.01.577	Yes
3.1.4	Toxic Air Pollutants	IDAPA 58.01.01.585 and 586	Yes
3.1.5	New Source Performance Standards	IDAPA 58.01.01.590	No
3.1.6	National Emissions Standards for Hazardous Air Pollutants	IDAPA 58.01.01.591	No
3.1.7	Open Burning	IDAPA 58.01.01.600-616	Yes
3.1.8	Visible Emissions	IDAPA 58.01.01.625	Yes
3.1.9	Rules for Control of Fugitive Dust	IDAPA 58.01.01.650	Yes
3.1.10	Fuel Burning Equipment – Particulate Matter	IDAPA 58.01.01.675-681	Yes
3.1.11	Particulate Matter – Process Weight Limitations	IDAPA 58.01.01.701	Yes
3.1.12	Odors	IDAPA 58.01.01.775-776	Yes

3.1.1 Certification of Documents

IDAPA 58.01.01.123 requires all documents including application forms for permits to construct, records, and monitoring reports submitted to the Department shall contain a certification by a responsible official. Gem State will comply with this requirement and the appropriate certifications by a responsible official are being submitted with this application.

3.1.2 Excess Emissions

IDAPA 58.01.01.130-136 requires that any episode of excess emissions be reported to DEQ where appropriate. Gem State will abide by all excess emission requirements.

3.1.3 Ambient Air Quality Standards for Specific air Pollutants

IDAPA 58.01.01.577 establishes ambient air quality standards for specific air pollutants including $PM_{2.5/10}$, Sulfur Dioxide, Ozone, Nitrogen Oxide, Carbon Monoxide, and Lead. Facility-wide modeling was conducted for all particulates, NO_2 and SO_2. Additionally, the increase of emissions of the dehydration units required a toxics analysis. Specific details regarding the analysis and documentation of compliance is included in Appendix E of this application.

3.1.4 Toxic Air Pollutants

IDAPA 58.01.01.585 and 586 establishes requirements for compliance with toxic air pollutants. Gem State evaluated all toxic pollutants associated with the increase and have demonstrated compliance with the standards or appropriate modeling was conducted. Please refer to Appendix E of this document for details.

3.1.5 New Source Performance Standards

New Source Performance Standards (NSPS) in 40 CFR Part 60 are applicable to new, modified, or reconstructed stationary sources that meet or exceed specified applicability thresholds. Subpart Dc of the NSPS, "Standards of Performance for Small Industrial, Commercial, and Institutional Steam Generating Units" applies to the proposed boilers because the total heat input is between 10 and 100 million British thermal units per hour (MMBtu/hr) and the boilers were constructed after 1989. The boilers are not subject to any SO_2 emission limitations in Subpart Dc because they will operate on natural gas and do not combust oil, coal, or combinations that include coal and/or oil. The boilers are not subject to any PM or PM opacity emissions limitations in Subpart Dc because they do not combust coal, oil, wood, a mixture of these fuels, or a mixture of these fuels with any other fuels. The boilers are subject to the applicable monitoring and recordkeeping requirements identified in NSPS Subpart Dc Part 60.48c.

3.1.6 National Emission Standards for Hazardous Air Pollutants

Two sets of National Emissions Standards for Hazardous Air Pollutants (NESHAPs) may potentially apply to the Gem State facility. The first NESHAP regulations were developed under the auspices of the original Clean Air Act. These standards are codified in 40 CFR Part 61, and address a limited number of pollutants and industries. The Gem State facility does not fall under any of the industries or have the potential to emit any of the pollutants listed in 40 CFR Part 61, and therefore, 40 CFR Part 61 regulations do not apply to this facility.

Newer regulations are codified in 40 CFR Part 63 under the authority of the 1990 Clean Air Act Amendments (CAAA). These standards regulate HAP emissions from specific source categories and typically affect only major sources of HAPs. Part 63 regulations are frequently called Maximum Achievable Control Technology (MACT) standards. Major HAP sources have the PTE 10 tpy or more of any single HAP or 25 tpy or more of all combined HAP emissions. At the Gem State facility, potential emissions of individual HAPs will be less than 10 tpy and combined HAP

emissions will be less than 25 tpy. The area source boiler MACT was evaluated and was determined not to comply as the sources combust only natural gas. Therefore, the facility is not subject to 40 CFR Part 63.

3.1.7 Open Burning

IDAPA 58.01.01.600 and 616 establishes requirements for open burning. Gem State does not expect to conduct open burning at the facility however will comply with the requirements under Section 600-616 if any allowable burning is to be conducted at the facility.

3.1.8 Visible Emissions

IDAPA 58.01.01.625 restricts discharge of air pollutants into the atmosphere which is greater than 20% opacity for a period or periods aggregating more than three (3) minutes in any sixty (60) minute period. Gem State will comply with this rule by conducting monthly facility-wide inspections of potential sources of visible emissions, during daylight hours and under normal operating conditions. The inspection will consist of a see/no see evaluation for each potential source. If any visible emissions are observed Gem State will take corrective action or perform a Method 9 or Method 22 opacity test in accordance with the procedures outlined in IDAPA 58.01.01.625. Gem State will keep records onsite documenting the monthly visible emission inspection or Method 9/22 test conducted. However, it should be noted that during the winter months, the opacity may seem a bit higher. That is not due to anything more than water vapor being emitted from the stacks.

3.1.9 Rules for Control of Fugitive Dust

IDAPA 58.01.01.625 restricts discharge of air pollutants into the atmosphere which is greater than 20% opacity for a period or periods aggregating more than three (3) minutes in any sixty (60) minute period. Gem State will comply with this rule by conducting monthly facility-wide inspections of potential sources of visible emissions, during daylight hours and under normal operating conditions. The inspection will consist of a see/no see evaluation for each potential source. If any visible emissions are observed, Gem State will take corrective action or perform a Method 9/22 opacity test in accordance with the procedures outlined in IDAPA 58.01.01.625. Gem State will keep records onsite documenting the monthly visible emission inspection and Method 9 test conducted. However, it should be noted that during the winter months, the opacity may seem a bit higher. That is not due to anything more than water vapor being emitted from the stacks.

IDAPA 58.01.01.650 requires that all reasonable precautions be taken to prevent the generation of fugitive dust. Gem State will comply with fugitive particulate matter regulations, including through the use of hoods, fans and fabric filters to enclose and vent potential fugitive particulate matter.

3.1.10 Fuel Burning Equipment - Particulate Matter

IDAPA 58.01.01.676 restricts any fuel burning source of greater than 10 MMBtu to limit the PM released from combustion to 0.015 gr/dscf for gas fuel. The boilers, one stage of the dehydrators and three Reyco Air Makeup Units are greater than 10 MMBtu/hr, and will comply with this standard as shown in Table 3-2 below. All natural gas combustion equipment is in compliance with the grain loading standard.

Table 3-2 Grain Loading Emissions for Natural Gas Combustion

Source	PM Emission Factor (lb/scf)[a]	Gas Volume @ 3% O_2 (dscf/MMBTU)	Combustion Volume of 1 cubic foot of gas (dscf/scf)	Grain Loading (grain/dscf)	Grain Loading Standard (grain/dscf)	Meet Grain Loading Standard?
Boiler #1	7.6×10^{-6}	1.198×10^{4}	12.58	4.23×10^{-3}	0.015	Yes
Boiler #2	7.6×10^{-6}	1.198×10^{4}	12.58	4.23×10^{-3}	0.015	Yes
Boiler #3	7.6×10^{-6}	1.198×10^{4}	12.58	4.23×10^{-3}	0.015	Yes
AMU #5	7.6×10^{-6}	1.198×10^{4}	12.58	4.23×10^{-3}	0.015	Yes
AMU #6	7.6×10^{-6}	1.198×10^{4}	12.58	4.23×10^{-3}	0.015	Yes
Dehydrator #1	7.6×10^{-6}	1.198×10^{4}	12.58	4.23×10^{-3}	0.015	Yes
Dehydrator #2	7.6×10^{-6}	1.198×10^{4}	12.58	4.23×10^{-3}	0.015	Yes

[a]AP-42, Table 1.4-2, 1998.

3.1.11 Particulate Matter - Process Weight Limitations

IDAPA 58.01.01.701 promulgates restrictions on PM for the entire facility based on process weight. Fuel burning equipment at the facility is not subject to this requirement. Process weight calculations are shown in Table 3-3 below.

Table 3-3 Process Weight Calculations

Source	Process Weight, PW (lb/hr dry)	PM-10 Emissions - Estimated (lb/hr)	Process Weight Rate Limitations - E (lb/hr)	In Compliance? (Y/N)
Drum Dryer Drum Fan Hood #1	2250	0.73	4.62	Y
Drum Dryer Drum Fan Hood #2	2250	0.73	4.62	Y
Drum Dryer Drum Fan Hood #3	2250	0.73	4.62	Y
Drum Dryer Drum Fan Hood #4	2250	0.73	4.62	Y
Drum Dryer Drum Fan Hood #5	2250	0.73	4.62	Y
Drum Dryer Drum Fan Hood #6	2250	0.73	4.62	Y
Bubble Sheet Dryer #1	3300	0.71	5.81	Y
Bubble Sheet Dryer #2	0	0.00	0.00	Y
Wol. Dehydrator Stage A #1,2	2708	0.50	2.67	Y
Wol. Dehydrator Stage B #1,2	2708	0.111	2.67	Y
Wol. Dehydrator Stage C #1,2	2708	0.111	2.67	Y

E = Emission Limit = $0.045(PW)^{0.60}$, if PW is less than 9,250 lb/hr.

3.1.12 Odors

IDAPA 58.01.01.775-776 requires no emissions of odorous gases, liquids, or solids to the atmosphere in such quantities as to cause air pollution. Gem State will comply with this requirement by keeping records of any odor complaints received and will take appropriate action for each complaint which has merit.

3.2 FEDERAL REGULATORY APPLICABILITY

A review of applicable Federal Rules is provided in Table 3-4. Included in Appendix B is the completed federal regulatory applicability FRA form.

Table 3-4 Federal Regulatory Applicability Summary

Section	Description	Regulatory Citation	Applicable?
3.2.1	National Ambient Air Quality Standards (NAAQS)- (dispersion modeling)	40 CFR Part 50	Yes
3.2.2	Title V Operating Permit	40 CFR Part 70	No
3.2.3	Air Pollutants (NESHAPs)	40 CFR Parts 61, 63	No
3.2.4	New Source Review (NSR)	40 CFR Part 52	No
3.2.5	New Source Performance Standards (NSPS)	40 CFR Part 60	Yes

Section	Description	Regulatory Citation	Applicable?
3.2.6	Acid Rain Requirements	40 CFR Parts 72–78	No
3.2.7	Risk Management Programs For Chemical Accidental Release Prevention	40 CFR Part 68	No

3.2.1 National Ambient Air Quality Standards (NAAQS)

Primary National Ambient Air Quality Standards (NAAQS) are identified in 40 CFR Part 50 and define levels of air quality, which the United States Environmental Protection Agency (USEPA) deems necessary to protect the public health. Secondary NAAQS define levels of air quality, which the USEPA judges necessary to protect public welfare from any known, or anticipated adverse effects of a pollutant. Examples of public welfare include protecting wildlife, buildings, national monuments, vegetation, visibility, and property values from degradation due to excessive emissions of criteria pollutants.

Specific standards for the following pollutants have been promulgated by USEPA: $PM_{2.5}$, PM_{10}, SO_2, NO_x, CO, ozone, and lead. The Gem State facility will emit $PM_{2.5}$, PM_{10}, SO_2, NO_x, CO, and VOCs, a precursor to ozone. A facility-wide compliance demonstration of $PM_{2.5}$, PM_{10}, SO_2 and NO_2 is described in detail in Section 5.

3.2.2 Title V (Part 70) Operating Permit

Title V of the Clean Air Act (CAA) created the federal operating permit program. These permitting requirements are codified in 40 CFR Part 70. These permits are required for major sources with a PTE (considering federally enforceable limitations) greater than 100 tpy for any criteria pollutant, 25 tpy for all hazardous air pollutants (HAPs) in aggregate, or 10 tpy of any single HAP. Gem State is a minor source because the potential to emit of any criteria pollutant is less than 100 tons per year, the potential to emit of all HAPs in aggregate is less than 25 tpy, and the potential to emit of any single HAP is less than 10 tpy.

Gem State has the potential to exceed 100,000 metric tons of CO2e and illustrated in the associated emission inventory (Appendix C). However, on June 23, 2014 the Supreme Court issued a ruling regarding greenhouse gas permit applicability.[1] Stantec and Gem State understands that any facility that qualifies as a Step 2 greenhouse gas facility (only major for GHGs and no other criteria pollutants) are no longer required to obtain a Title V permit.

[1] Supreme Court Decision Regarding Step 2 GHG Sources and Permit Applicability. http://www.epa.gov/nsr/ghgpermitting.html

3.2.3 National Emission Standards for Hazardous Air Pollutants (NESHAPs)

National Emission Standards for Hazardous Air Pollutants are discussed in Section 3.1.7 above.

3.2.4 New Source Review (NSR) Requirements

Minidoka County is designated as an attainment area for all criteria pollutants. Therefore, the prevention of significant deterioration (PSD) regulations codified in 40 CFR Part 52 could potentially apply to the proposed facility. The PSD rule applies to: (1) a new major source that has the potential to emit 100 tons per year or more for any criteria pollutant for a facility that is one of the 28 industrial source categories listed in 40 CFR § 52.21(b)(1)(i)(a); or (2) a new major source that has the potential to emit 250 tons per year or more of a regulated pollutant if the facility is not on the list of industrial source categories; or (3) a modification to an existing major source that results in a net emission increase greater than a PSD significant emission rate as specified in 40 CFR § 52.21 (b)(23)(i); or (4) a modification to an existing minor source that is major in itself. The Gem State facility does not fall under one of the 28 industrial source categories, nor will the PTE exceed 250 tpy for any regulated pollutant. Therefore, Gem State is not subject to PSD regulations.

3.2.5 New Source Performance Standards (NSPS)

New Source Performance Standards are discussed in Section 3.1.6 above.

3.2.6 Acid Rain Requirements

The acid rain requirements codified in 40 CFR Parts 72-78 apply only to utilities and other facilities that combust fossil fuel and generate electricity for wholesale or retail sale. The proposed facility will not produce electrical power for sale. Therefore, the facility is not subject to the acid rain provisions and will not require an acid rain permit.

3.2.7 Risk Management Programs for Chemical Accidental Release Prevention

The facility is not subject to the Chemical Accidental Release Prevention Program and will not be required to develop a Risk Management Plan (RMP). Facilities that produce, process, store, or use any regulated toxic or flammable substance in excess of the thresholds listed in 40 CFR Part 68 must develop a RMP. The facility does not store any regulated toxic or flammable substances in excess of the applicable thresholds. A RMP is not necessary for this facility.

4.0 EMMISSIONS SUMMARY

A complete emissions inventory is included in Appendix C.

As discussed in Section 2.2, even though several baghouses will be installed at the Gem State facility, only one, the nuisance dust collector is considered as pollution control equipment. The nuisance dust collector has a manufacturer guaranteed collection efficiency of 99.9% of incoming particulate 2 micron and larger. In addition to the nuisance dust collector baghouse, process particulate will be controlled by the Idaho Steel Snifter Fan Collection System, installed on each of the drum dryer snifter fan drums. The snifter fan filter system has a manufacturer guaranteed removal efficiency of 80% of 10 micron or larger particles. Both the nuisance dust collector and snifter fan collection system will be used to control PM, PM_{10} and $PM_{2.5}$.

Only process emissions associated with the dehydration units are being increased. All other emissions remain unchanged from the previous permitting action. The throughput of each dryer stage is increased 2,708 lb/hr. This equates to 65,000 lb/day through each stage. The previous application inadvertently reduced the desired throughput by 1/3.

Note that the total number of exhaust points associated with the AMU's has been reduced from six (6) to four (4). This was done to balance out the air flow of the ventilation system.

Documentation of compliance with NAAQS standards, Acceptable Ambient Concentrations (AACs) for IDAPA 58.01.01.585 non-carcinogen TAPs and Acceptable Ambient Concentrations for Carcinogens for IDAPA 58.01.01.586 carcinogen TAPs is documented in the air quality modeling report included in Appendix E.

4.1 CRITERIA POLLUTANTS

As discussed in Section 2.1, sources of criteria pollutant emissions at the Gem State facility will be natural gas combustion from the boilers, air makeup unit burners, bubble sheet dryers and Dehydrator Dryers and process particulates from the drum dryers, bubble sheet dryers, process baghouses, dehydrator units and the nuisance dust collector. Emission factors for natural gas combustion were obtained from AP-42 Section 1.4. The following table 4-1 illustrates the overall criteria pollutant changes due to this permit modification. All combustion is to remain unchanged.

Table 4-1 Facility Criteria Pollutant PTE Difference

	NO_x		CO		$PM_{2.5/10}$		SO_x		VOC	
	lb/hr[1]	T/yr	lb/hr[1]	T/yr	lb/hr[2]	T/yr	lb/hr[1]	T/yr	lb/hr[1]	T/yr
Pre-Project	11.03	42.59	14.5	54.41	8.27	34.55	0.21	0.58	1.77	4.60
Post-Project	11.03	42.59	14.5	54.41	8.56	35.81	0.21	0.58	1.77	4.60
Change	**0.00**	**0.00**	**0.00**	**0.00**	**0.29**	**1.26**	**0.00**	**0.00**	**0.00**	**0.00**

1. The lb/hr values are aggregated between the wolverine dryers and all other combustion sources (Wolverine tab and NG Comb (pph)-Control tab of EI).
2. The lb/hr values are aggregated between the wolverine dryers, all other combustion sources and process sources (Wolverine tab, NG Comb (pph)-Control tab and Particulate-Control tab of EI).

4.2 TOXIC AIR POLLUTANTS

The increase of toxic air pollutants associated with this project consists of the installation of the two new AMUs (unit #5 and #6). All pollutants can be viewed in the table 4-2 below. Modeling was conducted on the four TAPs that exceed applicable emission levels.

Table 4-2 TAPs Emissions Increase

Pollutant	CAS #	EF for NG Combustion (lb/10^6 scf)[a]	TAP Emissions (lb/hr)	Screening Level (lb/hr)	Modeling? (Y/N)
Antimony	7440-36-0	0.0E+00	0.00E+00	3.3E-02	No
Barium	7440-39-3	4.4E-03	7.76E-05	3.3E-02	No
Chromium	7440-47-3	1.4E-03	2.47E-05	3.3E-02	No
Cobalt	7440-48-4	8.4E-05	1.48E-06	3.3E-03	No
Copper	7440-50-8	8.5E-04	1.50E-05	6.7E-02	No
Ethylbenzene	100-41-4	0.0E+00	0.00E+00	2.9E+01	No
Fluoride (as F)	16984-48-8	0.0E+00	0.00E+00	1.67E-01	No
Hexane	110-54-3	1.8E+00	3.18E-02	1.2E+01	No
Manganese	7439-96-5	3.8E-04	6.71E-06	3.33E-01	No
Mercury	7439-97-6	2.6E-04	4.59E-06	3.E-03	No
Molybdenum	7439-98-7	1.1E-03	1.94E-05	3.33E-01	No
Naphthalene	91-20-3	6.1E-04	1.08E-05	3.33E+00	No
Pentane	109-66-0	2.6E+00	4.59E-02	1.18E+02	No
Phosphorous	7723-14-0	0.0E+00	0.00E+00	7.E-03	No
Selenium	7782-49-2	2.4E-05	4.24E-07	1.3E-02	No
1,1,1-Trichloroethane	71-55-6	0.0E+00	0.00E+00	1.27E+02	No
Toluene	108-88-3	3.4E-03	6.00E-05	2.5E+01	No
o-Xylene	1330-20-7	0.0E+00	0.00E+00	2.9E+01	No
Zinc	7440-66-6	2.9E-02	5.12E-04	6.67E-01	No

PERMIT-TO-CONSTRUCT MODIFICATION APPLICATION

EMMISSIONS SUMMARY
January 13, 2016

Pollutant	CAS #	EF for Natural Gas Combustion (lb/10^6 scf)[a]	Max 1-hr TAP Emissions (lb/hr)	Annual Average (lb/hr)	Screening Level (lb/hr)	Modeling? (Y/N)
Arsenic	7440-38-2	2.0E-04	3.53E-06	2.12E-06	1.5E-06	Yes
Benzene	71-43-2	2.1E-03	3.71E-05	2.23E-05	8.0E-04	No
Beryllium	7440-41-7	1.2E-05	2.12E-07	1.27E-07	2.8E-05	No
Cadmium	7440-43-9	1.1E-03	1.94E-05	1.17E-05	3.7E-06	Yes
Chromium VI	7440-47-3	0.0E+00	0.00E+00	0.00E+00	5.6E-07	No
Formaldehyde	50-00-0	7.5E-02	1.32E-03	7.96E-04	5.1E-04	Yes
Nickel	7440-02-0	2.1E-03	3.71E-05	2.23E-05	2.7E-05	No
Benzo(a)pyrene	50-32-8	1.2E-06	2.12E-08	1.27E-08	2.0E-06	No
Benz(a)anthracene	56-55-3	1.8E-06	3.18E-08	1.91E-08	NA	No
Benzo(b)fluoranthene	205-82-3	1.8E-06	3.18E-08	1.91E-08	NA	No
Benzo(k)fluoranthene	205-99-2	1.8E-06	3.18E-08	1.91E-08	NA	No
Chrysene	218-01-9	1.8E-06	3.18E-08	1.91E-08	NA	No
Dibenzo(a,h)anthracene	53-70-3	1.2E-06	2.12E-08	1.27E-08	NA	No
Indeno(1,2,3-cd)pyrene	193-39-5	1.8E-06	3.18E-08	1.91E-08	NA	No
Total PAHs		1.1E-05	2.01E-07	1.21E-07	2.00E-06	No

a. Emission Factors from AP-42, Tables 1.4-3 and 1.4-4, 7/98
b. Emission Factors from AP-42, Table 1.3-10, 9/98

5.0 AMBIENT AIR QUALITY ANALYSES

To ensure that the emissions updates to the two new dehydration dryers and adjustments to the drum dryer and snifter fan stacks demonstrates compliance with applicable NAAQS and state TAP ambient standards, ambient air quality analyses were performed. This included facility-wide analysis of $PM_{2.5}$, PM_{10}, SO_2 and NO_2 for all averaging periods. In addition, the inclusion of the dehydration units and AMU required an evaluation of four toxic pollutants. Note that the calculated emission rates for all evaluated TAPs were performed due to the change in stack parameters of the dehydration units and the reduction of exhausts points for the AMU since the March 5, 2015 permit. Please refer to Appendix E for the modeling report and a detailed discussion of the assumptions made.

APPENDICES

Appendix A SITE SELECTION MAP

Gem State Potato Processing
Heyburn, ID

Figure 1 – Site Location

Appendix B DEQ PTC FORMS AND CHECKLISTS

DEQ AIR QUALITY PROGRAM
1410 N. Hilton, Boise, ID 83706
For assistance, call the
Air Permit Hotline – 1-877-5PERMIT

Cover Sheet for Air Permit Application – Permit to Construct **Form CSPTC**

Please see instructions on page 2 before filling out the form.

COMPANY NAME, FACILITY NAME, AND FACILITY ID NUMBER			
1. Company Name	Gem State Processing, LLC		
2. Facility Name	Gem State	3. Facility ID No.	067-00038
4. Brief Project Description - One sentence or less	Updates to Dehydration throughput, updates to drum dryers and dehydrator parameters		

PERMIT APPLICATION TYPE

5. ☐ New Source ☐ New Source at Existing Facility ☐ PTC for a Tier I Source Processed Pursuant to IDAPA 58.01.01.209.05.c
☐ Unpermitted Existing Source ☐ Facility Emissions Cap ☒ Modify Existing Source: Permit No.: P-2010-0183 Date Issued: 03-5-15
☐ Required by Enforcement Action: Case No.:____

6. ☒ Minor PTC ☐ Major PTC

FORMS INCLUDED

Included	N/A	Forms		DEQ Verify
☒	☐	Form CSPTC – Cover Sheet		☐
☒	☐	Form GI – Facility Information		☐
☒	☐	Form EU0 – Emissions Units General		☐
☐	☐	Form EU1– Industrial Engine Information	Please specify number of EU1s attached: ____	☐
☐	☐	Form EU2– Nonmetallic Mineral Processing Plants	Please specify number of EU2s attached: ____	☐
☐	☐	Form EU3– Spray Paint Booth Information	Please specify number of EU3s attached: ____	☐
☐	☐	Form EU4– Cooling Tower Information	Please specify number of EU3s attached: ____	☐
☐	☐	Form EU5 – Boiler Information	Please specify number of EU4s attached: ____	☐
☐	☐	Form CBP– Concrete Batch Plant	Please specify number of CBPs attached: ____	☐
☐	☐	Form HMAP – Hot Mix Asphalt Plant	Please specify number of HMAPs attached: ____	☐
☐	☐	PERF – Portable Equipment Relocation Form		☐
☐	☐	Form AO – Afterburner/Oxidizer		☐
☐	☐	Form CA – Carbon Adsorber		☐
☐	☐	Form CYS – Cyclone Separator		☐
☐	☐	Form ESP – Electrostatic Precipitator		☐
☐	☐	Form BCE– Baghouses Control Equipment		☐
☐	☐	Form SCE– Scrubbers Control Equipment		☐
☐	☐	Form VSCE – Venturi Scrubber Control Equipment		☐
☐	☐	Form CAM – Compliance Assurance Monitoring		☐
☐	☐	Forms EI– Emissions Inventory		☐
☐	☐	PP – Plot Plan		☐
☒	☐	Forms MI1 – MI4 – Modeling	(Excel workbook, all 4 worksheets)	☐
☒	☐	Form FRA – Federal Regulation Applicability		☐

DEQ AIR QUALITY PROGRAM
1410 N. Hilton, Boise, ID 83706
For assistance, call the
Air Permit Hotline: 1-877-5PERMIT

General Information Form GI
Revision 7
6/29/12

Please see instructions on back page before filling out the form. All information is required. If information is missing, the application will not be processed.

Identification

1. Facility name: Gem State Processing, LLC

2. Existing facility identification number: 067-00038

☐ Check if new facility (not yet operating)

3. Brief project description: Updates to dehydrator throughput, drum dryers parameters

Facility Information

4. Primary facility permitting contact name: Bill Schow
Contact type: Responsible official
Telephone number: 208-678-6440
E-mail: bill@gemstateprocessing.com

5. Alternate facility permitting contact name: Miguel Rementeria
Alternate contact type: Responsible official
Telephone number: 208-678-6436
E-mail: mrementeria@gemstateprocessing.com

6. Mailing address where permit will be sent (street/city/county/state/zip code): 951 Highway 30, Heyburn, Idaho, Minidoka, Idaho 83336

7. Physical address of permitted facility (if different than mailing address) (street/city/county/state/zip code): Same as above

8. Is the equipment portable? ☐ Yes* ☒ No *If yes, complete and attach PERF; see instructions.

9. NAICS codes: Primary NAICS: 311423 Secondary NAICS:

10. Brief business description and principal product produced: Producer of dehydrated potato flakes and other dehydrated potato products

11. Identify any adjacent or contiguous facility this company owns and/or operates: N/A

12. Specify type of application ☒ Permit to construct (PTC); application fee of $1,000 required. See instructions.

☐ Tier I permit ☐ Tier II permit ☐ Tier II/Permit to construct

For Tier I permitted facilities only: If you are applying for a PTC then you must also specify how the PTC will be incorporated into the Tier I permit.

☐ Co-process Tier I modification and PTC ☐ Incorporate PTC at the time of Tier I renewal ☐ Administratively amend the Tier I permit to incorporate the PTC upon applicant's request (IDAPA 58.01.01.209.05.a, b, or c)

Certification

In accordance with IDAPA 58.01.01.123 (Rules for the Control of Air Pollution in Idaho), I certify based on information and belief formed after reasonable inquiry, the statements and information in the document(s) are true, accurate, and complete.

13. Responsible official's name: Bill Schow
Official's title: General Manager
Official's address: 951 Highway 30, Heyburn, Idaho 83336
Telephone number: 208-678-6440
E-mail: bill@gemstateprocessing.com
Official's signature: Bill Schow
Date: 1/4/12

☒ 14. Check here to indicate that you want to review the draft permit before final issuance.

DEQ AIR QUALITY PROGRAM
1410 N. Hilton, Boise, ID 83706
For assistance, call the
Air Permit Hotline – 1-877-5PERMIT

Emissions Unit - General **Form EU0**
Revision 4
08/28/08

Please see instructions on page 2 before filling out the form.

IDENTIFICATION

1. Company Name:	2. Facility Name:	3. Facility ID No:
Gem State Processing, LLC	Gem State	067-00038

4. Brief Project Description: Addition of dehydrators and AMUs, permit condition language update

EMISSIONS UNIT (PROCESS) IDENTIFICATION & DESCRIPTION

5.	Emissions Unit (EU) Name:	DEHYDRATOR #1
6.	EU ID Number:	EU12-EU19
7.	EU Type:	☒ New Source ☐ Unpermitted Existing Source ☐ Modification to a Permitted Source -- Previous Permit #: Date Issued:
8.	Manufacturer:	WOLVERINE
9.	Model:	WX0300, WX0200, WX0100, WX0050 BURNER MODELS
10..	Maximum Capacity:	18, 6, 2.2 MMBTU/HR
11.	Date of Construction:	1ST QTR OF 2015
12.	Date of Modification (if any):	N/A
13.	Is this a Controlled Emission Unit?	☒ No ☐ Yes If Yes, complete the following section. If No, go to line 22.

EMISSIONS CONTROL EQUIPMENT

14. Control Equipment Name and ID:

15. Date of Installation: 16. Date of Modification (if any):

17. Manufacturer and Model Number:

18. ID(s) of Emission Unit Controlled:

19. Is operating schedule different than emission units(s) involved? ☐ Yes ☐ No

20. Does the manufacturer guarantee the control efficiency of the control equipment? ☐ Yes ☐ No (If Yes, attach and label manufacturer guarantee)

	Pollutant Controlled					
	PM	PM10	SO_2	NOx	VOC	CO
Control Efficiency						

21. If manufacturer's data is not available, attach a separate sheet of paper to provide the control equipment design specifications and performance data to support the above mentioned control efficiency.

EMISSION UNIT OPERATING SCHEDULE (hours/day, hours/year, or other)

22.	Actual Operation:	8520 HRS/YR
23.	Maximum Operation:	8520 HRS/YR

REQUESTED LIMITS

24.	Are you requesting any permit limits?	☒ Yes ☐ No (If Yes, indicate all that apply below)
	☒ Operation Hour Limit(s):	8520 HRS/YR
	☐ Production Limit(s):	
	☐ Material Usage Limit(s):	
	☐ Limits Based on Stack Testing:	Please attach all relevant stack testing summary reports
	☐ Other:	
25.	Rationale for Requesting the Limit(s):	CONSISTENT WITH OTHER CURRENTLY PERMITTED UNITS.

DEQ AIR QUALITY PROGRAM
1410 N. Hilton, Boise, ID 83706
For assistance, call the
Air Permit Hotline – 1-877-5PERMIT

Emissions Unit - General **Form EU0**
Revision 4
08/28/08

Please see instructions on page 2 before filling out the form.

IDENTIFICATION

1. Company Name:	2. Facility Name:	3. Facility ID No:
Gem State Processing, LLC	Gem State	067-00038

4. Brief Project Description: Addition of dehydrators and AMUs, permit condition language update

EMISSIONS UNIT (PROCESS) IDENTIFICATION & DESCRIPTION

5.	Emissions Unit (EU) Name:	DEHYDRATOR #2
6.	EU ID Number:	EU12-EU19
7.	EU Type:	☒ New Source ☐ Unpermitted Existing Source ☐ Modification to a Permitted Source -- Previous Permit #: Date Issued:
8.	Manufacturer:	WOLVERINE
9.	Model:	WX0300, WX0200, WX0100, WX0050 BURNER MODELS
10..	Maximum Capacity:	18, 6, 2.2 MMBTU/HR
11.	Date of Construction:	1ST QTR OF 2015
12.	Date of Modification (if any):	N/A
13.	Is this a Controlled Emission Unit?	☒ No ☐ Yes If Yes, complete the following section. If No, go to line 22.

EMISSIONS CONTROL EQUIPMENT

14. Control Equipment Name and ID:

15. Date of Installation: 16. Date of Modification (if any):

17. Manufacturer and Model Number:

18. ID(s) of Emission Unit Controlled:

19. Is operating schedule different than emission units(s) involved? ☐ Yes ☐ No

20. Does the manufacturer guarantee the control efficiency of the control equipment? ☐ Yes ☐ No (If Yes, attach and label manufacturer guarantee)

	Pollutant Controlled					
	PM	PM10	SO_2	NOx	VOC	CO
Control Efficiency						

21. If manufacturer's data is not available, attach a separate sheet of paper to provide the control equipment design specifications and performance data to support the above mentioned control efficiency.

EMISSION UNIT OPERATING SCHEDULE (hours/day, hours/year, or other)

22.	Actual Operation:	8520 HRS/YR
23.	Maximum Operation:	8520 HRS/YR

REQUESTED LIMITS

24.	Are you requesting any permit limits?	☒ Yes ☐ No (If Yes, indicate all that apply below)
	☒ Operation Hour Limit(s):	8520 HRS/YR
	☐ Production Limit(s):	
	☐ Material Usage Limit(s):	
	☐ Limits Based on Stack Testing:	Please attach all relevant stack testing summary reports
	☐ Other:	
25.	Rationale for Requesting the Limit(s):	CONSISTENT WITH OTHER CURRENTLY PERMITTED UNITS.

DEQ AIR QUALITY PROGRAM
1410 N. Hilton, Boise, ID 83706
For assistance, call the
Air Permit Hotline – 1-877-5PERMIT

Emissions Unit - General **Form EU0**
Revision 4
08/28/08

Please see instructions on page 2 before filling out the form.

IDENTIFICATION

1. Company Name:	2. Facility Name:	3. Facility ID No:
Gem State Processing, LLC	Gem State	067-00038

4. Brief Project Description:	Addition of dehydrators and AMUs, permit condition language update

EMISSIONS UNIT (PROCESS) IDENTIFICATION & DESCRIPTION

5.	Emissions Unit (EU) Name:	Air Makeup Unit #5
6.	EU ID Number:	EU-10
7.	EU Type:	☒ New Source ☐ Unpermitted Existing Source ☐ Modification to a Permitted Source -- Previous Permit #: Date Issued:
8.	Manufacturer:	REYCO
9.	Model:	GASPAC 1250
10..	Maximum Capacity:	9 MMBTU/HR
11.	Date of Construction:	1ST QTR OF 2015
12.	Date of Modification (if any):	N/A
13.	Is this a Controlled Emission Unit?	☒ No ☐ Yes If Yes, complete the following section. If No, go to line 22.

EMISSIONS CONTROL EQUIPMENT

14. Control Equipment Name and ID:	
15. Date of Installation:	16. Date of Modification (if any):
17. Manufacturer and Model Number:	
18. ID(s) of Emission Unit Controlled:	
19. Is operating schedule different than emission units(s) involved?	☐ Yes ☐ No
20. Does the manufacturer guarantee the control efficiency of the control equipment?	☐ Yes ☐ No (If Yes, attach and label manufacturer guarantee)

	Pollutant Controlled					
	PM	PM10	SO_2	NOx	VOC	CO
Control Efficiency						

21. If manufacturer's data is not available, attach a separate sheet of paper to provide the control equipment design specifications and performance data to support the above mentioned control efficiency.

EMISSION UNIT OPERATING SCHEDULE (hours/day, hours/year, or other)

22.	Actual Operation:	5270.4 HRS/YR
23.	Maximum Operation:	5270.4 HRS/YR

REQUESTED LIMITS

24.	Are you requesting any permit limits?	☒ Yes ☐ No (If Yes, indicate all that apply below)
	☒ Operation Hour Limit(s):	5270.4 HRS/YR
	☐ Production Limit(s):	
	☐ Material Usage Limit(s):	
	☐ Limits Based on Stack Testing:	Please attach all relevant stack testing summary reports
	☐ Other:	
25.	Rationale for Requesting the Limit(s):	CONSISTENT WITH OTHER CURRENTLY PERMITTED UNITS.

DEQ AIR QUALITY PROGRAM
1410 N. Hilton, Boise, ID 83706
For assistance, call the
Air Permit Hotline – 1-877-5PERMIT

Emissions Unit - General **Form EU0**
Revision 4
08/28/08

Please see instructions on page 2 before filling out the form.

IDENTIFICATION

1. Company Name:	2. Facility Name:	3. Facility ID No:
Gem State Processing, LLC	Gem State	067-00038

4. Brief Project Description: Addition of dehydrators and AMUs, permit condition language update

EMISSIONS UNIT (PROCESS) IDENTIFICATION & DESCRIPTION

5.	Emissions Unit (EU) Name:	AIR MAKEUP UNIT #6
6.	EU ID Number:	EU-11
7.	EU Type:	☒ New Source ☐ Unpermitted Existing Source ☐ Modification to a Permitted Source -- Previous Permit #: Date Issued:
8.	Manufacturer:	REYCO
9.	Model:	GASPAC 1250
10..	Maximum Capacity:	9 MMBTU/HR
11.	Date of Construction:	1ST QTR OF 2015
12.	Date of Modification (if any):	N/A
13.	Is this a Controlled Emission Unit?	☒ No ☐ Yes If Yes, complete the following section. If No, go to line 22.

EMISSIONS CONTROL EQUIPMENT

14. Control Equipment Name and ID:	
15. Date of Installation:	16. Date of Modification (if any):
17. Manufacturer and Model Number:	
18. ID(s) of Emission Unit Controlled:	
19. Is operating schedule different than emission units(s) involved?	☐ Yes ☐ No
20. Does the manufacturer guarantee the control efficiency of the control equipment?	☐ Yes ☐ No (If Yes, attach and label manufacturer guarantee)

	Pollutant Controlled					
	PM	PM10	SO_2	NOx	VOC	CO
Control Efficiency						

21. If manufacturer's data is not available, attach a separate sheet of paper to provide the control equipment design specifications and performance data to support the above mentioned control efficiency.

EMISSION UNIT OPERATING SCHEDULE (hours/day, hours/year, or other)

22.	Actual Operation:	5270.4 HRS/YR
23.	Maximum Operation:	5270.4 HRS/YR

REQUESTED LIMITS

24.	Are you requesting any permit limits?	☒ Yes ☐ No (If Yes, indicate all that apply below)
	☒ Operation Hour Limit(s):	5270.4 HRS/YR
	☐ Production Limit(s):	
	☐ Material Usage Limit(s):	
	☐ Limits Based on Stack Testing:	Please attach all relevant stack testing summary reports
	☐ Other:	
25.	Rationale for Requesting the Limit(s):	CONSISTENT WITH OTHER CURRENTLY PERMITTED UNITS.

	DEQ AIR QUALITY PROGRAM 1410 N. Hilton, Boise, ID 83706 For assistance, call the **Air Permit Hotline - 1-877-5PERMIT**	**PERMIT TO CONSTRUCT APPLICATION** Revision 3 4/5/2007

Please see instructions on page 2 before filling out the form.

Company Name:	Gem State Processing, LLC
Facility Name:	Gem State - Heyburn Facility
Facility ID No.:	067-00038
Brief Project Description:	Construction and operation of a new potato processing facility in Heyburn, ID

SUMMARY OF AIR IMPACT ANALYSIS RESULTS - CRITERIA POLLUTANTS

		1.		2.	3.	4.		5.
Criteria Pollutants	**Averaging Period**	**Significant Impact Analysis Results (µg/m3)**	**Significant Contribution Level (µg/m3)**	**Full Impact Analysis Results (µg/m3)**	**Background Concentration (µg/m3)**	**Total Ambient Impact (µg/m3)**	**NAAQS (µg/m3)**	**Percent of NAAQS**
PM_{10}	24-hour	n/a	n/a	28.60	73.00	101.60	150	68%
$PM_{2.5}$	24-hour	n/a	n/a	21.70	13.00	34.70	35	99%
	Annual	n/a	n/a	6.50	4.30	10.80	15	72%
SO_2	1-hr	n/a	n/a	2.99	3.63	6.62	196	3%
NO_2	1-hr	n/a	n/a	160.70	PVMRM2	160.70	188	85%
	Annual	n/a	n/a	12.90	5.83	18.73	100	19%
CO	1-hr	n/a	n/a	n/a	n/a		10000	
	8-hr	n/a	n/a	n/a	n/a		40000	

	DEQ AIR QUALITY PROGRAM 1410 N. Hilton, Boise, ID 83706 For assistance, call the **Air Permit Hotline - 1-877-5PERMIT**	**PERMIT TO CONSTRUCT APPLICATION** Revision 3 3/27/2007

Please see instructions on page 2 before filling out the form.

Company Name:	Gem State Processing, LLC
Facility Name:	Gem State - Heyburn Facility
Facility ID No.:	067-00038
Brief Project Description:	Modification to permit for potato processing facility in Heyburn, ID

POINT SOURCE STACK PARAMETERS

1.	2.	3a.	3b.	4.	5.	6.	7.	8.	9.	10.
Emissions units	**Stack ID**	**UTM Easting (m)**	**UTM Northing (m)**	**Base Elevation (m)**	**Stack Height (ft)**	**Modeled Diameter (ft)**	**Stack Exit Temperature (F)**	**Stack Exit Flowrate (acfm)**	**Stack Exit Velocity (ft/s)**	**Stack orientation (e.g., horizontal, rain cap)**
Point Source(s)										
Drum/Snifter Fan Hood #1	DFH#1	273,385.00	4,714,654.00	1,266.36	82.00	3.00	119.00	45,000.00	106.10	vertical
Drum/Snifter Fan Hood #2	DFH#2	273,388.00	4,714,657.00	1,266.35	82.00	3.00	119.00	45,000.00	106.10	vertical
Drum/Snifter Fan Hood #3	DFH#3	273,392.00	4,714,660.00	1,266.32	82.00	3.00	119.00	45,000.00	106.10	vertical
Drum/Snifter Fan Hood #4	DFH#4	273,395.00	4,714,663.00	1,266.29	82.00	3.00	119.00	45,000.00	106.10	vertical
Drum/Snifter Fan Hood #5	DFH#5	273,399.00	4,714,667.00	1,266.30	82.00	3.00	119.00	45,000.00	106.10	vertical
Drum/Snifter Fan Hood #6	DFH#6	273,402.00	4,714,670.00	1,266.31	82.00	3.00	119.00	45,000.00	106.10	vertical
Bubble Sheet Dryer #1	PRE#1	273,428.86	4,714,698.39	1,266.33	82.00	2.67	131.00	35,000.00	104.19	vertical
Bubble Sheet Dryer #2	PRE#2	273,441.58	4,714,709.33	1,266.26	82.00	3.17	150.00	30,001.90	63.75	vertical
Nuisance Dust Collector Baghouse	BH1	273,409.01	4,714,689.25	1,266.25	40.10	1.33	100.00	866.53	10.39	vertical
Exhaust #1	EX1	273,481.00	4,714,588.00	1,266.26	38.80	3.67	80.01	24,225.44	38.17	vertical
Exhaust #2	EX2	273,476.00	4,714,604.00	1,266.13	38.80	3.67	80.01	24,225.44	38.17	vertical
Exhaust #3	EX3	273,463.00	4,714,572.00	1,266.37	38.80	3.67	80.01	24,225.44	38.17	vertical
Exhaust #4	EX4	273,407.00	4,714,616.00	1,266.45	38.80	2.50	80.01	7,139.27	24.24	vertical
Exhaust #5	EX5	273,403.00	4,714,613.00	1,266.46	38.00	2.50	80.01	7,139.27	24.24	vertical
Exhaust #6	EX6	273,419.00	4,714,629.00	1,266.36	38.00	3.67	80.01	24,225.44	38.17	vertical
Exhaust #7	EX7	273,385.56	4,714,692.25	1,266.34	37.70	2.00	80.01	4,000.00	21.22	vertical
Exhaust #8	EX8	273,415.90	4,714,682.06	1,266.26	37.90	2.50	80.01	7,000.00	23.77	vertical
Exhaust #9	EX9	273,427.10	4,714,692.76	1,266.33	37.90	2.50	80.01	7,000.00	23.77	vertical
Exhaust #10	EX10	273,414.32	4,714,726.45	1,266.27	35.90	4.00	80.01	17,281.27	22.92	vertical
Exhaust #11	EX11	273,449.20	4,714,763.23	1,266.18	35.80	4.00	80.01	17,281.27	22.92	vertical
Exhaust #12	EX12	273,475.00	4,714,754.00	1,266.08	35.70	4.00	80.01	17,281.27	22.92	vertical
Exhaust #13	EX13	273,463.77	4,714,747.27	1,266.15	36.10	4.00	80.01	18,563.04	24.62	vertical
Exhaust #14	EX14	273,474.48	4,714,735.48	1,266.05	36.10	4.00	80.01	18,563.04	24.62	vertical
Exhaust #15	EX15	273,428.02	4,714,645.42	1,266.36	36.00	3.00	90	24,355.00	57.43	vertical
Exhaust #16	EX16	273,450.05	4,714,637.36	1,266.27	36.00	3.00	90	24,355.00	57.43	vertical
Dryer #1 Stage A Stack #1	WDRY1A1	273,464.30	4,714,628.57	1,266.18	60.00	2.67	225	14,667.00	43.77	vertical
Dryer #2 Stage A Stack #1	WDRY2A1	273,458.26	4,714,623.54	1,266.21	60.00	2.67	225	14,667.00	43.77	vertical
Dryer #1 Stage A Stack #2	WDRY1A2	273,455.38	4,714,636.64	1,266.25	60.00	3.00	232	19,115.00	45.07	vertical
Dryer #2 Stage A Stack #2	WDRY2A2	273,449.33	4,714,631.02	1,266.26	60.00	3.00	232	19,115.00	45.07	vertical
Dryer #1 Stage B	WDRY1B	273,443.86	4,714,646.86	1,266.34	60.00	2.67	186	14,805.00	44.18	vertical
Dryer #2 Stage B	WDRY2B	273,438.53	4,714,641.39	1,266.34	60.00	2.67	186	14,805.00	44.18	vertical
Dryer #1 Stage C	WDRY1C	273,430.46	4,714,660.26	1,266.33	60.00	1.83	176	6,264.00	39.55	vertical
Dryer #2 Stage C	WDRY2C	273,425.13	4,714,655.79	1,266.35	60.00	1.83	176	6,264.00	39.55	vertical
Boiler #1	BO1	273,357.00	4,714,685.00	1,266.30	60.79	3.00	315.00	14,911.88	35.16	vertical
Boiler #2	BO2	273,360.00	4,714,687.00	1,266.29	60.79	3.00	315.00	14,911.88	35.16	vertical
Boiler #3	BO3	273,362.00	4,714,689.00	1,266.25	60.79	3.00	315.00	14,911.88	35.16	vertical
Pneumatic Conveying	PRE3	273,404.37	4,714,685.38	1,266.28	60.00	1.67	100.00	6,000.00	45.87	vertical

DEQ AIR QUALITY PROGRAM
1410 N. Hilton, Boise, ID 83706
For assistance, call the
Air Permit Hotline - 1-877-5PERMIT

PERMIT TO CONSTRUCT APPLICATION

Revision 3
4/5/2007

Please see instructions on page 2 before filling out the form.

Company Name:	Gem State Processing, LLC
Facility Name:	Gem State - Heyburn Facility
Facility ID No.:	067-00038
Brief Project Description:	Construction and operation of a new potato processing facility in Heyburn, ID - No Airport

SUMMARY OF AIR IMPACT ANALYSIS RESULTS - CRITERIA POLLUTANTS

		1.		2.	3.	4.		5.
Criteria Pollutants	**Averaging Period**	**Significant Impact Analysis Results (µg/m3)**	**Significant Contribution Level (µg/m3)**	**Full Impact Analysis Results (µg/m3)**	**Background Concentration (µg/m3)**	**Total Ambient Impact (µg/m3)**	**NAAQS (µg/m3)**	**Percent of NAAQS**
PM_{10}	24-hour	n/a	n/a	23.60	73.00	96.60	150	64%
$PM_{2.5}$	24-hour	n/a	n/a	17.70	13.00	30.70	35	88%
	Annual	n/a	n/a	5.40	4.30	9.70	15	65%
SO_2	1-hr	n/a	n/a	2.99	3.63	6.62	196	3%
NO_2	1-hr	n/a	n/a	160.40	PVMRM2	160.40	188	85%
	Annual	n/a	n/a	12.90	5.83	18.73	100	19%
CO	1-hr	n/a	n/a	n/a	n/a		10000	
	8-hr	n/a	n/a	n/a	n/a		40000	

	DEQ AIR QUALITY PROGRAM 1410 N. Hilton, Boise, ID 83706 For assistance, call the **Air Permit Hotline - 1-877-5PERMIT**	**PERMIT TO CONSTRUCT APPLICATION** Revision 3 3/27/2007

Please see instructions on page 2 before filling out the form.

Company Name:	Gem State Processing, LLC
Facility Name:	Gem State - Heyburn Facility
Facility ID No.:	067-00038
Brief Project Description:	Modification to permit for potato processing facility in Heyburn, ID - No Airport

POINT SOURCE STACK PARAMETERS

1.	2.	3a.	3b.	4.	5.	6.	7.	8.	9.	10.
Emissions units	**Stack ID**	**UTM Easting (m)**	**UTM Northing (m)**	**Base Elevation (m)**	**Stack Height (ft)**	**Modeled Diameter (ft)**	**Stack Exit Temperature (F)**	**Stack Exit Flowrate (acfm)**	**Stack Exit Velocity (ft/s)**	**Stack orientation (e.g., horizontal, rain cap)**
Point Source(s)										
Drum/Snifter Fan Hood #1	DFH#1	273,385.00	4,714,654.00	1,266.36	100.00	3.50	119.00	35,000.00	106.10	vertical
Drum/Snifter Fan Hood #2	DFH#2	273,388.00	4,714,657.00	1,266.35	100.00	3.50	119.00	35,000.00	106.10	vertical
Drum/Snifter Fan Hood #3	DFH#3	273,392.00	4,714,660.00	1,266.32	100.00	3.50	119.00	35,000.00	106.10	vertical
Drum/Snifter Fan Hood #4	DFH#4	273,395.00	4,714,663.00	1,266.29	100.00	3.50	119.00	35,000.00	106.10	vertical
Drum/Snifter Fan Hood #5	DFH#5	273,399.00	4,714,667.00	1,266.30	100.00	3.50	119.00	35,000.00	106.10	vertical
Drum/Snifter Fan Hood #6	DFH#6	273,402.00	4,714,670.00	1,266.31	100.00	3.50	119.00	35,000.00	106.10	vertical
Bubble Sheet Dryer #1	PRE#1	273,428.86	4,714,698.39	1,266.33	100.00	2.67	131.00	25,000.00	104.19	vertical
Bubble Sheet Dryer #2	PRE#2	273,441.58	4,714,709.33	1,266.26	82.00	3.17	150.00	30,001.90	63.75	vertical
Nuisance Dust Collector Baghouse	BH1	273,409.01	4,714,689.25	1,266.25	40.10	1.33	100.00	866.53	10.39	vertical
Exhaust #1	EX1	273,481.00	4,714,588.00	1,266.26	38.80	3.67	80.01	24,225.44	38.17	vertical
Exhaust #2	EX2	273,476.00	4,714,604.00	1,266.13	38.80	3.67	80.01	24,225.44	38.17	vertical
Exhaust #3	EX3	273,463.00	4,714,572.00	1,266.37	38.80	3.67	80.01	24,225.44	38.17	vertical
Exhaust #4	EX4	273,407.00	4,714,616.00	1,266.45	38.80	2.50	80.01	7,139.27	24.24	vertical
Exhaust #5	EX5	273,403.00	4,714,613.00	1,266.46	38.00	2.50	80.01	7,139.27	24.24	vertical
Exhaust #6	EX6	273,419.00	4,714,629.00	1,266.36	38.00	3.67	80.01	24,225.44	38.17	vertical
Exhaust #7	EX7	273,385.56	4,714,692.25	1,266.34	37.70	2.00	80.01	4,000.00	21.22	vertical
Exhaust #8	EX8	273,415.90	4,714,682.06	1,266.26	37.90	2.50	80.01	7,000.00	23.77	vertical
Exhaust #9	EX9	273,427.10	4,714,692.76	1,266.33	37.90	2.50	80.01	7,000.00	23.77	vertical
Exhaust #10	EX10	273,414.32	4,714,726.45	1,266.27	35.90	4.00	80.01	17,281.27	22.92	vertical
Exhaust #11	EX11	273,449.20	4,714,763.23	1,266.18	35.80	4.00	80.01	17,281.27	22.92	vertical
Exhaust #12	EX12	273,475.00	4,714,754.00	1,266.08	35.70	4.00	80.01	17,281.27	22.92	vertical
Exhaust #13	EX13	273,463.77	4,714,747.27	1,266.15	36.10	4.00	80.01	18,563.04	24.62	vertical
Exhaust #14	EX14	273,474.48	4,714,735.48	1,266.05	36.10	4.00	80.01	18,563.04	24.62	vertical
Exhaust #15	EX15	273,428.02	4,714,645.42	1,266.36	36.00	3.00	90	24,355.00	57.43	vertical
Exhaust #16	EX16	273,450.05	4,714,637.36	1,266.27	36.00	3.00	90	24,355.00	57.43	vertical
Dryer #1 Stage A Stack #1	WDRY1A1	273,464.30	4,714,628.57	1,266.18	60.00	2.67	225	14,667.00	43.77	vertical
Dryer #2 Stage A Stack #1	WDRY2A1	273,458.26	4,714,623.54	1,266.21	60.00	2.67	225	14,667.00	43.77	vertical
Dryer #1 Stage A Stack #2	WDRY1A2	273,455.38	4,714,636.64	1,266.25	60.00	3.00	232	19,115.00	45.07	vertical
Dryer #2 Stage A Stack #2	WDRY2A2	273,449.33	4,714,631.02	1,266.26	60.00	3.00	232	19,115.00	45.07	vertical
Dryer #1 Stage B	WDRY1B	273,443.86	4,714,646.86	1,266.34	60.00	2.67	186	14,805.00	44.18	vertical
Dryer #2 Stage B	WDRY2B	273,438.53	4,714,641.39	1,266.34	60.00	2.67	186	14,805.00	44.18	vertical
Dryer #1 Stage C	WDRY1C	273,430.46	4,714,660.26	1,266.33	60.00	1.83	176	6,264.00	39.55	vertical
Dryer #2 Stage C	WDRY2C	273,425.13	4,714,655.79	1,266.35	60.00	1.83	176	6,264.00	39.55	vertical
Boiler #1	BO1	273,357.00	4,714,685.00	1,266.30	60.79	3.00	315.00	14,911.88	35.16	vertical
Boiler #2	BO2	273,360.00	4,714,687.00	1,266.29	60.79	3.00	315.00	14,911.88	35.16	vertical
Boiler #3	BO3	273,362.00	4,714,689.00	1,266.25	60.79	3.00	315.00	14,911.88	35.16	vertical
Pneumatic Conveying	PRE3	273,404.37	4,714,685.38	1,266.28	60.00	1.67	100.00	6,000.00	45.87	vertical

	DEQ AIR QUALITY PROGRAM 1410 N. Hilton, Boise, ID 83706 For assistance, call the **Air Permit Hotline - 1-877-5PERMIT**	**PERMIT TO CONSTRUCT APPLICATION** Revision 3 4/5/2007

Please see instructions on page 2 before filling out the form.

Company Name:	Gem State Processing, LLC
Facility Name:	Gem State
Facility ID No.:	067-00038
Brief Project Description:	Updates to AMU's dehydrators and drum dryers

FUGITIVE SOURCE PARAMETERS

1.	2.	3a.	3b.	4.	5.	6.	7.	8.	9.	10.
Emissions units	**Stack ID**	**UTM Easting (m)**	**UTM Northing (m)**	**Base Elevation (m)**	**Release Height (m)**	**Easterly Length (m)**	**Northerly Length (m)**	**Angle from North (°)**	**Initial Vertical Dimension (m)**	**Initial Horizontal Dimension (m)**
Area Source(s)										
NA										
Volume Source(s)										
Silo Bin Vent BH#1	BV1A	273,376.00	4,714,701.00	1,266.27	23.01				10.96	0.26
Silo Bin Vent BH#2	BV2A	273,385.00	4,714,707.00	1,266.34						
Silo Bin Vent BH#3	BV3A	273,391.00	4,714,713.00	1,266.35						
Silo Bin Vent BH#4	BV4A	273,398.00	4,714,719.00	1,266.34						
Rail load BH	RAILLOAD	273,386.50	4,714,725.00	1,266.28	12.74				6.18	0.26

	DEQ AIR QUALITY PROGRAM 1410 N. Hilton, Boise, ID 83706 For assistance, call the **Air Permit Hotline - 1-877-5PERMIT**	**PERMIT TO CONSTRUCT APPLICATION** Revision 3 4/5/2007

Please see instructions on page 2 before filling out the form.

Company Name:	Gem State Processing, LLC
Facility Name:	Gem State Processing, LLC
Facility ID No.:	067-00038
Brief Project Description:	Updates to AMU's dehydrators and drum dryers

BUILDING AND STRUCTURE INFORMATION

1.	2.	3.	4.	5.	6.	7.
Building ID Number	**Length (ft)**	**Width (ft)**	**Base Elevation (m)**	**Building Height (m)**	**Number of Tiers**	**Description/Comments**
Main Building			1266.04	9.14	1	Main Building
Well House			1266.12	6.25	1	Well House
Dry Storage			1266.80	6.71	1	Dry Storage
Café			1266.54	4.06	1	Café
Boyer			1266.69	3.51	1	Boyer
Inland Environmental			1265.96	7.77	1	Inland Environmental
Simplot			1265.26	13.72	1	Simplot
Addition - Dryer			1266.34	9.75	1	Addition - Dryer
Other Storage			1266.01	9.75	1	Other Storage
Silo 1			1266.30	24.31	1	Silo 1
Silo 2			1266.34	24.31	1	Silo 2
Silo 3			1266.35	24.31	1	Silo 3
Silo 4			1266.34	24.31	1	Silo 4

DEQ AIR QUALITY PROGRAM
1410 N. Hilton, Boise, ID 83706
For assistance, call the
Air Permit Hotline – 1-877-5PERMIT

AIR PERMIT APPLICATION

Revision 6
10/7/09

For each box in the table below, CTRL+click on the blue underlined text for instructions and information.

IDENTIFICATION	
1. Company Name: Gem State Processing, LLC	2. Facility Name: Gem State - Heyburn Facility
3. Brief Project Description:	Revision to permit for potato processing facility in Heyburn, ID

APPLICABILITY DETERMINATION	
4. List applicable subparts of the New Source Performance Standards (NSPS) (40 CFR part 60). Examples of NSPS affected emissions units include internal combustion engines, boilers, turbines, etc. The applicant must thoroughly review the list of affected emissions units.	List of applicable subpart(s): Subpart Dc See Section 3.1.6 of the permit application ☐ Not Applicable
5. List applicable subpart(s) of the National Emission Standards for Hazardous Air Pollutants (NESHAP) found in 40 CFR part 61 and 40 CFR part 63. Examples of affected emission units include solvent cleaning operations, industrial cooling towers, paint stripping and miscellaneous surface coating. EPA has a web page dedicated to NESHAP that should be useful to applicants.	List of applicable subpart(s): ☑ Not Applicable DEQ received a full analysis w/ the app for Permit P-2010.0183. It was submitted December 21, 2010
6. For each subpart identified above, conduct a complete a regulatory analysis using the instructions and referencing the example provided on the following pages. **Note** - Regulatory reviews must be submitted with sufficient detail so that DEQ can verify applicability and document in legal terms why the regulation applies. Regulatory reviews that are submitted with insufficient detail will be determined incomplete.	☑ A detailed regulatory review is provided (Follow instructions and example). ☐ DEQ has already been provided a detailed regulatory review. Give a reference to the document including the date.

IF YOU ARE UNSURE HOW TO ANSWER ANY OF THESE QUESTIONS, CALL THE AIR PERMIT HOTLINE AT 1-877-5PERMIT

It is emphasized that it is the applicant's responsibility to satisfy all technical and regulatory requirements, and that DEQ will help the applicant understand what those requirements are prior to the application being submitted but that DEQ will not perform the required technical or regulatory analysis on the applicant's behalf.

Appendix C EMISSION INVENTORY

Gem State Processing, LLC
Heyburn Facility

CRITERIA EMISSIONS - UNCONTROLLED NATURAL GAS COMBUSTION (lb/hr)

Emission Factors

NOx	0.036	lb/MMBtu	Manufacturer specific emission factor for 30 ppm A-FGR low NOx burner on boiler
CO	0.04	lb/MMBtu	Manufacturer specific emission factor for boiler
PM-10	0.001	lb/MMBtu	Manufacturer specific emission factor for boilers
SOx	0.00055	lb/MMBtu	Manufacturer specific emission factor for boilers
VOC	0.004	lb/MMBtu	Manufacturer specific emission factor for boilers
NOx	100	lb/10^6 scf	AP-42, Table 1.4-1, 1998
CO	84	lb/10^6 scf	AP-42, Table 1.4-1, 1998
PM-10	7.6	lb/10^6 scf	AP-42, Table 1.4-2, 1998
SOx	0.6	lb/10^6 scf	AP-42, Table 1.4-2, 1998
VOC	5.5	lb/10^6 scf	AP-42, Table 1.4-2, 1998
Lead	0.0005	lb/10^6 scf	AP-42, Table 1.4-2, 1998
CO2	120,000	lb/10^6 scf	AP-42, Table 1.4-2, 1998
N2O	2.2	lb/10^6 scf	AP-42, Table 1.4-2, 1998, Low-NOx burner
CH4	2.3	lb/10^6 scf	AP-42, Table 1.4-2, 1998

Description	Capacity (MMBtu/hr)	Throughput (scf/hr)	Pounds per Hour					
			NOx Emissions (lb/hr)	CO Emissions (lb/hr)	PM2.5/PM-10 Emissions (lb/hr)	SOx Emissions (lb/hr)	VOC Emissions (lb/hr)	Lead Emissions (lb/hr)
Boiler #1[a] (1200 hp)	49.37	48,398	4.8398	1.9746	0.0494	0.0272	0.1975	0.0000242
Boiler #2[a] (1200 hp)	49.37	48,398	4.8398	1.9746	0.0494	0.0272	0.1975	0.0000242
Boiler #3[a] (1600 hp)	65.82	64,530	6.4530	2.6328	0.0658	0.0362	0.2633	0.0000323
Reyco AMU #1 850	9.0	8,824	0.8824	0.7412	0.0671	0.0053	0.0485	0.0000044
Reyco AMU #2 1000	9.0	8,824	0.8824	0.7412	0.0671	0.0053	0.0485	0.0000044
Reyco AMU #3 1000	9.0	8,824	0.8824	0.7412	0.0671	0.0053	0.0485	0.0000044
Reyco AMU #4 1250	10.0	9,804	0.9804	0.8235	0.0745	0.0059	0.0539	0.0000049
Reyco AMU #5 1250	9.0	8,824	0.8824	0.7412	0.0671	0.0053	0.0485	0.0000044
Reyco AMU #6 1250	9.0	8,824	0.8824	0.7412	0.0671	0.0053	0.0485	0.0000044
Bubble Sheet Dryer #1	7.0	6,863	0.6863	0.5765	0.0522	0.0041	0.0377	0.0000034
Bubble Sheet Dryer #2	7.0	6,863	0.6863	0.5765	0.0522	0.0041	0.0377	0.0000034
TOTAL	**233.6**	**228,972.3**	**22.90**	**12.26**	**0.68**	**0.13**	**1.03**	**1.14E-04**

[a]The boilers will be equipped with Low NOx Burners; however the calculations shown in this spreadsheet are the uncontrolled emissions using emissions factors from AP-42 for NOx and CO emissions from the boilers. Boiler capacity and throughput based on manufacturer specific information

Gem State Processing, LLC
Heyburn Facility

CRITERIA EMISSIONS - CONTROLLED NATURAL GAS COMBUSTION (lb/hr)

Emission Factors

NOx	0.036	lb/MMBtu	Manufacturer specific emission factor for 30 ppm A-FGR low NOx burner on boiler
CO	0.04	lb/MMBtu	Manufacturer specific emission factor for boiler
PM-10	0.001	lb/MMBtu	Manufacturer specific emission factor for boilers
SOx	0.00055	lb/MMBtu	Manufacturer specific emission factor for boilers
VOC	0.004	lb/MMBtu	Manufacturer specific emission factor for boilers
NOx	100	lb/10^6 scf	AP-42, Table 1.4-1, 1998
NOx	50	lb/10^6 scf	AP-42, Table 1.4-1, 1998, Low NOx
CO	84	lb/10^6 scf	AP-42, Table 1.4-1, 1998
PM-10	7.6	lb/10^6 scf	AP-42, Table 1.4-2, 1998
SOx	0.6	lb/10^6 scf	AP-42, Table 1.4-2, 1998
VOC	5.5	lb/10^6 scf	AP-42, Table 1.4-2, 1998
Lead	0.0005	lb/10^6 scf	AP-42, Table 1.4-2, 1998
CO2	120,000	lb/10^6 scf	AP-42, Table 1.4-2, 1998
N2O	0.64	lb/10^6 scf	AP-42, Table 1.4-2, 1998
CH4	2.3	lb/10^6 scf	AP-42, Table 1.4-2, 1998

Description	Capacity (MMBtu/hr)	Throughput (scf/hr)	Pounds per Hour					
			NOx Emissions (lb/hr)	CO Emissions (lb/hr)	PM2.5/PM-10 Emissions (lb/hr)	SOx Emissions (lb/hr)	VOC Emissions (lb/hr)	Lead Emissions (lb/hr)
Boiler #1[a] (1200 hp)	48.40	48,398	1.7423	1.9359	0.0484	0.0266	0.1936	0.0000242
Boiler #2[a] (1200 hp)	48.40	48,398	1.7423	1.9359	0.0484	0.0266	0.1936	0.0000242
Boiler #3[a] (1600 hp)	64.53	64,530	2.3231	2.5812	0.0645	0.0355	0.2581	0.0000323
Reyco AMU #1 850	9.0	8,824	0.4412	0.7412	0.0671	0.0053	0.0485	0.0000044
Reyco AMU #2 1000	9.0	8,824	0.4412	0.7412	0.0671	0.0053	0.0485	0.0000044
Reyco AMU #3 1000	9.0	8,824	0.4412	0.7412	0.0671	0.0053	0.0485	0.0000044
Reyco AMU #4 1250	10.0	9,804	0.4902	0.8235	0.0745	0.0059	0.0539	0.0000049
Reyco AMU #5 1250	9.0	8,824	0.4412	0.7412	0.0671	0.0053	0.0485	0.0000044
Reyco AMU #6 1250	9.0	8,824	0.4412	0.7412	0.0671	0.0053	0.0485	0.0000044
Bubble Sheet Dryer #1	7.0	6,863	0.6863	0.5765	0.0522	0.0041	0.0377	0.0000034
Bubble Sheet Dryer #2	7.0	6,863	0.6863	0.5765	0.0522	0.0041	0.0377	0.0000034
TOTAL	**230.33**	**228,973.06**	**9.88**	**12.14**	**0.68**	**0.13**	**1.02**	**1.14E-04**

[a]Utilize Low NOx Burners, capacity and throughput based on manufacturer specific information

Gem State Processing, LLC
Heyburn Facility

CRITERIA EMISSIONS - UNCONTROLLED NATURAL GAS COMBUSTION (tpy)

Emission Factors

NOx	0.036 lb/MMBtu	Manufacturer specific emission factor for 30 ppm A-FGR low NOx burner on boiler
CO	0.04 lb/MMBtu	Manufacturer specific emission factor for boiler
PM-10	0.001 lb/MMBtu	Manufacturer specific emission factor for boilers
SOx	0.00055 lb/MMBtu	Manufacturer specific emission factor for boilers
VOC	0.004 lb/MMBtu	Manufacturer specific emission factor for boilers
NOx	100 lb/10^6 scf	AP-42, Table 1.4-1, 1998
CO	84 lb/10^6 scf	AP-42, Table 1.4-1, 1998
PM-10	7.6 lb/10^6 scf	AP-42, Table 1.4-2, 1998
SOx	0.6 lb/10^6 scf	AP-42, Table 1.4-2, 1998
VOC	5.5 lb/10^6 scf	AP-42, Table 1.4-2, 1998
Lead	0.0005 lb/10^6 scf	AP-42, Table 1.4-2, 1998
CO2	120,000 lb/10^6 scf	AP-42, Table 1.4-2, 1998
N2O	0.64 lb/10^6 scf	AP-42, Table 1.4-2, 1998
CH4	2.3 lb/10^6 scf	AP-42, Table 1.4-2, 1998

Description	Capacity (MMBtu/hr)	Throughput (scf/hr)	Ton per Year					
			NOx Emissions (T/yr)	CO Emissions (T/yr)	PM2.5/PM-10 Emissions (T/yr)	SOx Emissions (T/yr)	VOC Emissions (T/yr)	Lead Emissions (T/yr)
Boiler #1[a] (1200 hp)	48.40	48,398	20.62	8.41	0.21	0.12	0.84	1.03E-04
Boiler #2[a] (1200 hp)	48.40	48,398	20.62	8.41	0.21	0.12	0.84	1.03E-04
Boiler #3[a] (1600 hp)	64.53	64,530	27.49	11.22	0.28	0.15	1.12	1.37E-04
Reyco AMU #1 850	9.0	8,824	2.33	1.95	0.18	0.01	0.13	1.16E-05
Reyco AMU #2 1000	9.0	8,824	2.33	1.95	0.18	0.01	0.13	1.16E-05
Reyco AMU #3 1000	9.0	8,824	2.33	1.95	0.18	0.01	0.13	1.16E-05
Reyco AMU #4 1250	10.0	9,804	2.58	2.17	0.20	0.02	0.14	1.29E-05
Reyco AMU #5 1250	9.0	8,824	2.33	1.95	0.18	0.01	0.13	1.16E-05
Reyco AMU#6 1250	9.0	8,824	2.33	1.95	0.18	0.01	0.13	1.16E-05
Bubble Sheet Dryer #1	7.0	6,863	2.92	2.46	0.22	0.02	0.16	1.46E-05
Bubble Sheet Dryer #2	7.0	6,863	2.92	2.46	0.22	0.02	0.16	1.46E-05
TOTAL	**230.33**	**228,973.06**	**88.78**	**44.89**	**2.23**	**0.51**	**3.91**	**4.4E-04**

[a]The boilers will be equipped with Low NOx Burners; however the calculations shown in this spreadsheet are the uncontrolled emissions using emissions factors from AP-42 for NOx and CO emissions from the boilers. Boiler capacity and throughput based on manufacturer specific information
Ton per year emissions based on 5270.4 hours of operation/yr for the AMUs and 8520 hrs/year for all other listed equipment.

Gem State Processing, LLC
Heyburn Facility

CRITERIA EMISSIONS - CONTROLLED NATURAL GAS COMBUSTION (tpy)

Emission Factors

NOx	0.036 lb/MMBtu	Manufacturer specific emission factor for 30 ppm A-FGR low NOx burner on boiler
CO	0.04 lb/MMBtu	Manufacturer specific emission factor for boiler
PM-10	0.001 lb/MMBtu	Manufacturer specific emission factor for boilers
SOx	0.00055 lb/MMBtu	Manufacturer specific emission factor for boilers
VOC	0.004 lb/MMBtu	Manufacturer specific emission factor for boilers
NOx	100 lb/10^6 scf	AP-42, Table 1.4-1, 1998
NOx	50 lb/10^6 scf	AP-42, Table 1.4-1, 1998, Low NOx
CO	84 lb/10^6 scf	AP-42, Table 1.4-1, 1998
PM-10	7.6 lb/10^6 scf	AP-42, Table 1.4-2, 1998
SOx	0.6 lb/10^6 scf	AP-42, Table 1.4-2, 1998
VOC	5.5 lb/10^6 scf	AP-42, Table 1.4-2, 1998
Lead	0.0005 lb/10^6 scf	AP-42, Table 1.4-2, 1998
CO2	120,000 lb/10^6 scf	AP-42, Table 1.4-2, 1998
N2O	0.64 lb/10^6 scf	AP-42, Table 1.4-2, 1998
CH4	2.3 lb/10^6 scf	AP-42, Table 1.4-2, 1998

Description	Capacity (MMBtu/hr)	Throughput (scf/hr)	Ton per Year					
			NOx Emissions (T/yr)	CO Emissions (T/yr)	PM2.5/PM-10 Emissions (T/yr)	SOx Emissions (T/yr)	VOC Emissions (T/yr)	Lead Emissions (T/yr)
Boiler #1[a] (1200 hp)	48.40	48,398	7.42	8.25	0.21	0.11	0.82	1.03E-04
Boiler #2[a] (1200 hp)	48.40	48,398	7.42	8.25	0.21	0.11	0.82	1.03E-04
Boiler #3[a] (1600 hp)	64.53	64,530	9.90	11.00	0.27	0.15	1.10	1.37E-04
Reyco AMU #1 850	9.0	8,824	1.16	1.95	0.18	0.01	0.13	1.16E-05
Reyco AMU #2 1000	9.0	8,824	1.16	1.95	0.18	0.01	0.13	1.16E-05
Reyco AMU #3 1000	9.0	8,824	1.16	1.95	0.18	0.01	0.13	1.16E-05
Reyco AMU #4 1250	10.0	9,804	1.29	2.17	0.20	0.02	0.14	1.29E-05
Reyco AMU #5 1250	9.0	8,824	1.16	1.95	0.18	0.01	0.13	1.16E-05
Reyco AMU #6 1250	9.0	8,824	1.16	1.95	0.18	0.01	0.13	1.16E-05
Bubble Sheet Dryer #1	7.0	6,863	2.92	2.46	0.22	0.02	0.16	1.46E-05
Bubble Sheet Dryer #2	7.0	6,863	2.92	2.46	0.22	0.02	0.16	1.46E-05
TOTAL	**230.3**	**228,973.1**	**37.7**	**44.3**	**2.2**	**0.5**	**3.9**	**4.4E-04**

[a]Utilize Low NOx Burners, capacity and throughput based on manufacturer specific information

Ton per year emissions based on 5270.4 hours of operation/yr for the AMUs and 8520 hrs/year for all other listed equipment.

Gem State Processing, LLC
Heyburn Facility

UNCONTROLLED PARTICULATE EMISSIONS - DRYERS, FLAKERS, AND BAGHOUSE EQUIPMENT

Description	Throughput (scfm)	Emission Factor (grain/scf)	EF Reference	PM Emissions (lb/hr)	PM Emissions (T/yr) [a]	PM-2.5/10 Emissions (lb/hr)	PM-2.5/10 Emissions (T/yr) [a]
Silo Bin Vent Baghouse #1	1,000	0.007	Manufacturer Guarantee	0.06	0.26	0.06	0.26
Silo Bin Vent Baghouse #2	1,000	0.007	Manufacturer Guarantee	0.06	0.26	0.06	0.26
Silo Bin Vent Baghouse #3	1,000	0.007	Manufacturer Guarantee	0.06	0.26	0.06	0.26
Silo Bin Vent Baghouse #4	1,000	0.007	Manufacturer Guarantee	0.06	0.26	0.06	0.26
Plant Reciever Baghouse #1 (Multi-Purpose)	1,200	0.007	Manufacturer Guarantee	0.07	0.31	0.07	0.31
Plant Reciever Baghouse #2 (Off-Spec)	1,200	0.007	Manufacturer Guarantee	0.07	0.31	0.07	0.31
Plant Reciever Baghouse #3 (Sack/Tote Pacing)	1,000	0.007	Manufacturer Guarantee	0.06	0.26	0.06	0.26
Plant Reciever Baghouse #4 (Bag Packing)	1,000	0.007	Manufacturer Guarantee	0.06	0.26	0.06	0.26
Plant Reciever Baghouse #5 (Pet Food)	1,000	0.007	Manufacturer Guarantee	0.06	0.26	0.06	0.26
Plant Reciever Baghouse #6 (Off-Spec #2)	1,200	0.007	Manufacturer Guarantee	0.07	0.31	0.07	0.31
Truck Loadout Baghouse	1,000	0.007	Manufacturer Guarantee	0.06	0.26	0.06	0.26
Rail Load Baghouse	1,000	0.007	Manufacturer Guarantee	0.06	0.26	0.06	0.26
Pneumatic Conveying Line[b]	1,000	0.007	Manufacturer Guarantee	0.06	0.26	0.06	0.26
Nuisance Dust Collector	See note f	See note f	Manufacturer Guarantee	0.324	1.380	0.324	1.380

Description	Throughput (lb/hr dry)	Emission Factor (lb/ton)	EF Reference	PM Emissions (lb/hr)	PM Emissions (T/yr) [a]	PM-2.5/10 Emissions (lb/hr)	PM-2.5/10 Emissions (T/yr) [a]
Drum Dryer Drum Fan Hood #1[c]	2250	0.63	Performance Test Results[g]	0.71	3.02	0.71	3.02
Drum Dryer Snifter Fan Drum#1[d]	1.125	0.02	Performance Test Results[g]	0.020	0.08520	0.02000	0.08520
Drum Dryer Drum Fan Hood #2[c]	2250	0.63	Performance Test Results[g]	0.71	3.02	0.71	3.02
Drum Dryer Snifter Fan Drum #2[d]	1.125	0.02	Performance Test Results[g]	0.020	0.08520	0.02000	0.08520
Drum Dryer Drum Fan Hood #3[c]	2250	0.63	Performance Test Results[g]	0.71	3.02	0.71	3.02
Drum Dryer Snifter Fan Drum #3[d]	1.125	0.02	Performance Test Results[g]	0.020	0.08520	0.02000	0.08520
Drum Dryer Drum Fan Hood #4[c]	2250	0.63	Performance Test Results[g]	0.71	3.02	0.71	3.02
Drum Dryer Snifter Fan Drum #4[d]	1.125	0.02	Performance Test Results[g]	0.020	0.08520	0.02000	0.08520
Drum Dryer Drum Fan Hood #5[c]	2250	0.63	Performance Test Results[g]	0.71	3.02	0.71	3.02
Drum Dryer Snifter Fan Drum #5[d]	1.125	0.02	Performance Test Results[g]	0.020	0.08520	0.02000	0.08520
Drum Dryer Drum Fan Hood #6[c]	2250	0.63	Performance Test Results[g]	0.71	3.02	0.71	3.02
Drum Dryer Snifter Fan Drum #6[d]	1.125	0.02	Performance Test Results[g]	0.020	0.08520	0.02000	0.08520
Bubble Sheet Dryer #1[l]	3300	0.43	Performance Test Results[h]	0.71	3.02	0.71	3.02
Bubble Sheet Dryer #2[l]	0	0.43	Performance Test Results[h]	0.00	0.00	0.00	0.00
TOTAL[e]	30,407			6	26	6	26

[a] Ton per year emissions based on 8,520 hours of operation/yr

[b] The Pneumatic Conveying Line includes the baghouse on each drum dryer used to convey product to the packaging recievers.

[c] Based on engineering judgement from review of various references, drum fan hood emissions comprise approximately 90.6% of drum dryer emissions. Snifter fan drum emissions comprise approximately 9.4% of drum dryer emissions; the emission factor (lb/ton) was calculated to reflect this ratio.

[d] The total lb/hr emission rate from the Drum Dryer Snifter Fans was determined based on model sensitivity analysis. This is the maximum emission rate the snifter fans can emit in order for the facility to be in compliance with the PM10 NAAQs standards.

[e] Only one of the four Silo Bin Vents will operate at one time.

[f] The nuisance dust collector will collect fugitive dust from other emissions sources that discharge inside the building including the reject silo baghouse, plant reciever baghouses, and truck loadout baghouse.

[g] Emission Factor was established by June 20-21, 2011 Performance Test

[h] Emission Factor was established by September 21, 2011 Performance Test

7/27 8/11 11/9

[l] A total of 18% of the flakes will flow through the fluidized bed dryers (9% each)

Gem State Processing, LLC
Heyburn Facility

CONTROLLED PARTICULATE EMISSIONS - DRYERS, FLAKERS, AND BAGHOUSE EQUIPMENT

Description	Throughput (scfm)	Emission Factor (grain/scf)	EF Reference	PM Emissions (lb/hr)	PM Emissions (T/yr) [a]	PM-10/PM2.5 Emissions (lb/hr)	PM-10/PM-2.5 Emissions (T/yr)
Silo Bin Vent Baghouse #1	1,000	0.007	Manufacturer Guarantee	0.06	0.26	0.06	0.26
Silo Bin Vent Baghouse #2	1,000	0.007	Manufacturer Guarantee	0.06	0.26	0.06	0.26
Silo Bin Vent Baghouse #3	1,000	0.007	Manufacturer Guarantee	0.06	0.26	0.06	0.26
Silo Bin Vent Baghouse #4	1,000	0.007	Manufacturer Guarantee	0.06	0.26	0.06	0.26
Plant Reciever Baghouse #1 (Multi-Purpose)	1,200	0.007	Manufacturer Guarantee	0.07	0.31	0.07	0.31
Plant Reciever Baghouse #2 (Off-Spec)	1,200	0.007	Manufacturer Guarantee	0.07	0.31	0.07	0.31
Plant Reciever Baghouse #3 (Sack/Tote Pacing)	1,000	0.007	Manufacturer Guarantee	0.06	0.26	0.06	0.26
Plant Reciever Baghouse #4 (Bag Packing)	1,000	0.007	Manufacturer Guarantee	0.06	0.26	0.06	0.26
Plant Reciever Baghouse #5 (Pet Food)	1,200	0.007	Manufacturer Guarantee	0.07	0.31	0.07	0.31
Plant Reciever Baghouse #6 (Off-Spec#2)	1,000	0.007	Manufacturer Guarantee	0.06	0.26	0.06	0.26
Truck Loadout Baghouse	1,000	0.007	Manufacturer Guarantee	0.06	0.26	0.06	0.26
Rail Load Baghouse	1,000	0.007	Manufacturer Guarantee	0.06	0.26	0.06	0.26
Pneumatic Conveying Line[b]	1,000	0.007	Manufacturer Guarantee	0.06	0.26	0.06	0.26
Nuisance Dust Collector	See note f	See note f	Manufacturer Guarantee	0.0003	0.001	0.0003	0.001

Description	Throughput (lb/hr dry)	Emission Factor (lb/ton)	EF Reference	PM Emissions (lb/hr)	PM Emissions (T/yr)	PM-10/PM2.5 Emissions (lb/hr)	PM-10/PM-2.5 Emissions (T/yr)
Drum Dryer Drum Fan Hood #1[c]	2250	0.63	Performance Test Results[g]	0.71	3.02	0.71	3.02
Drum Dryer Snifter Fan Drum#1[d]	1.125	0.02	Performance Test Results[g]	0.020	0.08520	0.02000	0.08520
Drum Dryer Drum Fan Hood #2[c]	2250	0.63	Performance Test Results[g]	0.71	3.02	0.71	3.02
Drum Dryer Snifter Fan Drum #2[d]	1.125	0.02	Performance Test Results[g]	0.020	0.08520	0.02000	0.08520
Drum Dryer Drum Fan Hood #3[c]	2250	0.63	Performance Test Results[g]	0.71	3.02	0.71	3.02
Drum Dryer Snifter Fan Drum #3[d]	1.125	0.02	Performance Test Results[g]	0.020	0.08520	0.02000	0.08520
Drum Dryer Drum Fan Hood #4[c]	2250	0.63	Performance Test Results[g]	0.71	3.02	0.71	3.02
Drum Dryer Snifter Fan Drum #4[d]	1.125	0.02	Performance Test Results[g]	0.020	0.08520	0.02000	0.08520
Drum Dryer Drum Fan Hood #5[c]	2250	0.63	Performance Test Results[g]	0.71	3.02	0.71	3.02
Drum Dryer Snifter Fan Drum #5[d]	1.125	0.02	Performance Test Results[g]	0.020	0.08520	0.02000	0.08520
Drum Dryer Drum Fan Hood #6[c]	2250	0.63	Performance Test Results[g]	0.71	3.02	0.71	3.02
Drum Dryer Snifter Fan Drum #6[d]	1.125	0.02	Performance Test Results[g]	0.020	0.08520	0.02000	0.08520
Bubble Sheet Dryer #1[i]	3300	0.43	Performance Test Results[h]	0.71	3.02	0.71	3.02
Bubble Sheet Dryer #2[i]	0	0.43	Performance Test Results[h]	0.00	0.00	0.00	0.00
TOTAL[e]	30,407			6	24	6	24

[a] Ton per year emissions based on 8,520 hours of operation/yr

[b] The Pneumatic Conveying Line includes the baghouse on each drum dryer used to convey product to the packaging recievers.

[c] Based on engineering judgement from review of various references, drum fan hood emissions comprise approximately 90.6% of drum dryer emissions. Snifter fan drum emissions comprise approximately 9.4% of drum dryer emissions; the emission factor (lb/ton) was calculated to reflect this ratio.

[d] The total lb/hr emission rate from the Drum Dryer Snifter Fans was determined based on model sensitivity analysis. This is the maximum emission rate the snifter fans can emit in order for the facility to be in compliance with the PM10 NAAQs standards.

[e] Only one of the four Silo Bin Vents will operate at one time.

[f] The nuisance dust collector will collect fugitive dust from other emissions sources that discharge inside the building including the reject silo baghouse, plant reciever baghouses, and truck loadout baghouse.

[g] Emission Factor was established by June 20-21, 2011 Performance Test

[h] Emission Factor was established by September 21, 2011 Performance Test

[i] A total of 18% of the flakes will flow through the fluidized bed dryers (9% each)

Gem State Processing, LLC
Heyburn Facility

UNCONTROLLED CRITERIA POLLUTANTS POTENTIAL TO EMIT

	Fuel Combustion of Natural Gas											
	NOx Emissions		CO Emissions		PM-2.5/10 Emissions		SOx Emissions		VOC Emissions		Lead Emissions	
Description	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr
Boiler #1 (1200 hp)	4.840	20.617	1.975	8.412	0.049	0.210	0.027	0.116	0.197	0.841	0.000	0.000
Boiler #2 (1200 hp)	4.840	20.617	1.975	8.412	0.049	0.210	0.027	0.116	0.197	0.841	0.000	0.000
Boiler #3 (1600 hp)	6.453	27.490	2.633	11.216	0.066	0.280	0.036	0.154	0.263	1.122	0.000	0.000
Reyco AMU #1 850	0.882	2.325	0.741	1.953	0.067	0.177	0.005	0.014	0.049	0.128	0.000	0.000
Reyco AMU #2 1000	0.882	2.325	0.741	1.953	0.067	0.177	0.005	0.014	0.049	0.128	0.000	0.000
Reyco AMU #3 1000	0.882	2.325	0.741	1.953	0.067	0.177	0.005	0.014	0.049	0.128	0.000	0.000
Reyco AMU #4 1250	0.980	2.584	0.824	2.170	0.075	0.196	0.006	0.016	0.054	0.142	0.000	0.000
Reyco AMU #5 1250	0.882	2.325	0.741	1.953	0.067	0.177	0.005	0.014	0.049	0.128	0.000	0.000
Reyco AMU #6 1250	0.882	2.325	0.741	1.953	0.067	0.177	0.005	0.014	0.049	0.128	0.000	0.000
Bubble Sheet Dryer #1	0.686	2.924	0.576	2.456	0.052	0.222	0.004	0.018	0.038	0.161	0.000	0.000
Bubble Sheet Dryer #2	0.686	2.924	0.576	2.456	0.052	0.222	0.004	0.018	0.038	0.161	0.000	0.000

	Particulate Equipment											
	NOx Emissions		CO Emissions		PM-2.5/10 Emissions		SOx Emissions		VOC Emissions		Lead Emissions	
Description	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr
Silo Bin Vent Baghouse #1					0.06	0.26						
Silo Bin Vent Baghouse #2					0.06	0.26						
Silo Bin Vent Baghouse #3					0.06	0.26						
Silo Bin Vent Baghouse #4					0.06	0.26						
Plant Reciever Baghouse #1					0.07	0.31						
Plant Reciever Baghouse #2					0.07	0.31						
Plant Reciever Baghouse #3					0.06	0.26						
Plant Reciever Baghouse #4					0.06	0.26						
Plant Reciever Baghouse #5					0.06	0.26						
Plant Reciever Baghouse #6					0.07	0.31						
Truck Loadout Baghouse					0.06	0.26						
Rail Load Baghouse					0.06	0.26						
Pneumatic Conveying Line Baghouse					0.06	0.26						
Nuisance Dust Collector					0.32	1.38						
Drum Dryer Drum Fan Hood #1					0.71	3.02						
Drum Dryer Snifter Fan Drum #1					0.02000	0.0852						
Drum Dryer Drum Fan Hood #2					0.71	3.02						
Drum Dryer Snifter Fan Drum #2					0.02000	0.0852						
Drum Dryer Drum Fan Hood #3					0.71	3.02						
Drum Dryer Snifter Fan Drum #3					0.02000	0.0852						
Drum Dryer Drum Fan Hood #4					0.71	3.02						
Drum Dryer Snifter Fan Drum #4					0.02000	0.0852						
Drum Dryer Drum Fan Hood #5					0.71	3.02						
Drum Dryer Snifter Fan Drum #5					0.02000	0.0852						
Drum Dryer Drum Fan Hood #6					0.71	3.02						
Drum Dryer Snifter Fan Drum #6					0.02000	0.0852						
Bubble Sheet Dryer #1					0.71	3.02						
Bubble Sheet Dryer #2					0.00	0.00						

	NOx Emissions		CO Emissions		PM-2.5/10 Emissions		SOx Emissions		VOC Emissions		Lead Emissions	
	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr
TOTAL	22.90	88.78	12.26	44.89	6.72	27.96	0.13	0.51	1.03	3.91	0.0001	0.0001

Gem State Processing, LLC
Heyburn Facility

CONTROLLED CRITERIA POLLUTANTS POTENTIAL TO EMIT

	Fuel Combustion of Natural Gas											
	NOx Emissions		CO Emissions		PM-2.5/10 Emissions		SOx Emissions		VOC Emissions		Lead Emissions	
Description	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr
Boiler #1 (1200 hp)	1.742	7.422	1.936	8.247	0.048	0.206	0.027	0.113	0.194	0.825	0.000	0.000
Boiler #2 (1200 hp)	1.742	7.422	1.936	8.247	0.048	0.206	0.027	0.113	0.194	0.825	0.000	0.000
Boiler #3 (1600 hp)	2.323	9.896	2.581	10.996	0.065	0.275	0.035	0.151	0.258	1.100	0.000	0.000
Reyco AMU #1 850	0.441	1.163	0.741	1.953	0.067	0.177	0.005	0.014	0.049	0.128	0.000	0.000
Reyco AMU #2 1000	0.441	1.163	0.741	1.953	0.067	0.177	0.005	0.014	0.049	0.128	0.000	0.000
Reyco AMU #3 1000	0.441	1.163	0.741	1.953	0.067	0.177	0.005	0.014	0.049	0.128	0.000	0.000
Reyco AMU #4 1250	0.490	1.292	0.824	2.170	0.075	0.196	0.006	0.016	0.054	0.142	0.000	0.000
Reyco AMU #5 1250	0.441	1.163	0.741	1.953	0.067	0.177	0.005	0.014	0.049	0.128	0.000	0.000
Reyco AMU #6 1250	0.441	1.163	0.741	1.953	0.067	0.177	0.005	0.014	0.049	0.128	0.000	0.000
Bubble Sheet Dryer #1	0.686	2.924	0.576	2.456	0.052	0.222	0.004	0.018	0.038	0.161	0.000	0.000
Bubble Sheet Dryer #2	0.686	2.924	0.576	2.456	0.052	0.222	0.004	0.018	0.038	0.161	0.000	0.000
Dehydration Units	1.150	4.899	2.364	10.071	0.243	1.034	0.019	0.082	0.176	0.748	0.000	0.000

	Particulate Equipment											
	NOx Emissions		CO Emissions		PM-2.5/10 Emissions		SOx Emissions		VOC Emissions		Lead Emissions	
Description	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr
Silo Bin Vent Baghouse #1					0.06	0.26						
Silo Bin Vent Baghouse #2					0.06	0.26						
Silo Bin Vent Baghouse #3					0.06	0.26						
Silo Bin Vent Baghouse #4					0.06	0.26						
Plant Reciever Baghouse #1					0.07	0.31						
Plant Reciever Baghouse #2					0.07	0.31						
Plant Reciever Baghouse #3					0.06	0.26						
Plant Reciever Baghouse #4					0.06	0.26						
Plant Reciever Baghouse #5					0.07	0.31						
Plant Reciever Baghouse #6					0.06	0.26						
Truck Loadout Baghouse					0.06	0.26						
Rail Load Baghouse					0.06	0.26						
Pneumatic Conveying Line Baghouse					0.06	0.26						
Nuisance Dust Collector					0.0003	0.0014						
Drum Dryer Drum Fan Hood #1					0.71	3.02						
Drum Dryer Snifter Fan Drum #1					0.02000	0.08520						
Drum Dryer Drum Fan Hood #2					0.71	3.02						
Drum Dryer Snifter Fan Drum #2					0.02000	0.08520						
Drum Dryer Drum Fan Hood #3					0.71	3.02						
Drum Dryer Snifter Fan Drum #3					0.02000	0.08520						
Drum Dryer Drum Fan Hood #4					0.71	3.02						
Drum Dryer Snifter Fan Drum #4					0.02000	0.08520						
Drum Dryer Drum Fan Hood #5					0.71	3.02						
Drum Dryer Snifter Fan Drum #5					0.02000	0.08520						
Drum Dryer Drum Fan Hood #6					0.71	3.02						
Drum Dryer Snifter Fan Drum #6					0.02000	0.08520						
Bubble Sheet Dryer #1					0.71	3.02						
Bubble Sheet Dryer #2					0.00	0.00						
Dehydration Units					1.75	7.44						
Total of Drum Dryer, snifter, Bubble sheet					**5.13**	**21.87**						

	NOx Emissions		CO Emissions		PM-2.5/10 Emissions		SOx Emissions		VOC Emissions		Lead Emissions	
	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr
TOTAL	11.03	42.59	14.50	54.41	8.56	35.81	0.15	0.58	1.19	4.60	0.00	0.00

Gem State Processing, LLC
Heyburn Facility

TOXIC AIR POLLUTANTS (TAPs) COMBUSTION CALCULATIONS
GEM STATE

Emission Unit	Fuel Usage
Reyco AMU #5 1250	8,823.53 scf/hr
Reyco AMU #6 1250	8,823.53 scf/hr

NON-CARCINOGENS (POUNDS PER HOUR)

Pollutant	CAS #	EF for NG Combustion ($lb/10^6$ scf)[a]	TAP Emissions (lb/hr)	Screening Level (lb/hr)	Modeling? (Y/N)
Antimony	7440-36-0	0.0E+00	0.00E+00	3.3E-02	No
Barium	7440-39-3	4.4E-03	7.76E-05	3.3E-02	No
Chromium	7440-47-3	1.4E-03	2.47E-05	3.3E-02	No
Cobalt	7440-48-4	8.4E-05	1.48E-06	3.3E-03	No
Copper	7440-50-8	8.5E-04	1.50E-05	6.7E-02	No
Ethylbenzene	100-41-4	0.0E+00	0.00E+00	2.9E+01	No
Fluoride (as F)	16984-48-8	0.0E+00	0.00E+00	1.67E-01	No
Hexane	110-54-3	1.8E+00	3.18E-02	1.2E+01	No
Manganese	7439-96-5	3.8E-04	6.71E-06	3.33E-01	No
Mercury	7439-97-6	2.6E-04	4.59E-06	3.E-03	No
Molybdenum	7439-98-7	1.1E-03	1.94E-05	3.33E-01	No
Naphthalene	91-20-3	6.1E-04	1.08E-05	3.33E+00	No
Pentane	109-66-0	2.6E+00	4.59E-02	1.18E+02	No
Phosphorous	7723-14-0	0.0E+00	0.00E+00	7.E-03	No
Selenium	7782-49-2	2.4E-05	4.24E-07	1.3E-02	No
1,1,1-Trichloroethane	71-55-6	0.0E+00	0.00E+00	1.27E+02	No
Toluene	108-88-3	3.4E-03	6.00E-05	2.5E+01	No
o-Xylene	1330-20-7	0.0E+00	0.00E+00	2.9E+01	No
Zinc	7440-66-6	2.9E-02	5.12E-04	6.67E-01	No

CARCINOGENS (POUNDS PER HOUR)

Pollutant	CAS #	EF for Natural Gas Combustion ($lb/10^6$ scf)[a]	Max 1-hr TAP Emissions (lb/hr)	Annual Average (lb/hr)	Screening Level (lb/hr)	Modeling? (Y/N)
Arsenic	7440-38-2	2.0E-04	3.53E-06	2.12E-06	1.5E-06	Yes
Benzene	71-43-2	2.1E-03	3.71E-05	2.23E-05	8.0E-04	No
Beryllium	7440-41-7	1.2E-05	2.12E-07	1.27E-07	2.8E-05	No
Cadmium	7440-43-9	1.1E-03	1.94E-05	1.17E-05	3.7E-06	Yes
Chromium VI	7440-47-3	0.0E+00	0.00E+00	0.00E+00	5.6E-07	No
Formaldehyde	50-00-0	7.5E-02	1.32E-03	7.96E-04	5.1E-04	Yes
Nickel	7440-02-0	2.1E-03	3.71E-05	2.23E-05	2.7E-05	No
Benzo(a)pyrene	50-32-8	1.2E-06	2.12E-08	1.27E-08	2.0E-06	No
Benz(a)anthracene	56-55-3	1.8E-06	3.18E-08	1.91E-08	NA	No
Benzo(b)fluoranthene	205-82-3	1.8E-06	3.18E-08	1.91E-08	NA	No
Benzo(k)fluoranthene	205-99-2	1.8E-06	3.18E-08	1.91E-08	NA	No
Chrysene	218-01-9	1.8E-06	3.18E-08	1.91E-08	NA	No
Dibenzo(a,h)anthracene	53-70-3	1.2E-06	2.12E-08	1.27E-08	NA	No
Indeno(1,2,3-cd)pyrene	193-39-5	1.8E-06	3.18E-08	1.91E-08	NA	No
Total PAHs		1.1E-05	2.01E-07	1.21E-07	2.00E-06	No

[a]EFs from AP-42, Tables 1.4-3 and 1.4-4, 7/98

[b]EFs from AP-42, Table 1.3-10, 9/98

AIR MAKEUP UNITS - EXHAUST STACK EMISSIONS DISTRIBUTION

Area	Emissions Sources	Emissions					
		PM2.5/10 (lb/hr)	PM2.5/10 (tpy)	NOx (lb/hr)	NOx (tpy)	SO2 (lb/hr)	CO (lb/hr)
Zone #1	AMU-1	6.71E-02	1.77E-01	4.41E-01	1.16E+00	5.29E-03	7.41E-01
	AMU-2	6.71E-02	1.77E-01	4.41E-01	1.16E+00	5.29E-03	7.41E-01
	AMU-3	6.71E-02	1.77E-01	4.41E-01	1.16E+00	5.29E-03	7.41E-01
	Total	***2.01E-01***	***5.30E-01***	***1.32E+00***	***3.49E+00***	***1.59E-02***	***2.22E+00***
Zone #2	AMU-4	7.45E-02	1.96E-01	4.90E-01	1.29E+00	5.88E-03	8.24E-01
	Total	***7.45E-02***	***1.96E-01***	***4.90E-01***	***1.29E+00***	***5.88E-03***	***8.24E-01***
Zone #3	AMU-5	6.71E-02	1.77E-01	4.41E-01	1.16E+00	5.29E-03	7.41E-01
	AMU-6	6.71E-02	1.77E-01	4.41E-01	1.16E+00	5.29E-03	7.41E-01
	Total	***1.34E-01***	***3.53E-01***	***8.82E-01***	***2.33E+00***	***1.06E-02***	***1.48E+00***

Area	Exhaust Stack	Exhaust Flow (acfm)	% of Flow	Emissions									
				PM2.5/10 (lb/hr)	PM2.5/10 (tpy)	NOx (lb/hr)	NOx (tpy)	SO2 (lb/hr)	As (lb/hr)	Cd (lb/hr)	Form (lb/hr)	Ni (lb/hr)	CO (lb/hr)
Zone #1	EX-1	24225	0.217889908	4.38E-02	1.16E-01	2.88E-01	7.60E-01	3.46E-03					4.84E-01
	EX-2	24225	0.217889908	4.38E-02	1.16E-01	2.88E-01	7.60E-01	3.46E-03					4.84E-01
	EX-3	24225	0.217889908	4.38E-02	1.16E-01	2.88E-01	7.60E-01	3.46E-03					4.84E-01
	EX-4	7140	0.064220183	1.29E-02	3.40E-02	8.50E-02	2.24E-01	1.02E-03					1.43E-01
	EX-5	7140	0.064220183	1.29E-02	3.40E-02	8.50E-02	2.24E-01	1.02E-03					1.43E-01
	EX-6	24225	0.217889908	4.38E-02	1.16E-01	2.88E-01	7.60E-01	3.46E-03					4.84E-01
	Total	*111180*	*1*	*2.01E-01*	*5.30E-01*	*1.32E+00*	*3.49E+00*	1.59E-02					2.22E+00
Zone #2	EX-7	4000	0.037394011	2.79E-03	7.34E-03	1.83E-02	4.83E-02	2.20E-04					3.08E-02
	EX-8	7000	0.06543952	4.88E-03	1.28E-02	3.21E-02	8.45E-02	3.85E-04					5.39E-02
	EX-9	7000	0.06543952	4.88E-03	1.28E-02	3.21E-02	8.45E-02	3.85E-04					5.39E-02
	EX-10	17281	0.161551478	1.20E-02	3.17E-02	7.92E-02	2.09E-01	9.50E-04					1.33E-01
	EX-11	17281	0.161551478	1.20E-02	3.17E-02	7.92E-02	2.09E-01	9.50E-04					1.33E-01
	EX-12	17281	0.161551478	1.20E-02	3.17E-02	7.92E-02	2.09E-01	9.50E-04					1.33E-01
	EX-13	18563	0.173536258	1.29E-02	3.41E-02	8.51E-02	2.24E-01	1.02E-03					1.43E-01
	EX-14	18563	0.173536258	1.29E-02	3.41E-02	8.51E-02	2.24E-01	1.02E-03					1.43E-01
	Total	*106969*	*1*	*7.45E-02*	*1.96E-01*	*4.90E-01*	*1.29E+00*	5.88E-03					8.24E-01
Zone #3	EX-15	18000	0.5	6.71E-02	1.77E-01	4.41E-01	1.16E+00	5.29E-03	1.06E-06	5.84E-06	3.98E-04	1.11E-05	7.41E-01
	EX-16	18000	0.5	6.71E-02	1.77E-01	4.41E-01	1.16E+00	5.29E-03	1.06E-06	5.84E-06	3.98E-04	1.11E-05	7.41E-01
	Total	*36000*	*1*	*1.34E-01*	*3.53E-01*	*8.82E-01*	*2.33E+00*	*1.06E-02*	*2.12E-06*	*1.17E-05*	*7.96E-04*	*2.23E-05*	1.48E+00

Gem State Processing, LLC
Heyburn Facility

HAZARDOUS AIR POLLUTANTS (HAPs) COMBUSTION CALCULATIONS
GEM STATE

Emission Unit	Fuel Usage	
Boiler #1[a] (1200 hp)	48,398.00 scf/hr	247,980.35
Boiler #2[a] (1200 hp)	48,398.00 scf/hr	11,764.71
Boiler #3[a] (1600 hp)	64,530.00 scf/hr	259,745.06
Reyco AMU #1 850	8,823.53 scf/hr	
Reyco AMU #2 1000	8,823.53 scf/hr	95.47%
Reyco AMU #3 1000	8,823.53 scf/hr	4.53%
Reyco AMU #4 1250	9,803.92 scf/hr	
Reyco AMU #5 1250	9,803.92 scf/hr	
Reyco AMU #6 1250	9,803.92 scf/hr	
Bubble Sheet Dryer #1	5,882.35 scf/hr	
Bubble Sheet Dryer #2	5,882.35 scf/hr	
Dryer #1 Stage A Stack 1 &	11,052.00 scf/hr	
Dryer #1 Stage B Stack 3	3,747.00 scf/hr	
Dryer #1 Stage C Stack 4	1,174.00 scf/hr	
Dryer #2 Stage A Stack 1 &	11,052.00 scf/hr	
Dryer #2 Stage B Stack 3	3,747.00 scf/hr	

Pollutant	CAS #	EF for NG Combustion (lb/10^6 scf)[a]	HAP Emissions (lb/hr)
Chromium	7440-47-3	1.4E-03	3.64E-04
Cobalt	7440-48-4	8.4E-05	2.18E-05
Hexane	110-54-3	1.8E+00	4.68E-01
Manganese	7439-96-5	3.8E-04	9.87E-05
Mercury	7439-97-6	2.6E-04	6.75E-05
Naphthalene	91-20-3	6.1E-04	1.58E-04
Selenium	7782-49-2	2.4E-05	6.23E-06
Toluene	108-88-3	3.4E-03	8.83E-04
Arsenic	7440-38-2	2.0E-04	5.19E-05
Benzene	71-43-2	2.1E-03	5.45E-04
Beryllium	7440-41-7	1.2E-05	3.12E-06
Cadmium	7440-43-9	1.1E-03	2.86E-04
Formaldehyde	50-00-0	7.5E-02	1.95E-02
Nickel	7440-02-0	2.1E-03	5.45E-04

[a]EFs from AP-42, Tables 1.4-3 and 1.4-4, 7/98

[b]EFs from AP-42, Table 1.3-10, 9/98

Description	Capacity (MMBtu/hr)	Throughput (scf/hr)	Pounds per Hour		
			CO_2 Emissions (lb/hr)	N_2O Emissions (lb/hr)	CH_4 Emissions (lb/hr)
Boiler #1[a] (1200 hp)	49.37	48,398	5807.7120	0.0310	0.1113
Boiler #2[a] (1200 hp)	49.37	48,398	5807.7120	0.0310	0.1113
Boiler #3[a] (1600 hp)	64.53	64,530	7743.6000	0.0413	0.1484
Reyco AMU #1 850	9.0	8,824	1058.8235	0.0194	0.0203
Reyco AMU #2 1000	9.0	8,824	1058.8235	0.0194	0.0203
Reyco AMU #3 1000	9.0	8,824	1058.8235	0.0194	0.0203
Reyco AMU #4 1250	10.0	9,804	1176.4706	0.0216	0.0225
Reyco AMU #5 1250	9.0	8,824	1058.8235	0.0194	0.0203
Reyco AMU #6 1250	9.0	8,824	1058.8235	0.0194	0.0203
Bubble Sheet Dryer #1	7.0	6,863	823.5294	0.0151	0.0158
Bubble Sheet Dryer #2	7.0	6,863	823.5294	0.0151	0.0158
Dryer #1 Stage A Stack 1 & 2[a]	18.0	11,052	1326.2400	0.0071	0.0254
Dryer #1 Stage B Stack 3[a]	6.0	3,747	449.6400	0.0024	0.0086
Dryer #1 Stage C Stack 4[a]	2.2	1,174	140.8800	0.0008	0.0027
Dryer #2 Stage A Stack 1 & 2[a]	18.0	11,052	1326.2400	0.0071	0.0254
Dryer #2 Stage B Stack 3[a]	6.0	3,747	449.6400	0.0024	0.0086
Dryer #2 Stage C Stack 4[a]	2.2	1,174	140.8800	0.0008	0.0027
TOTAL	**284.7**	**260,918.3**	**31,310.2**	**0.27**	**0.60**

[a]The boilers and dehydrators will be equipped with Low NOx Burners; and controlled emissions using emissions factors from AP-42 for N2O emissions from the boilers. Boiler capacity and throughput based on manufacturer specific information

Description	Capacity (MMBtu/hr)	Throughput (MMscf/yr)	Tons per Year			
			CO_2 Emissions (T/yr)[b]	N_2O Emissions (T/yr)[b]	CH_4 Emissions (T/yr)[b]	CO_2e Emission (metric T/yr)[c,d]
Boiler #1[a] (1200 hp)	49.37	412	24740.8531	0.1320	0.4742	22490.59
Boiler #2[a] (1200 hp)	49.37	412	24740.8531	0.1320	0.4742	22490.95
Boiler #3[a] (1600 hp)	64.53	550	32987.7360	0.1759	0.6323	29987.87
Reyco AMU #1 850	9.00	47	2790.2118	0.0827	0.0865	2555.55
Reyco AMU #2 1000	9.00	47	2790.2118	0.0827	0.0865	2555.55
Reyco AMU #3 1000	9.00	47	2790.2118	0.0827	0.0865	2555.55
Reyco AMU #4 1250	10.00	52	3100.2353	0.0919	0.0961	2839.50
Reyco AMU #5 1250	9.00	47	2790.2118	0.0827	0.0865	2555.55
Reyco AMU #6 1250	9.00	47	2790.2118	0.0827	0.0865	2555.55
Bubble Sheet Dryer #1	7.00	58	3508.2353	0.0643	0.0672	3201.53
Bubble Sheet Dryer #2	7.00	58	3508.2353	0.0643	0.0672	3201.53
Dryer #1 Stage A Stack 1 & 2[a]	18.00	94	5649.7824	0.0301	0.1083	5136.00
Dryer #1 Stage B Stack 3[a]	6.00	32	1915.4664	0.0102	0.0367	1741.28
Dryer #1 Stage C Stack 4[a]	2.20	10	600.1488	0.0032	0.0115	545.57
Dryer #2 Stage A Stack 1 & 2[a]	18.00	94	5649.7824	0.0301	0.1083	5136.00
Dryer #2 Stage B Stack 3[a]	6.00	32	1915.4664	0.0102	0.0367	1741.28
Dryer #2 Stage C Stack 4[a]	2.20	10	600.1488	0.0032	0.0115	545.57
TOTAL	**284.7**	**2,047.8**	**122,868.00**	**1.16**	**2.56**	**111,835.44**

[a]The boilers and dehydrators will be equipped with Low NOx Burners; and controlled emissions using emissions factors from AP-42 for N2O emissions from the boilers. Boiler capacity and throughput based on manufacturer specific information

[b]All natural gas combustion units with the execption of AMUs are assumed to opperate 8,520 hours per year as was previously assumed in the last permitting action. AMU's are operational for 5270.4 hr/yr

[c]The greenhouse gas emissions calcuations uses carbon dioxide equivalent in metric tons rather than short tons. Therefore the conversion of 1 short ton equal to 0.90718474 metric tons was applied. This is consistent with EPA guidance and calculation methods.

[d]Note that the global warming potential values used in the CO2e calculation were derived from Table A-1 of the Appendix within Part 98 of the Manadory GHG Reporting Rule.

IDEQ PTC Forms
Facility Wide Potential to Emit Emission Inventory

Table 1. POTENTIAL TO EMIT FOR NSR REGULATED POLLUTANTS

Emissions Unit	EU ID #	NSR Pollutant[a]							
		PM	PM-10	PM2.5	CO	Pb	NOx	VOC	SO2
		T/yr[b]	T/yr[b]	T/yr[b]	T/yr[b]	T/yr[b]	T/yr[b]	T/yr[b]	T/yr[b]
Point Sources									
Boiler #1 (1200 hp)	EU -1	0.21	0.21	0.21	8.25	1.03E-04	7.42	0.82	0.11
Boiler #2 (1200 hp)	EU -2	0.21	0.21	0.21	8.25	1.03E-04	7.42	0.82	0.11
Boiler #3 (1600 hp)	EU -3	0.27	0.27	0.27	11.00	1.37E-04	9.90	1.10	0.15
Bubble Sheet Dryer #1	EU -4	3.24	3.24	3.24	2.456	1.46E-05	2.92	0.16	0.02
Bubble Sheet Dryer #2	EU -5	0.22	0.22	0.22	2.456	1.46E-05	2.92	0.16	0.02
Reyco AMU #1 850	EU -6	0.18	0.18	0.18	1.953	1.16E-05	1.16	0.13	0.01
Reyco AMU #2 1000	EU -7	0.18	0.18	0.18	1.953	1.16E-05	1.16	0.13	0.01
Reyco AMU #3 1000	EU -8	0.18	0.18	0.18	1.953	1.16E-05	1.16	0.13	0.01
Reyco AMU #4 1250	EU -9	0.20	0.20	0.20	2.170	1.29E-05	1.29	0.14	0.02
Reyco AMU #5 1250	EU -10	0.18	0.18	0.18	1.953	1.16E-05	1.16	0.13	0.01
Reyco AMU #6 1250	EU -11	0.18	0.18	0.18	1.953	1.16E-05	1.16	0.13	0.01
Wolverine Stage A Stack #1 Dryer1	EU -12	1.10	1.10	1.10	2.238	1.512E-05	1.09	0.17	1.81E-02
Wolverine Stage A Stack #2 Dryer1	EU -13	0.61	0.61	0.61	1.246	8.418E-06	0.61	0.09	1.01E-02
Wolverine Stage B Dryer1	EU -14	0.93	0.93	0.93	1.181	7.981E-06	0.57	0.09	9.58E-03
Wolverine Stage C Dryer1	EU -15	1.59	1.59	1.59	0.370	2.501E-06	0.18	0.03	3.00E-03
Wolverine Stage A Stack #1 Dryer2	EU -16	1.10	1.10	1.10	2.238	1.512E-05	1.09	0.17	1.81E-02
Wolverine Stage A Stack #2 Dryer2	EU -17	0.61	0.61	0.61	1.246	8.418E-06	0.61	0.09	1.01E-02
Wolverine Stage B Dryer2	EU -18	0.93	0.93	0.93	1.181	7.981E-06	0.57	0.09	9.58E-03
Wolverine Stage C Dryer2	EU -19	1.59	1.59	1.59	0.370	2.501E-06	0.18	0.03	3.00E-03
Silo Bin Vent Baghouse #1	EU -20	0.26	0.26	0.26	n/a	n/a	n/a	n/a	n/a
Silo Bin Vent Baghouse #2	EU -21	0.26	0.26	0.26	n/a	n/a	n/a	n/a	n/a
Silo Bin Vent Baghouse #3	EU -22	0.26	0.26	0.26	n/a	n/a	n/a	n/a	n/a
Silo Bin Vent Baghouse #4	EU -23	0.26	0.26	0.26	n/a	n/a	n/a	n/a	n/a
Plant Reciever Baghouse #1	EU -24	0.31	0.31	0.31	n/a	n/a	n/a	n/a	n/a
Plant Reciever Baghouse #2	EU -25	0.31	0.31	0.31	n/a	n/a	n/a	n/a	n/a
Plant Reciever Baghouse #3	EU -26	0.26	0.26	0.26	n/a	n/a	n/a	n/a	n/a
Plant Reciever Baghouse #4	EU -27	0.26	0.26	0.26	n/a	n/a	n/a	n/a	n/a
Plant Reciever Baghouse #5	EU -28	0.31	0.31	0.31	n/a	n/a	n/a	n/a	n/a
Plant Reciever Baghouse #6	EU -29	0.26	0.26	0.26	n/a	n/a	n/a	n/a	n/a
Truck Loadout Baghouse	EU -30	0.26	0.26	0.26	n/a	n/a	n/a	n/a	n/a
Rail Load Baghouse	EU -31	0.26	0.26	0.26	n/a	n/a	n/a	n/a	n/a
Pneumatic Conveying Line	EU -32	0.26	0.26	0.26	n/a	n/a	n/a	n/a	n/a
Nuisance Dust Collector	EU -33	0.001	0.001	0.001	n/a	n/a	n/a	n/a	n/a
Drum Dryer Drum Fan Hood #1	EU -34	3.02	3.02	3.02	n/a	n/a	n/a	n/a	n/a
Drum Dryer Snifter Fan Drum #1	EU -35	0.0852	0.0852	0.0852	n/a	n/a	n/a	n/a	n/a
Drum Dryer Drum Fan Hood #2	EU -36	3.02	3.02	3.02	n/a	n/a	n/a	n/a	n/a
Drum Dryer Snifter Fan Drum #2	EU -37	0.0852	0.0852	0.0852	n/a	n/a	n/a	n/a	n/a
Drum Dryer Drum Fan Hood #3	EU -38	3.02	3.02	3.02	n/a	n/a	n/a	n/a	n/a
Drum Dryer Snifter Fan Drum #3	EU -39	0.0852	0.0852	0.0852	n/a	n/a	n/a	n/a	n/a
Drum Dryer Drum Fan Hood #4	EU -40	3.02	3.02	3.02	n/a	n/a	n/a	n/a	n/a
Drum Dryer Snifter Fan Drum #4	EU -41	0.0852	0.0852	0.0852	n/a	n/a	n/a	n/a	n/a
Drum Dryer Drum Fan Hood #5	EU -42	3.02	3.02	3.02	n/a	n/a	n/a	n/a	n/a
Drum Dryer Snifter Fan Drum #5	EU -43	0.0852	0.0852	0.0852	n/a	n/a	n/a	n/a	n/a
Drum Dryer Drum Fan Hood #6	EU -44	3.02	3.02	3.02	n/a	n/a	n/a	n/a	n/a
Drum Dryer Snifter Fan Drum #6	EU -45	0.0852	0.0852	0.0852	n/a	n/a	n/a	n/a	n/a
Totals*		35.81	35.81	35.81	54.41	0.00	42.59	4.60	0.58

a) NSR Regulated air Pollutants are defined[1] as: Particulate Matter (PM, PM-10, PM-2.5), Carbon Monoxide, Lead, Nitrogen Dioxide, Ozone (VOC), Sulfur Dioxide, all pollutants regulated by NSPS (40 CFR 60)(i.e. TRS, fluoride, sulfuric acid mist) & Class I & Class II Ozone Depleting Substances (40 CFR 82)(i.e. CFC, HCFC, Halon, etc.) The Gem State facility is not a source of any pollutants regualted by NSPS other than NSR regulated air pollutants, nor is the facility a source of Class I or Class II Ozone Depleting Substances

b)Ton per year emissions based on 5270.4 hours of operation/yr for the AMUs and 8520 hrs/year for all other listed equipment.

* The total shown in the table includes emissions from all four silo bin vents as if each bin vent were operating 8520 hrs/year, when in actuality, only one bin vent will operate at a time.

** See spreadsheets prepared by JBR (included in Appendix I of the permit application for further information regarding emission factors and calculation assumptions.

IDEQ PTC Forms
Toxic Air Pollutant Emissions Inventory

Table 1. PRE- AND POST PROJECT NON-CARCINOGENIC TAP EMISSIONS SUMMARY POTENTIAL TO EMIT

Non-Carcinogenic Toxic Air Pollutants (sum of all emissions)	Pre-Project 24-hour Average Emissions Rates for Units at the Facility (lb/hr)	Post Project 24-hour Average Emissions Rates for Units at the Facility (lb/hr)	Change in 24-hour Average Emissions Rates for Units at the Facility (lb/hr)	Non-Carcinogenic Screening Emission Level (lb/hr)	Exceeds Screening Level? (Y/N)
Antimony	0.00E+00	0.00E+00	0.00E+00	3.30E-02	N
Barium	0.00E+00	2.18E-04	2.18E-04	3.30E-02	N
Chromium	0.00E+00	6.94E-05	6.94E-05	3.30E-02	N
Cobalt	0.00E+00	4.17E-06	4.17E-06	3.30E-03	N
Copper	0.00E+00	4.22E-05	4.22E-05	6.70E-02	N
Ethylbenzene	0.00E+00	0.00E+00	0.00E+00	2.90E+01	N
Fluoride (as F)	0.00E+00	0.00E+00	0.00E+00	1.67E-01	N
Hexane	0.00E+00	8.93E-02	8.93E-02	1.20E+01	N
Manganese	0.00E+00	1.88E-05	1.88E-05	3.33E-01	N
Mercury	0.00E+00	1.29E-05	1.29E-05	3.00E-03	N
Molybdenum	0.00E+00	5.46E-05	5.46E-05	3.33E-01	N
Naphthalene	0.00E+00	3.03E-05	3.03E-05	3.33E+00	N
Pentane	0.00E+00	1.29E-01	1.29E-01	1.18E+02	N
Phosphorous	0.00E+00	0.00E+00	0.00E+00	7.00E-03	N
Selenium	0.00E+00	1.19E-06	1.19E-06	1.30E-02	N
1,1,1-Trichloroethane	0.00E+00	0.00E+00	0.00E+00	1.27E+02	N
Toluene	0.00E+00	1.69E-04	1.69E-04	2.50E+01	N
o-Xylene	0.00E+00	0.00E+00	0.00E+00	2.90E+01	N
Zinc	0.00E+00	1.44E-03	1.44E-03	6.67E-01	N

** See spreadsheets prepared by JBR (included in Appendix I of the permit application for further information regarding emission factors and calculation assumptions.

Table 2. PRE- AND POST PROJECT CARCINOGENIC TAP EMISSIONS SUMMARY POTENTIAL TO EMIT

Carcinogenic Toxic Air Pollutants (sum of all emissions)	Pre-Project Annual Average Emissions Rates for Units at the Facility (lb/hr)	Post Project Annual Average Emissions Rates for Units at the Facility (lb/hr)	Change in Annual Average Emissions Rates for Units at the Facility (lb/hr)	Carcinogenic Screening Emission Level (lb/hr)	Exceeds Screening Level? (Y/N)
Arsenic	0.00E+00	8.34E-06	8.34E-06	1.50E-06	Y
Benzene	0.00E+00	8.75E-05	8.75E-05	8.00E-04	N
Beryllium	0.00E+00	5.00E-07	5.00E-07	2.80E-05	N
Cadmium	0.00E+00	4.59E-05	4.59E-05	3.70E-06	Y
Chromium VI	0.00E+00	0.00E+00	0.00E+00	5.60E-07	N
Formaldehyde	0.00E+00	3.13E-03	3.13E-03	5.10E-04	Y
Nickel	0.00E+00	8.75E-05	8.75E-05	2.70E-05	Y
Benzo(a)pyrene	0.00E+00	5.00E-08	5.00E-08	2.00E-06	N
Benz(a)anthracene	0.00E+00	7.50E-08	7.50E-08	NA	N
Benzo(b)fluoranthene	0.00E+00	7.50E-08	7.50E-08	NA	N
Benzo(k)fluoranthene	0.00E+00	7.50E-08	7.50E-08	NA	N
Chrysene	0.00E+00	7.50E-08	7.50E-08	NA	N
Dibenzo(a,h)anthracene	0.00E+00	5.00E-08	5.00E-08	NA	N
Indeno(1,2,3-cd)pyrene	0.00E+00	7.50E-08	7.50E-08	NA	N
Total PAHs	0.00E+00	4.75E-07	4.75E-07	2.00E-06	N

a) PAH is considered as one TAP comprised of: benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, chrysene, indeno(1,2,3-cd)pyrene, benzo(a)pyrene. The total is compared to benzo(a)pyrene.

** See spreadsheets prepared by JBR (included in Appendix I of the permit application for further information regarding emission factors and calculation assumptions.

IDEQ PTC Forms
Facility Wide Hazardous Air Pollutant Potential to Emit

Table 1 HAP POTENTIAL TO EMIT EMISSIONS SUMMARY

HAP Pollutants	PTE (T/yr)
Benzene	**1.32E-04**
Formaldehyde	**4.70E-03**
Hexane*	**1.13E-01**
Naphthalene	**3.82E-05**
Toluene	**2.13E-04**
Arsenic Compounds	**1.25E-05**
Beryllium Compounds	**7.52E-07**
Cadmium Compounds	**6.89E-05**
Chromium Compounds	**8.77E-05**
Cobalt Compounds	**5.26E-06**
Manganese Compounds	**2.38E-05**
Mercury Compounds	**1.63E-05**
Nickel Compounds	**1.32E-04**
Selenium Compounds	**1.50E-06**
Total	1.18E-01

* Maximum Individual HAP

** See spreadsheets prepared by JBR (included in Appendix I of the permit application for further information regarding emission factors and calculation assumptions.

CRITERIA EMISSIONS - NATURAL GAS COMBUSTION

Emission Factors

NOx	0.036	lb/MMBtu	Manufacturer specific emission factor for Winnox low NOx burners (WX0300,WX0200, WX0100, WX0050)
CO	0.074	lb/MMBtu	Manufacturer specific emission factor for burners
PM-10	7.6	lb/10^6 scf	AP-42, Table 1.4-2, 1998
SOx	0.6	lb/10^6 scf	AP-42, Table 1.4-2, 1998
VOC	5.5	lb/10^6 scf	AP-42, Table 1.4-2, 1998
Lead	0.0005	lb/10^6 scf	AP-42, Table 1.4-2, 1998

			Pounds per Hour					
Description[a]	Capacity (MMBtu/hr)	Throughput (scf/hr)	NOx Emissions (lb/hr)	CO Emissions (lb/hr)	PM-2.5/10 Emissions (lb/hr)	SOx Emissions (lb/hr)	VOC Emissions (lb/hr)	Lead Emissions (lb/hr)
Stage A - Zone 1 Burner #1	3.0	2,137	0.1080	0.2220	0.0162	0.0013	0.0118	0.0000011
Stage A - Zone 1 Burner #2	3.0	2,137	0.1080	0.2220	0.0162	0.0013	0.0118	0.0000011
Stage A - Zone 2 Burner #1	2.0	1,413	0.0720	0.1480	0.0107	0.0008	0.0078	0.0000007
Stage A - Zone 2 Burner #2	2.0	1,413	0.0720	0.1480	0.0107	0.0008	0.0078	0.0000007
Stage A - Zone 3 Burner #1	2.0	926	0.0720	0.1480	0.0070	0.0006	0.0051	0.0000005
Stage A - Zone 3 Burner #2	2.0	926	0.0720	0.1480	0.0070	0.0006	0.0051	0.0000005
Stage A - Zone 4 Burner #1	2.0	1,050	0.0720	0.1480	0.0080	0.0006	0.0058	0.0000005
Stage A - Zone 4 Burner #2	2.0	1,050	0.0720	0.1480	0.0080	0.0006	0.0058	0.0000005
Stage B - Zone 1 Burner #1	1.0	817	0.0360	0.0740	0.0062	0.0005	0.0045	0.0000004
Stage B - Zone 1 Burner #2	1.0	817	0.0360	0.0740	0.0062	0.0005	0.0045	0.0000004
Stage B - Zone 1 Burner #3	1.0	817	0.0360	0.0740	0.0062	0.0005	0.0045	0.0000004
Stage B - Zone 2 Burner #1	1.0	432	0.0360	0.0740	0.0033	0.0003	0.0024	0.0000002
Stage B - Zone 2 Burner #2	1.0	432	0.0360	0.0740	0.0033	0.0003	0.0024	0.0000002
Stage B - Zone 2 Burner #3	1.0	432	0.0360	0.0740	0.0033	0.0003	0.0024	0.0000002
Stage C - Zone 1 Burner #1	0.55	380	0.0198	0.0407	0.0029	0.0002	0.0021	0.0000002
Stage C - Zone 1 Burner #2	0.55	380	0.0198	0.0407	0.0029	0.0002	0.0021	0.0000002
Stage C - Zone 2 Burner #1	0.55	207	0.0198	0.0407	0.0016	0.0001	0.0011	0.0000001
Stage C - Zone 2 Burner #2	0.55	207	0.0198	0.0407	0.0016	0.0001	0.0011	0.0000001
TOTAL	**26.2**	**15,973.0**	**9.43E-01**	**1.94E+00**	**1.21E-01**	**9.58E-03**	**8.79E-02**	**7.99E-06**

[a]Utilize Low NOx Burners

CRITERIA EMISSIONS - NATURAL GAS COMBUSTION - NONPAREIL

Emission Factors

NOx	0.036 lb/MMBtu	Manufacturer specific emission factor for Winnox low NOx burners (WX0300,WX0200, WX0100, WX0050)
CO	0.074 lb/MMBtu	Manufacturer specific emission factor for burners
PM-10	7.6 lb/10^6 scf	AP-42, Table 1.4-2, 1998
SOx	0.6 lb/10^6 scf	AP-42, Table 1.4-2, 1998
VOC	5.5 lb/10^6 scf	AP-42, Table 1.4-2, 1998
Lead	0.0005 lb/10^6 scf	AP-42, Table 1.4-2, 1998

			Ton per Year					
Description	Capacity (MMBtu/hr)	Throughput (scf/yr)	NOx Emissions (T/yr)	CO Emissions (T/yr)	PM-2.5/10 Emissions (lb/hr)	SOx Emissions (T/yr)	VOC Emissions (T/yr)	Lead Emissions (T/yr)
Stage A - Zone 1 Burner #1	25560	18,207,240	0.46	0.95	0.07	0.01	0.05	0.00
Stage A - Zone 1 Burner #2	25560	18,207,240	0.46	0.95	0.07	0.01	0.05	0.00
Stage A - Zone 2 Burner #1	17040	12,038,760	0.31	0.63	0.05	0.00	0.03	0.00
Stage A - Zone 2 Burner #2	17040	12,038,760	0.31	0.63	0.05	0.00	0.03	0.00
Stage A - Zone 3 Burner #1	17040	7,889,520	0.31	0.63	0.03	0.00	0.02	0.00
Stage A - Zone 3 Burner #2	17040	7,889,520	0.31	0.63	0.03	0.00	0.02	0.00
Stage A - Zone 4 Burner #1	17040	8,946,000	0.31	0.63	0.03	0.00	0.02	0.00
Stage A - Zone 4 Burner #2	17040	8,946,000	0.31	0.63	0.03	0.00	0.02	0.00
Stage B - Zone 1 Burner #1	8520	6,960,840	0.15	0.32	0.03	0.00	0.02	0.00
Stage B - Zone 1 Burner #2	8520	6,960,840	0.15	0.32	0.03	0.00	0.02	0.00
Stage B - Zone 1 Burner #3	8520	6,960,840	0.15	0.32	0.03	0.00	0.02	0.00
Stage B - Zone 2 Burner #1	8520	3,680,640	0.15	0.32	0.01	0.00	0.01	0.00
Stage B - Zone 2 Burner #2	8520	3,680,640	0.15	0.32	0.01	0.00	0.01	0.00
Stage B - Zone 2 Burner #3	8520	3,680,640	0.15	0.32	0.01	0.00	0.01	0.00
Stage C - Zone 1 Burner #1	4686	3,237,600	0.08	0.17	0.01	0.00	0.01	0.00
Stage C - Zone 1 Burner #2	4686	3,237,600	0.08	0.17	0.01	0.00	0.01	0.00
Stage C - Zone 2 Burner #1	4686	1,763,640	0.08	0.17	0.01	0.00	0.00	0.00
Stage C - Zone 2 Burner #2	4686	1,763,640	0.08	0.17	0.01	0.00	0.00	0.00
TOTAL	**223,224.0**	**136,089,960.0**	**4.0**	**8.3**	**5.2E-01**	**4.1E-02**	**3.8E-01**	**3.4E-05**

Ton per year emissions based on 8,520 hours of operation/yr

CRITERIA EMISSIONS - NATURAL GAS COMBUSTION

Emission Factors

NOx	0.036	lb/MMBtu	Manufacturer specific emission factor for Winnox low NOx burners (WX0300,WX0200, WX0100, WX0050)
CO	0.074	lb/MMBtu	Manufacturer specific emission factor for burners
PM-10	7.6	lb/10^6 scf	AP-42, Table 1.4-2, 1998
SOx	0.6	lb/10^6 scf	AP-42, Table 1.4-2, 1998
VOC	5.5	lb/10^6 scf	AP-42, Table 1.4-2, 1998
Lead	0.0005	lb/10^6 scf	AP-42, Table 1.4-2, 1998

			Pounds per Hour													
Description[a]	Capacity (MMBtu/hr)	Throughput (scf/hr)	NOx Emissions (lb/hr)[b]	CO Emissions (lb/hr)	PM-2.5/10 Emissions (lb/hr)	SOx Emissions (lb/hr)	VOC Emissions (lb/hr)	Lead Emissions (lb/hr)	CO lb/hr Stack 1	CO lb/hr Stack 2	NOx lb/hr Stack 1	NOx lb/hr Stack 2	NOx tpy Stack 1	NOx tpy Stack 2	SO2 lb/hr Stack 1	SO2 lb/hr Stack 2
Dryer #1 Stage A Stack 1 & 2	18.0	11,052	0.3979	0.8178	0.0840	0.0066	0.0608	0.0000055	0.525	0.292	0.256	0.142	1.09	0.61	0.0043	0.002371
Dryer #1 Stage B Stack 3	6.0	3,747	0.1349	0.2773	0.0285	0.0022	0.0206	0.0000019								
Dryer #1 Stage C Stack 4	2.2	1,174	0.0423	0.0869	0.0089	0.0007	0.0065	0.0000006								
Dryer #2 Stage A Stack 1 & 2	18.0	11,052	0.3979	0.8178	0.0840	0.0066	0.0608	0.0000055								
Dryer #2 Stage B Stack 3	6.0	3,747	0.1349	0.2773	0.0285	0.0022	0.0206	0.0000019								
Dryer #2 Stage C Stack 4	2.2	1,174	0.0423	0.0869	0.0089	0.0007	0.0065	0.0000006								
TOTAL	52.4	31,946.0	1.15	2.36	2.43E-01	1.92E-02	1.76E-01	1.60E-05								

[a] Utilize Low NOx Burners

[b] Eclipse manufactuer assumes 1000 Btu/scf

CRITERIA EMISSIONS - NATURAL GAS COMBUSTION - TON/YR

Emission Factors

NOx	0.036	lb/MMBtu	Manufacturer specific emission factor for Winnox low NOx burners (WX0300,WX0200,
CO	0.074	lb/MMBtu	Manufacturer specific emission factor for burners
PM-10	7.6	lb/10^6 scf	AP-42, Table 1.4-2, 1998
SOx	0.6	lb/10^6 scf	AP-42, Table 1.4-2, 1998
VOC	5.5	lb/10^6 scf	AP-42, Table 1.4-2, 1998
Lead	0.0005	lb/10^6 scf	AP-42, Table 1.4-2, 1998

			Ton per Year					
Description	Capacity (MMBtu/hr)	Throughput (scf/yr)	NOx Emissions (T/yr)	CO Emissions (T/yr)	PM-2.5/10 Emissions (T/yr)	SOx Emissions (T/yr)	VOC Emissions (T/yr)	Lead Emissions (T/yr)
Dryer #1 Stage A Stack 1 & 2	153360	94,163,040	1.69	3.48	0.36	0.03	0.26	0.00
Dryer #1 Stage B Stack 3	51120	31,924,440	0.57	1.18	0.12	0.01	0.09	0.00
Dryer #1 Stage C Stack 4	18744	10,002,480	0.18	0.37	0.04	0.00	0.03	0.00
Dryer #2 Stage A Stack 1 & 2	153360	94,163,040	1.69	3.48	0.36	0.03	0.26	0.00
Dryer #2 Stage B Stack 3	51120	31,924,440	0.57	1.18	0.12	0.01	0.09	0.00
Dryer #2 Stage C Stack 4	18744	10,002,480	0.18	0.37	0.04	0.00	0.03	0.00
TOTAL	446,448.0	272,179,920.0	4.9	10.1	1.0E+00	8.2E-02	7.5E-01	6.9E-05

Ton per year emissions based on 8,520 hours of operation/yr

UNCONTROLLED PROCESS PARTICULATE EMISSIONS - DRYERS

Description	Throughput (lb/hr dry)	Emission Factor (lb PM/lb dry throughput)	EF Reference	PM Emissions (lb/hr)	PM Emissions (T/yr) [a]	PM-10 Emissions (lb/hr)	PM-10 Emissions (T/yr) [a]	PM-2.5 Emissions (lb/hr)	PM-2.5 Emissions (T/yr) [a]
Dryer #1 Stage A Stack 1 & 2	2708.3	9.81E-05	Engineering Evaluation Test conducted on 10/1/15	0.32	1.36	0.32	1.36	0.32	1.36
Dryer #1 Stage B Stack 3	2708.3	5.85E-05	Engineering Evaluation Test conducted on 10/1/15	0.19	0.81	0.19	0.81	0.19	0.81
Dryer #1 Stage C Stack 4	2708.3	1.12E-04	Engineering Evaluation Test conducted on 10/1/15	0.36	1.55	0.36	1.55	0.36	1.55
Dryer #2 Stage A Stack 1 & 2	2708.3	9.81E-05	Engineering Evaluation Test conducted on 10/1/15	0.32	1.36	0.32	1.36	0.32	1.36
Dryer #2 Stage B Stack 3	2708.3	5.85E-05	Engineering Evaluation Test conducted on 10/1/15	0.19	0.81	0.19	0.81	0.19	0.81
Dryer #2 Stage C Stack 4	2708.3	1.12E-04	Engineering Evaluation Test conducted on 10/1/15	0.36	1.55	0.36	1.55	0.36	1.55
TOTAL*						1.75	7.44	1.75	7.44

[a] Ton per year emissions based on 8,520 hours of operation/yr

A safety factor of 20% has been added to the lb/hr emissions to account for it not be being an approved source test.

COMBINED COMBUSTION AND PROCESS PARTICULATE EMISSIONS - DRYERS

Description	PM Emissions (lb/hr)	PM Emissions (T/yr) [a]	PM-10 Emissions (lb/hr)	PM-10 Emissions (T/yr) [a]	PM-2.5 Emissions (lb/hr)	PM-2.5 Emissions (T/yr) [a]	PM 2.5 lb/hr Stack 1	PM2.5 lb/hr Stack 2	PM 2.5 tpy Stack 1	PM2.5 tpy Stack 2
Dryer #1 Stage A Stack 1 & 2	0.40	1.72	0.40	1.72	0.40	1.72	0.26	0.14	1.10	0.61
Dryer #1 Stage B Stack 3	0.22	0.93	0.22	0.93	0.22	0.93				
Dryer #1 Stage C Stack 4	0.37	1.59	0.37	1.59	0.37	1.59				
Dryer #2 Stage A Stack 1 & 2	0.40	1.72	0.40	1.72	0.40	1.72				
Dryer #2 Stage B Stack 3	0.22	0.93	0.22	0.93	0.22	0.93				
Dryer #2 Stage C Stack 4	0.37	1.59	0.37	1.59	0.37	1.59				
TOTAL*	2.0	8.5	2.0	8.5	2.0	8.5				

TOXIC AIR POLLUTANTS (TAPs) COMBUSTION CALCULATIONS
GEM STATE

Emission Unit	Fuel Usage
Dryer #1 Stage A Stack 1 & 2	11,052.00 scf/hr
Dryer #1 Stage B Stack 3	3,747.00 scf/hr
Dryer #1 Stage C Stack 4	1,174.00 scf/hr
Dryer #2 Stage A Stack 1 & 2	11,052.00 scf/hr
Dryer #2 Stage B Stack 3	3,747.00 scf/hr
Dryer #2 Stage C Stack 4	1,174.00 scf/hr

NON-CARCINOGENS (POUNDS PER HOUR)

Pollutant	CAS #	EF for NG Combustion (lb/10^6 scf)[a]	TAP Emissions (lb/hr)	Screening Level (lb/hr)	Modeling? (Y/N)
Antimony	7440-36-0	0.0E+00	0.00E+00	3.3E-02	No
Barium	7440-39-3	4.4E-03	1.41E-04	3.3E-02	No
Chromium	7440-47-3	1.4E-03	4.47E-05	3.3E-02	No
Cobalt	7440-48-4	8.4E-05	2.68E-06	3.3E-03	No
Copper	7440-50-8	8.5E-04	2.72E-05	6.7E-02	No
Ethylbenzene	100-41-4	0.0E+00	0.00E+00	2.9E+01	No
Fluoride (as F)	16984-48-8	0.0E+00	0.00E+00	1.67E-01	No
Hexane	110-54-3	1.8E+00	5.75E-02	1.2E+01	No
Manganese	7439-96-5	3.8E-04	1.21E-05	3.33E-01	No
Mercury	7439-97-6	2.6E-04	8.31E-06	3.E-03	No
Molybdenum	7439-98-7	1.1E-03	3.51E-05	3.33E-01	No
Naphthalene	91-20-3	6.1E-04	1.95E-05	3.33E+00	No
Pentane	109-66-0	2.6E+00	8.31E-02	1.18E+02	No
Phosphorous	7723-14-0	0.0E+00	0.00E+00	7.E-03	No
Selenium	7782-49-2	2.4E-05	7.67E-07	1.3E-02	No
1,1,1-Trichloroethane	71-55-6	0.0E+00	0.00E+00	1.27E+02	No
Toluene	108-88-3	3.4E-03	1.09E-04	2.5E+01	No
o-Xylene	1330-20-7	0.0E+00	0.00E+00	2.9E+01	No
Zinc	7440-66-6	2.9E-02	9.26E-04	6.67E-01	No

CARCINOGENS (POUNDS PER HOUR)

Pollutant	CAS #	EF for Natural Gas Combustion (lb/10^6 scf)[a]	Max TAP Emissions (lb/hr)	Annual Avg TAP Emissions (lb/hr)	Screening Level (lb/hr)	Modeling? (Y/N)
Arsenic	7440-38-2	2.0E-04	6.39E-06	6.21E-06	1.5E-06	Yes
Benzene	71-43-2	2.1E-03	6.71E-05	6.52E-05	8.0E-04	No
Beryllium	7440-41-7	1.2E-05	3.83E-07	3.73E-07	2.8E-05	No
Cadmium	7440-43-9	1.1E-03	3.51E-05	3.42E-05	3.7E-06	Yes
Chromium VI	7440-47-3	0.0E+00	0.00E+00	0.00E+00	5.6E-07	No
Formaldehyde	50-00-0	7.5E-02	2.40E-03	2.33E-03	5.1E-04	Yes
Nickel	7440-02-0	2.1E-03	6.71E-05	6.52E-05	2.7E-05	Yes
Benzo(a)pyrene	50-32-8	1.2E-06	3.83E-08	3.73E-08	2.0E-06	No
Benz(a)anthracene	56-55-3	1.8E-06	5.75E-08	5.59E-08	NA	No
Benzo(b)fluoranthene	205-82-3	1.8E-06	5.75E-08	5.59E-08	NA	No
Benzo(k)fluoranthene	205-99-2	1.8E-06	5.75E-08	5.59E-08	NA	No
Chrysene	218-01-9	1.8E-06	5.75E-08	5.59E-08	NA	No
Dibenzo(a,h)anthracene	53-70-3	1.2E-06	3.83E-08	3.73E-08	NA	No
Indeno(1,2,3-cd)pyrene	193-39-5	1.8E-06	5.75E-08	5.59E-08	NA	No
Total PAHs		1.1E-05	3.64E-07	3.54E-07	2.00E-06	No

[a]EFs from AP-42, Tables 1.4-3 and 1.4-4, 7/98

[b]EFs from AP-42, Table 1.3-10, 9/98

Dryer #1 Stage A Stack 1 & 2	Dryer #1 Stage B Stack 3	Dryer #1 Stage C Stack 4	Dryer #2 Stage A Stack 1 & 2	Dryer #2 Stage B Stack 3	Dryer #2 Stage C Stack 4
2.15E-06	7.29E-07	2.28E-07	2.15E-06	7.29E-07	2.28E-07
1.18E-05	4.01E-06	1.26E-06	1.18E-05	4.01E-06	1.26E-06
8.06E-04	2.73E-04	8.56E-05	8.06E-04	2.73E-04	8.56E-05
2.26E-05	7.65E-06	2.40E-06	2.26E-05	7.65E-06	2.40E-06

Stack 1	Stack 2
1.38E-06	7.69E-07
7.60E-06	4.23E-06
5.18E-04	2.88E-04
1.45E-05	8.07E-06

Source ID	Source Description	Easting (X)	Northing (Y)	Base Elevation	Stack Height	Temperature	Exit Velocity	Stack Diameter	PM2.5	PM2.5ANN	PM10	NO2	NO2ANN	ARSENIC	CADMIUM	FORMALD	NICKEL	SO2	CO
		(m)	(m)	(m)	(ft)	(°F)	(m/s)	(in)	(lb/hr)	(tpy)	(lb/hr)	(lb/hr)	(tpy)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)
DFH#1	Drum Fan Hood #1	273385	4714654	1266.36	82	119	32.3402844	36	0.73	3.10	0.73	0	0					0	0
DFH#2	Drum Fan Hood #2	273388	4714657	1266.35	82	119	32.3402844	36	0.73	3.10	0.73	0	0					0	0
DFH#3	Drum Fan Hood #3	273392	4714660	1266.32	82	119	32.3402844	36	0.73	3.10	0.73	0	0					0	0
DFH#4	Drum Fan Hood #4	273395	4714663	1266.29	82	119	30.543602	36	0.73	3.10	0.73	0	0					0	0
EX1	Ehxaust #1	273481	4714588	1266.26	38.8	80	11.634216	44	4.38E-02	0.116	4.38E-02	0.288	0.76					3.46E-03	0.484
EX2	Exhaust #2	273476	4714604	1266.13	38.8	80	11.634216	44	4.38E-02	0.116	4.38E-02	0.288	0.76					3.46E-03	0.484
EX3	Exhaust #3	273463	4714572	1266.37	38.8	80	11.634216	44	4.38E-02	0.116	4.38E-02	0.288	0.76					3.46E-03	0.484
EX5	Exhaust #5	273403	4714613	1266.46	38	80	7.388352	30	1.29E-02	0.034	1.29E-02	0.085	0.22					1.02E-03	0.143
EX4	Exhaust #4	273407	4714616	1266.45	38.8	80	7.388352	30	1.29E-02	0.034	1.29E-02	0.085	0.22					1.02E-03	0.143
EX6	Exhaust #6	273419	4714629	1266.36	38	80	11.634216	44	4.38E-02	0.116	4.38E-02	0.288	0.76					3.46E-03	0.484
PRE1	Bubble Sheet Dryer #1	273445	4714718	1266.24	82	131	36.2947519	32	0.76	3.2376	0.76	0.686	2.92					0.0041176	0.576471
PRE2	Bubble Sheet Dryer #2	273441.58	4714709.33	1266.26	82	150	19.432153	38	0	0	0.00	0	0					0	0
PRE3	Pneumatic Conveying Line Baghouse	273404.37	4714685.38	1266.28	60	100	13.9821664	20	0.06	0.26	0.06	0	0					0	0
BH1	Nuisance Dust Collector Baghouse	273409.01	4714689.25	1266.25	40.10006562	100	3.16802786	16	0.0003	0.0014	0.0003	0	0					0	0
EX7	Exhaust #7	273385.56	4714692.25	1266.34	37.70013123	80	6.46805689	24	2.79E-03	7.34E-03	2.79E-03	0.018	0.05					2.20E-04	0.031
EX8	Exhaust #8	273415.9	4714682.06	1266.26	37.89993438	80	7.24422371	30	4.88E-03	1.28E-02	4.88E-03	0.032	0.08					3.85E-04	0.054
EX9	Exhaust #9	273427.1	4714692.76	1266.33	37.89993438	80	7.24422371	30	4.88E-03	1.28E-02	4.88E-03	0.032	0.08					3.85E-04	0.054
EX10	Exhaust #10	273414.32	4714726.45	1266.27	35.89993438	80	6.98601601	48	1.20E-02	3.17E-02	1.20E-02	0.079	0.21					9.50E-04	0.133
EX11	Exhaust #11	273449.2	4714763.23	1266.18	35.79986877	80	6.98601601	48	1.20E-02	3.17E-02	1.20E-02	0.079	0.21					9.50E-04	0.133
EX12	Exhaust #12	273475	4714754	1266.08	35.70013123	80	6.986016	48	1.20E-02	3.17E-02	1.20E-02	0.079	0.21					9.50E-04	0.133
EX13	Exhaust #13	273463.77	4714747.27	1266.15	36.10006562	80	7.50417601	48	1.29E-02	3.41E-02	1.29E-02	0.085	0.22					1.02E-03	0.143
EX14	Exhaust #14	273474.48	4714735.48	1266.05	36.10006562	80	7.50417601	48	1.29E-02	3.41E-02	1.29E-02	0.085	0.22					1.02E-03	0.143
BO3	Boiler #3	273362	4714689	1266.25	60.8	315	10.716768	36	0.065	0.27	0.065	2.323	9.896					0.0355	2.5812
BO2	Boiler #2	273360	4714687	1266.29	60.8	315	10.716768	36	0.048	0.21	0.048	1.742	7.422					0.0266	1.9
BO1	Boiler #1	273357	4714685	1266.3	60.8	315	10.716768	36	0.048	0.21	0.048	1.742	7.422					0.0266	1.9
DFH#5	Drum Fan Hood #5	273399	4714667	1266.3	82	119	32.3402843	36	0.73	3.10	0.73	0	0					- 0	0
DFH#6	Drum Fan Hood #6	273402	4714670	1266.31	82	119	32.3402844	36	0.73	3.10	0.73	0	0					0	0
WDRY1A1	Wolverine Dryer #1 Stage A Stack 1	273464.3	4714628.57	1266.18	60	225	13.340337	32	0.259	1.10	0.259	0.256	1.09	1.38E-06	7.60E-06	5.18E-04	1.45E-05	0.00426	0.5254
WDRY2A1	Wolverine Dryer #2 Stage A Stack 1	273458.26	4714623.54	1266.21	60	225	13.340337	32	0.259	1.10	0.259	0.256	1.09	1.38E-06	7.60E-06	5.18E-04	1.45E-05	0.00426	0.5254
WDRY1A2	Wolverine Dryer #1 Stage A Stack 2	273455.38	4714636.64	1266.25	60	232	13.7374342	36	0.144	0.61	0.144	0.142	0.61	7.69E-07	4.23E-06	2.88E-04	8.07E-06	0.00237	0.2924
WDRY2A2	Wolverine Dryer #2 Stage A Stack 2	273449.33	4714631.02	1266.26	60	232	13.7374342	36	0.144	0.61	0.144	0.142	0.61	7.69E-07	4.23E-06	2.88E-04	8.07E-06	0.00237	0.2924
WDRY1B	Wolverine Dryer #1 Stage B	273443.86	4714646.86	1266.34	60	186	13.4658546	32	0.219	0.93	0.219	0.135	0.57	7.29E-07	4.01E-06	2.73E-04	7.65E-06	0.0022	0.277278
WDRY2B	Wolverine Dryer #2 Stage B	273438.53	4714641.39	1266.34	60	186	13.4658546	32	0.219	0.93	0.219	0.135	0.57	7.29E-07	4.01E-06	2.73E-04	7.65E-06	0.0022	0.277278
WDRY1C	Wolverine Dryer #1 Stage C	273430.46	4714660.26	1266.33	60	176	12.0547582	22	0.373	1.59	0.373	0.042	0.18	2.28E-07	1.26E-06	8.56E-05	2.40E-06	7.04E-04	0.066876
WDRY2C	Wolverine Dryer #2 Stage C	273425.13	4714655.79	1266.35	60	176	12.0547582	22	0.373	1.59	0.373	0.042	0.18	2.28E-07	1.26E-06	8.56E-05	2.40E-06	7.04E-04	0.066876
EX15	Exhaust #15	273428.02	4714645.42	1266.36	36	90	17.5032806	36	6.71E-02	1.77E-01	6.71E-02	0.441	1.16	1.06E-06	5.84E-06	3.98E-04	1.11E-05	5.29E-03	7.41E-01
EX16	Exhaust #16	273450.05	4714637.36	1266.27	36	90	17.5032806	36	6.71E-02	1.77E-01	6.71E-02	0.441	1.16	1.06E-06	5.84E-06	3.98E-04	1.11E-05	5.29E-03	7.41E-01

13.92

Source ID	Source Description	Easting (X)	Northing (Y)	Base Elevation	Release Height	Horizontal	Vertical	PM2.5
		(m)	(m)	(m)	(m)	(m)	(m)	(lb/hr)
BV1A	Silo Bin Vent Baghouse #1	273376	4714701	1266.3	23.0124	0.2551	10.9576	0.06
RAILROAD	Rail Load Baghouse	273386.5	4714725	1266.28	12.7406	0.2551	6.1813	0.06

If the airport is shutdown, all parameters will be consistent with the March 5, 2015 permit. This includes 100 ft stacks, velocity of 18.48 m/s for drums and 22.68 m/s for agglomerator, stack diameter of 3.5 feet (42 in) for the drums and 2.67 ft (32 in) for agglomerator. Note that the March 5, 2015 premit assumed 17.16 m/s for drum #4; it should have been 18.48 m/s.

Airport Remains Operational						
Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$)	Modeling Impact ($\mu g/m^3$)	Total Concentration (µg/m3)	NAAQS (µg/m3)	% of Standard
PM2.5	24-hr	13	21.7	34.7	35	99.1%
	Annual	4.3	6.5	10.8	12	90.1%
PM10	24-hr	73	28.6	101.6	150	67.7%
NO2	1-hr	PVMRM2	160.7	160.7	188	85.5%
	Annual	5.83	12.9	18.7	100	18.7%
SO2	1-hr	3.93	3.0	6.9	196	3.5%
		Background Concentration ($\mu g/m^3$)	Modeling Impact ($\mu g/m^3$)	Increment Concentration ($\mu g/m^3$)	AACC (µg/m3)	% of Standard
Arsenic		--	2.00E-05	2.00E-05	2.30E-04	8.7%
Cadmium		--	1.00E-04	1.20E-04	5.60E-04	17.9%
Formaldehyde		--	6.89E-03	8.16E-03	7.70E-02	8.9%
Nickel		--	1.90E-04	2.30E-04	4.20E-03	4.5%

Airport Shuts Down						
Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$)	Modeling Impact ($\mu g/m^3$)	Total Concentration (µg/m3)	NAAQS (µg/m3)	% of Standard
PM2.5	24-hr	13	17.7	30.7	35	87.7%
	Annual	4.3	5.4	9.7	12	80.8%
PM10	24-hr	73	23.6	96.6	150	64.4%
NO2	1-hr	PVMRM2	160.4	160.4	188	85.3%
	Annual	5.83	12.9	18.7	100	18.7%
SO2	1-hr	3.93	3.0	6.9	196	3.5%
		Background Concentration ($\mu g/m^3$)	Modeling Impact ($\mu g/m^3$)	Increment Concentration ($\mu g/m^3$)	AACC (µg/m3)	% of Standard
Arsenic		--	2.00E-05	2.00E-05	2.30E-04	8.7%
Cadmium		--	1.00E-04	1.20E-04	5.60E-04	17.9%
Formaldehyde		--	6.89E-03	8.16E-03	7.70E-02	8.9%
Nickel		--	1.90E-04	2.30E-04	4.20E-03	4.5%

Shift	Production Rate		
	(lb)	(lb/hr)	(ton/hr)
Dayshift 10/01/15 0800-2000	27,865	2,322	1.16
Graveyard 10/01/5 2000-0800	26,618	2,218	1.11
Dayshift 10/02/15 0800-1730	16,838	1,772	0.886

Unit 1

Parameter	Run 1	Run 2	Run 3	Average	
Date	10/1/2015	10/2/2015	10/2/2015		
Time	1558-1748	0710-0858	0903-1050		
Test Run Duration (min)	108	108	108	108	
Production Rate (ton/hr)	1.16	0.989	0.886	1.0	
PM Emission Rate (lb/hr)	0.0925	0.0768	0.0903	0.087	
PM Emission Factor (lb/ton)	0.0797	0.0776	0.102	0.086	4.32E-05

Unit 2

Parameter	Run 1	Run 2	Run 3	Average	
Date	10/1/2015	10/2/2015	10/2/2015		9.81E-05
Time	1605-1810	0711-0916	0920-1125		
Test Run Duration (min)	125	125	125	125	
Production Rate (ton/hr)	1.16	0.974	0.886	1.0	
PM Emission Rate (lb/hr)	0.124	0.0935	0.112	0.11	
PM Emission Factor (lb/ton)	0.107	0.0960	0.126	0.11	5.49E-05

Unit 3

Parameter	Run 1	Run 2	Run 3	Average	
Date	10/1/2015	10/2/2015	10/2/2015		
Time	1625-1827	0811-1017	1019-1224		
Test Run Duration (min)	125	125	125	125	
Production Rate (ton/hr)	1.16	0.886	0.886	1.0	
PM Emission Rate (lb/hr)	0.114	0.108	0.116	0.11	
PM Emission Factor (lb/ton)	0.098	0.122	0.131	0.12	5.85E-05

Unit 4

Parameter	Run 1	Run 2	Run 3	Average	
Date	10/1/2015	10/2/2015	10/2/2015		
Time	1625-1834	0729-0934	0937-1142		
Test Run Duration (min)	125	125	125	125	
Production Rate (ton/hr)	1.16	0.941	0.886	1.00	
PM Emission Rate (lb/hr)	0.232	0.237	0.193	0.22	
PM Emission Factor (lb/ton)	0.200	0.252	0.218	0.22	1.12E-04

Appendix D AIR VENTILATION INFORMATION & SCHEMATIC

IDAHOSTEEL
Food Processing Equipment
255 East Anderson . Idaho Falls . ID . 83401
Phone: 208.522.1275 . Fax: 208.522.6041
sales@idahosteel.com
www. idahosteel.com

1/12/2016
Revision 3

GEM State Processing Ventilation and Exhaust

Purpose:

The purpose of this document is for information only. It is regarding the history and the design intent for GEM State Processing exhaust stacks. This is a technical description on how the air is brought into the plant, how it is used, how it is exhausted and discharged out of the plant and the application of the air at the different process points.

History:

The original design was to accommodate a new GEM State Processing plant in Heyburn Idaho. In 2010 the design started and consisted of a single line that was designed to process approximately 40,000 lbs/hr potatoes.

The State of Idaho permitting standard at the beginning of the first design stage was PM_{10}. Many flake processing plants have been built under this standard by Idaho Steel Products and the original selection of components and stack heights were based off of the standard.

The plant in 2010 was designed with 4 REYCO Systems direct fired Air Make-Up Units for plant and process air make-up.

- REYCO Model 1250 producing 125,000 CFM of air for environmental conditioning in packaging.
- (2) REYCO Model 1000 producing 100,000 CFM of air for environmental conditioning and make-up.
- REYCO Model 750 producing 75,000 CFM of air for environmental conditioning in the raw receiving area.

IDAHOSTEEL
Food Processing Equipment
255 East Anderson . Idaho Falls . ID . 83401
Phone: 208.522.1275 . Fax: 208.522.6041
sales@idahosteel.com
www. idahosteel.com

These units were sized for the line 2 expansion and the additional agglomeration line that was relocated from Nonpareil to the GEM State facility in 2011.

Each one of the REYCO units are equipped with a Variable Frequency Drive (VFD) to be able to give the plant the ability to control interior pressure, to compensate for changing process conditions, and to be able to turn off the exhaust fans when they are not needed. There are more details in the design intent section.

$PM_{2.5}$ was adopted as the new standard in 2011. Prior to the adoption of the $PM_{2.5}$ the plant asked that Idaho Steel Products supply new 35'-0" stack extensions to the existing drum stacks. This was an attempt to satisfy the PM_{10} and the $PM_{2.5}$ which was still being addressed technically. With the modification of the original design parameter Idaho Steel Products increased the motor sizes and speed up the fans.

In the spring of 2012 Idaho Steel Products began the installation of a second 40,000 lbs/hr line. A line paralleling their first line. (Line 2)

In the early part of 2014 Idaho Steel Products was asked to help design and build a stack system to satisfy the new permitting issues. They proposed stack height at 100'-0" above grade. Idaho Steel Products contacted Eagle Engineering (Structural) out of Idaho Falls, ID and Walker Engineering (Mechanical) out of Pocatello, ID to assist with the design. Construction is started, it is now on hold and is not complete.

In December of 2014 it was discovered that the plant was unable to construct 100'-0" Stacks due to its close proximity to the Burley Airport. The stacks could have a maximum height of 83'-0" due to the airport approach. The reduced exhaust stack height no longer allows the plant to be in compliance with the current permit.

The proposed resolution for the reduced height increases the velocity in the stack to allow a higher projection into the atmosphere. Included in this is the introduction of an additional 10,000 CFM per drum dryer stack to get the dilution and trajectory required to get the air up in the atmosphere to make the environmental model work. (There are 6 drum dryers and an associated exhaust stack for each drum dryer.) Each stack needs to be modified again with a substantially larger fan/horsepower.

IDAHOSTEEL
Food Processing Equipment
255 East Anderson . Idaho Falls . ID . 83401
Phone: 208.522.1275 . Fax: 208.522.6041
sales@idahosteel.com
www. idahosteel.com

In 2014 Idaho Steel Products was approached to help build and install equipment for a new slice line. (Line 3) The Idaho Steel Products scope of supply included 2 additional REYCO Air Make-up units that were originally designed for 100,000 CFM but later changed to 125,000 CFM. These were changed for the additional air flow requirements by the impact of the new height restriction. No additional heat was required so the burners were not changed.

- (2) REYCO Model 1250 producing 125,000 CFM of air for environmental conditioning make-up air in the new slice area.

The existing drum areas would have been running at a 60,000 CFM deficit. The Air Make-up Unit upgrade was a way to pick up some of the additional airflow required by the parameters of the new model. Currently more air is needed but can be managed by turning off a percentage of the existing exhaust fans. The AMU pressure control system will slow the AMU fan speeds to accommodate the lower flows.

Idaho Steel Products has been asked a couple of times to provide a basic preliminary ventilation design that gives GEM State the ability to adapt and expand as needed. Idaho Steel Products has summited a couple of recommendations over the last 6 years that they have followed, though the exact volumes have been modified by different exhaust equipment vendors.

Idaho Steel Products is still in the processes of the final design of the exhaust stack system for the slice line. Design and construction documents are not completed.

Design Intent:

Plant Ventilation

The goal in the ventilation of large facilities is to provide sufficient air flows to remove process heat and moisture while maintaining comfortable working conditions. Generally, the exhaust volume of air should be 90% of the supply volume, to maintain a positive building pressure. It is important to locate the exhaust fans near the source of heat or wet processing equipment to prevent heat and vapor migration. Assuming the supply air is adequate, small roof exhausters can be positioned to exhaust these sources. This is the basis for the ventilation at GEM State Processing.

IDAHOSTEEL
Food Processing Equipment
255 East Anderson . Idaho Falls . ID . 83401
Phone: 208.522.1275 . Fax: 208.522.6041
sales@idahosteel.com
www. idahosteel.com

Most industrial facilities, to accommodate local codes and plant systems, provide separate closed areas for each process. Each are separated and balanced. The GEM State facility does not. Some areas, at points, are freely open to the next. This, from a ventilation standpoint, simply allows air to follow the air to the plant's low pressure point. When harnessed correctly the air can be manipulated and the plant building shell can be used as a duct. The exhaust fans, being the final point to exhaust the air out of the plant.

To accommodate process air flow requirements additional air must be supplied into the plant. One of the issues faced by a processing plant is the need to shut down a process and to still be able to maintain a positive pressure inside the plant. Because again, in the food processing industry a plant must be pressurized to keep moisture, insects and microbes out of the plant.

The strategy is to inject a volume of air into the plant and convey the air to the exhaust point. This strategy does not require precision placement of air into the plant because the air will seek out the low pressure prior to the exhaust fans as noted before. There just needs to be a sufficient volume being supplied to the plant so that the exhaust fans have air to exhaust.

To accommodate the variations of air flow due to changes in process requirements, GEM State Processing elected to use a pressure sensing system that is incorporated into their plant PLC. This includes a sensor that is placed on an exterior wall. The sensor takes the differential pressure from atmosphere, exterior to the plant, in relation to the interior plant pressure. This is set to a plant specific pressure (typically about .10" WC) depending on which process area that it is in. This system gives the plant the ability to shut off exhaust fans that may be needed seasonally or due to a process shutdown without risking an overpressure scenario.

All of the air make-up units that Gem State processing has purchased incorporates two unique design points. One they include a Variable Frequency Drive (VFD) on the main supply fan so they can be controlled by the plant PLC as described previously. The second is a direct fired burner that is somewhat self-contained and has a dedicated combustion blower that supplies each burner. This gives the system the ability to turn down without substantially affecting emissions.

In an area such as this, the air balance becomes extremely complex. This is why the GEM State pressure control system is so valuable in keeping the plant pressure where it needs to be, to maintain a consistent process and stack air flows.

IDAHOSTEEL
Food Processing Equipment
255 East Anderson . Idaho Falls . ID . 83401
Phone: 208.522.1275 . Fax: 208.522.6041
sales@idahosteel.com
www. idahosteel.com

Drum Stacks

A drum dryer is typically used to dry potato mash to make flake. There are 6 drum dryers at GEM State Processing. The drums use plant air for removing evaporating water. There is also a utility system (Sniffer System) designed to remove product fines from the potato sheet and a light fugitive steam that if not removed causes issues with the process.

At Gem state, because the exhaust stacks are so high, the plant has chosen to combine the stack from one Sniffer fan to one drum exhaust. This was an alternative to providing a large structure to support such a small diameter stack for the Sniffer flow.

We have evaporating steam coming off of the drum as it comes up though a hood into a 42" diameter duct. The air is then conveyed up to the fan. Right before the fan there is a convergence where the Sniffer air enters the air stream. After the fan, the air goes up the stack. The diameter is reduced to provide the required velocity. The proposed system has introduced an additional 10,000 CFM on each drum to dilute and accelerate the air at the discharge of the stack to aid in satisfying the permitting requirements.

One addition system that Gem State Processing elected to provide for the drums was the Idaho Steel Product's High Efficiency Sniffer System. This is a static High Efficiency Cyclone that was installed between each of the Sniffer Plenums and the exhaust stacks. Please note the previously issued document following this report.

Agglomeration Stacks

The agglomeration dryer is a fluidized bed dryer designed to dry/remove moisture from an agglomerated product. This exhaust on this system is a very simple system with a set speed and a flow designed to meet permitting standards.

IDAHOSTEEL
Food Processing Equipment
255 East Anderson . Idaho Falls . ID . 83401
Phone: 208.522.1275 . Fax: 208.522.6041
sales@idahosteel.com
www. idahosteel.com

Dehydrator Stacks

A Slice Line was installed in 2015 and incorporates two Proctor/Wolverine dryers. These dryers require a certain amount of air to dry product. Based off of the current design this air is pulled from around the dryers inside the building. The air is heated and used inside the dryers to dry the product. A portion of the air is recirculated and the remaining air is exhausted. How much air that is exhausted at any given time can and will vary based off of product, solids, exterior humidity and temperature.

The proposed Dehydration Stacks will be 60 foot from grade and will be a simple extension off of the Proctor/Wolverine dryer exhaust fans. The existing exhaust fans will need to be evaluated by Proctor/Wolverine and upgraded as required.

The stacks are 32" diameter for stage A1 and B1, 36" diameter for stage A2 and they will be 22" diameter for stage B2. Airflows will be controlled by the PLC controlling the Proctor/Wolverine dryer.

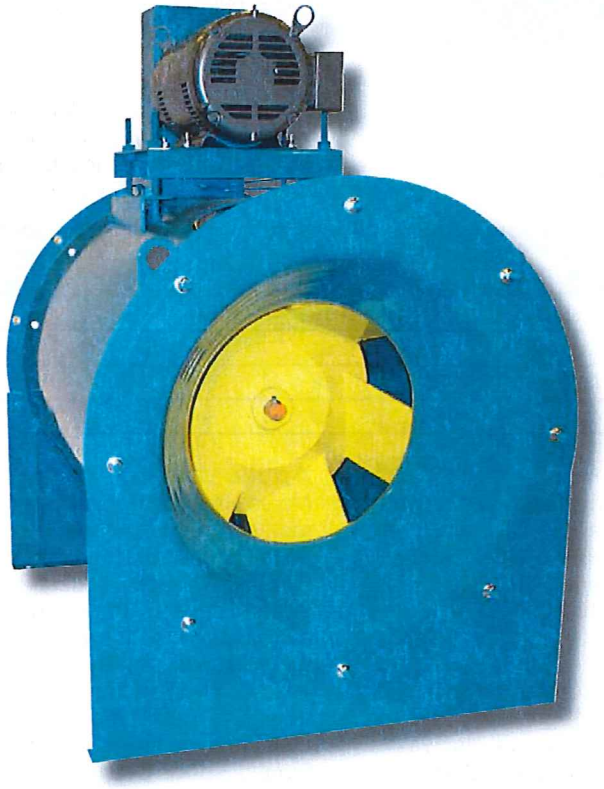
Specification

Attached is a drawing showing the current configuration of the plant. This drawing shows the basic stack heights, stack diameters and airflows.

Fans & Blowers

Twin City

Air Moving Solutions.

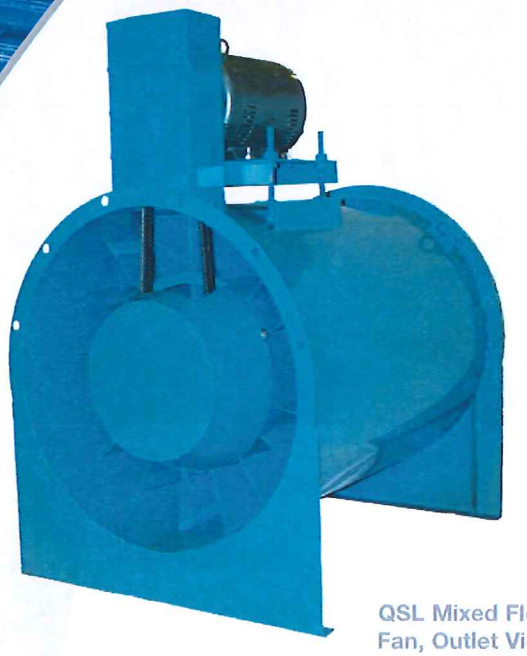


MIXED FLOW FANS

QSL (Standard) | QSLR (Restaurant) | QSLSH (Smoke and Heat)

CATALOG 1060
November 2012

MixedFlowFans



QSL Mixed Flow Fan, Outlet View

Models

QSL I QSLR I QSLSH

Benefits of Mixed Flow Fans

Twin City Fan Model QSL Mixed Flow Fan combines the benefits of axial flow and centrifugal flow fans. The QSL has the advantage of the compact design and straight-through airflow as well as the preferred acoustic characteristics and high pressure capability. QSL fans offer superior air and sound performance and the AMCA certified rating seal for air and sound.

Energy Savings

Mixed flow fans offer the economy of operation with a higher and broader efficiency range. The lower operating speed for a given performance provides longer and more reliable operation.

Ultra Quiet

The AMCA Certified Ratings for Air and Sound applies to both inlet and outlet sound power levels. The table below displays sound and static efficiency differences between performance points for a comparable tubular centrifugal fan and a vaneaxial fan.

Performance	Size	Static Efficiency (%)			Sound LwA (dB)		
		QSL	TSL	TCVA	QSL	TSL	TCVA
5000 CFM @ 1" SP	QSL 245	**70**	55	61	**72**	77	79
10000 CFM @ 1" SP	QSL 330	**70**	63	63	**72**	81	82
25000 CFM @ 3" SP	QSL 402	**72**	68	65	**86**	92	98
50000 CFM @ 6" SP	QSL 490	**71**	69	64	**95**	102	112

Mixed Flow Models

QSL – Available in both direct drive and belt driven. The QSL mounts both vertically and horizontally, allowing for numerous applications with multiple mounting arrangements. Sizes range from 150 - 730 and performance ranges from 1,300 - 160,000 CFM. Model QSL is UL/cUL 705 listed.

QSLR – Model QSLR is similar to the QSL but is specifically designed for exhausting grease-laden air from kitchens, restaurants and cooking and dishwasher hoods. Model QSLR is UL/cUL 762 listed for the exhaust of grease-laden air.

QSLSH – Model QSLSH is specifically designed for smoke control applications. UL/cUL listed for smoke control systems for 500°F for 4 hours or 1000°F for 15 minutes.

Application

Mixed flow fans are becoming a popular choice on many air supply, return, general and grease-laden exhaust and laboratory exhaust applications in the HVAC industry for both constant or variable air volume systems. The efficiency and sound characteristics of the mixed flow fans are often desired in buildings such as hospitals, libraries, theaters, and general offices. The Twin City Fan heavy-duty construction of QSL fans also make them suitable for many industrial applications handling ambient air. Applications involving fumes, spray booth exhaust, particulate, heavy moisture content, or high temperature should be discussed with the factory for possible product modifications.

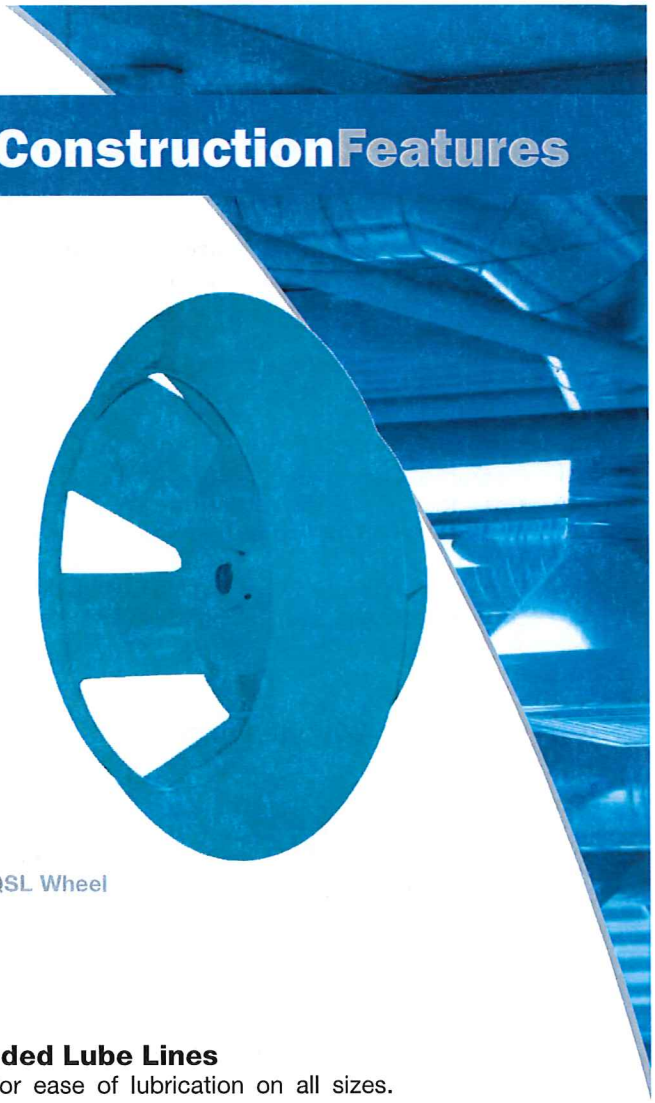
Twin City Fan & Blower certifies that the Models QSL, QSLR and QSLSH Mixed Flow Fans shown herein are licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program. See Catalog 1061 for sound ratings.

Model QSL is available with the UL/cUL 705 listing for electrical, File No. E158680.

Model QSLR is UL/cUL 762 listed for the exhaust of grease-laden air as standard, File No. MH-25478.

Model QSLSH is UL/cUL listed for Smoke Control Systems as standard, File No. MH-29313, 500°F for 4 hours and 1000°F for 15 minutes.

ConstructionFeatures



QSL Wheel

Housings
All fans are constructed of heavy-gauge steel and continuously welded for strength and rigidity. All QSL fans are provided with punched inlet and outlet flanges as standard.

Wheel
The QSL wheel impeller is designed with true airfoil (double surface - hollow) die-formed, continuously-welded blades for a stable air performance throughout the operating range. The wheel is statically and dynamically balanced prior to assembly and rechecked for balance after assembly by Twin City Fan & Blower.

Belt Guard
Totally enclosed, sealed belt guard is standard on Model QSL. Totally enclosed, non-sealed belt guard is standard on Models QSLR and QSLSH.

Inner Cylinder
The inner tube is rigidly constructed to support the shaft and bearings. The removable discharge cone provides full access to the shaft, bearings, and fan sheave. It is strongly recommended that an access door be provided in the ductwork adjacent to the discharge end of the fan for such service.

Bearings
Standard bearings are selected to exceed the L-10 life of 40,000 hours at the maximum operating speed.

Drives
V-belt drives or direct drive fans with motors and drives mounted by Twin City Fan & Blower are test run as a complete assembly and rechecked for balance.

Straightening Vanes
Straightening vanes convert tangential velocity pressure into useful static pressure, reducing turbulence and increasing efficiency. Extensive testing of various shapes and locations has resulted in the most efficient aerodynamic design of the straightening vanes.

Extended Lube Lines
Allow for ease of lubrication on all sizes.

Motor Mounting Platform
A heavy-duty motor mounting platform pivots to offer easy and positive adjustment of belt tension. The motor mounting platform is offered in eight standard locations to allow for motor accessibility and space requirements.

Shaft
Shaft diameter sized so that maximum operating speed does not exceed 70% of first critical speed.

EasyAccessDesigns

Clamshell Design
Two clamshell style doors swing open wide to provide complete access to the interior of the fan for maintenance or cleaning without removal of ductwork. Heavy duty hinges, positive locking latches, and full gasketing provide a complete seal when doors are closed. An access door provides access to the bearings. Available on all fan sizes, typically vertical mount.

Swingout Design
Provides full access to the wheel and inner casing. The entire wheel/shaft/bearing assembly is mounted on a large swingout door. Ideal for systems requiring frequent cleaning without removal of ductwork. Swingout construction is available for vertical mounting only. Available on sizes 182 and larger.

MountingConfigurations

Horizontal Construction

Horizontal construction is available in sizes 150 through 730.

Horizontal Base Mounted (HBM) — Support legs are provided at each end of the fan for floor mounting.

Horizontal Ceiling Hung (HCH) — For duct mounted fans, four suspension clips are welded to the fan casing to allow ceiling suspension using rod hangers.

Horizontal (HOR) — For mounting configurations where support legs and suspension clips are not required.

Vertical Construction

Vertical construction is available in sizes 150 through 542. Consult factory for larger sizes.

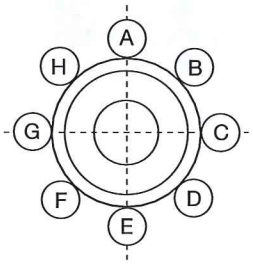
Floor or Ceiling Mounted (VUI/VUO/VDI/VDO) — Four vertical brackets are welded to either end of the fan housing. Bracket location is determined by airflow direction and support details (see drawing below).

Roof Mounted (VRM) — A curb cap provides weathertight seal for roof curb mounted fans. A discharge cap and weather cover are also available for the upblast style roof ventilator.

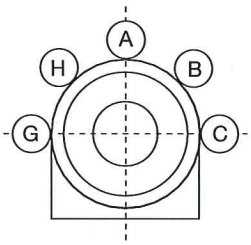
Vertical (VUN/VDN) — For mounting configurations where support brackets are not required.

Discharge Arrangements

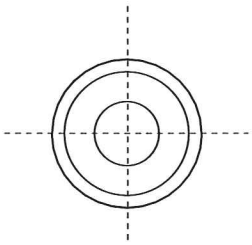
HCH
Horizontal Ceiling Hung



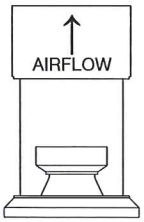
HBM
Horizontal Base Mounted



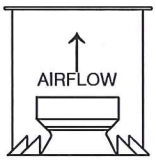
HOR
Horizontal No Mounting Brackets



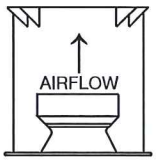
NOTE: Horizontal motor positions shown from oulet end.



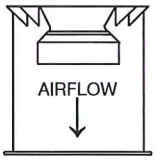
VRM
Vertical Roof Mounted



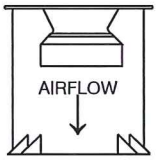
VUI
Vertical Discharge Up, Floor Mount Support Brackets On Inlet



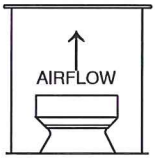
VUO
Vertical Discharge Up,Ceiling Hung Support Brackets On Outlet



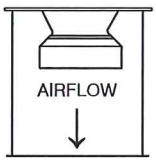
VDI
Vertical Discharge Down, Ceiling Hung Support Brackets On Inlet



VDO
Vertical Discharge Down, Floor Mount Support Brackets On Outlet



VUN
Vertical Up No Brackets



VDN
Vertical Down No Brackets

Available Discharges by Model

QSL	QSLSH	QSLR
HBM	HBM	HBM
HCH	HCH	HCH
HOR	HOR	HOR
VDI	**N/A**	**N/A**
VDN	**N/A**	**N/A**
VDO	**N/A**	**N/A**
VUI	VUI	VUI
VUN	VUN	VUN
VUO	VUO	VUO
VRM	VRM	VRM

Accessories

Belt Tube
A belt tube encloses the belts and drive components, protecting them from the airstream.

Support Legs — Horizontal Flow
For horizontal flow with floor mounting, support legs are welded to the fan flange with bolt holes aligned for connection of ductwork.

Support Legs — Vertical Flow
For vertical flow with either floor or ceiling mounting, support legs are welded to the fan housing for four-point support.

Suspension Clips
For horizontal flow with ceiling mounting, four clips of formed angle are welded to the fan housing for suspension via tie rods to the ceiling support structure.

Inlet and Outlet Screens
Safety screening can be provided for installation in the fan inlet or fan outlet.

Discharge Cap
Discharge caps are designed for vertical, rooftop discharge with butterfly type dampers to seal out the weather when the fan is shut off.

Curb Cap
Attached to the fan's flange for curb mounting.

Shaft Seal
To limit the air entering the inner cylinder and avoid contact of airstream contaminants with the bearings and V-belt drive. Consists of a Teflon wear pad/plate and a rubber checkseal at the wheel end of the inner cylinder. Please note that a shaft seal does not make the inner cylinder gas tight.

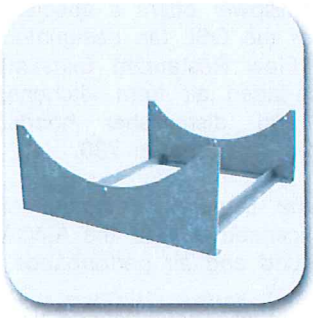
Weather Cover
For outdoor installations, the weather cover completely encloses the motor and V-belt drive from the elements. Provided with slots for ventilation. Weather covers are available for either horizontal or vertical flow fans.

Companion Flanges
Flanges are rolled angle rings, drilled to match the fan's inlet or outlet flange.

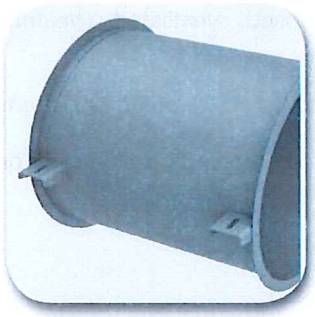
Spark-Resistant Construction
Various grades of spark resistance are as dictated by AMCA: Types A, B, and C. Spark resistant construction requires the addition of a sealed belt tube.

Vibration Isolation
Spring or rubber-in-shear isolators as an option. Spring isolators can be provided for floor mount or ceiling hung orientation.

Seismic Certification
Models QSL, QSLR and QSLSH have been seismically tested and certified with the California Office of Statewide Health, Planning and Development (OSHPD) per OSP-0271-10. Seismic certification is limited to certain product options and configurations.


Support Legs, Horizontal

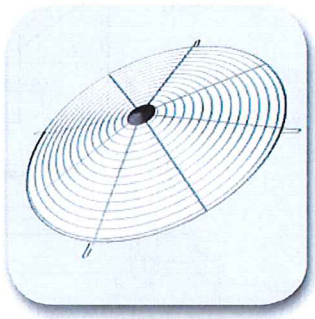
Support Legs, Vertical


Suspension Clips, Horizontal

Discharge Cap

Curb Cap

Shaft Seal


Inlet/Outlet Screens

Companion Flange

QSLR/QSLSHFans

QSLR Restaurant Fans

Twin City Fan & Blower offers a specially modified version of the QSL fan designated as "QSLR" (Mixed Flow Restaurant Exhaust) for exhausting grease-laden air from kitchens, restaurants, cooking and dishwasher hoods. QSLR is available in sizes 150 through 730.

Model QSLR is cULus 762 listed for exhaust of grease-laden air. QSLR is licensed to bear the AMCA certified ratings seal for sound and air performance.

The QSLR fan is available in all configurations with the exception of vertical down (VDN, VDO and VDI).

Standard Product Features

- Belt guard, totally enclosed, ventilated (weather cover for VRM)
- Belt tube, sealed
- Two cleanout doors located 180° apart (90° from motor)
- 2" drain located 180° from motor (lowest point for horizontal) vertical at the funnel
- Cooling fins on wheel
- Housing sealed with Hi-Temp caulk

QSLSH Smoke & Heat Fans

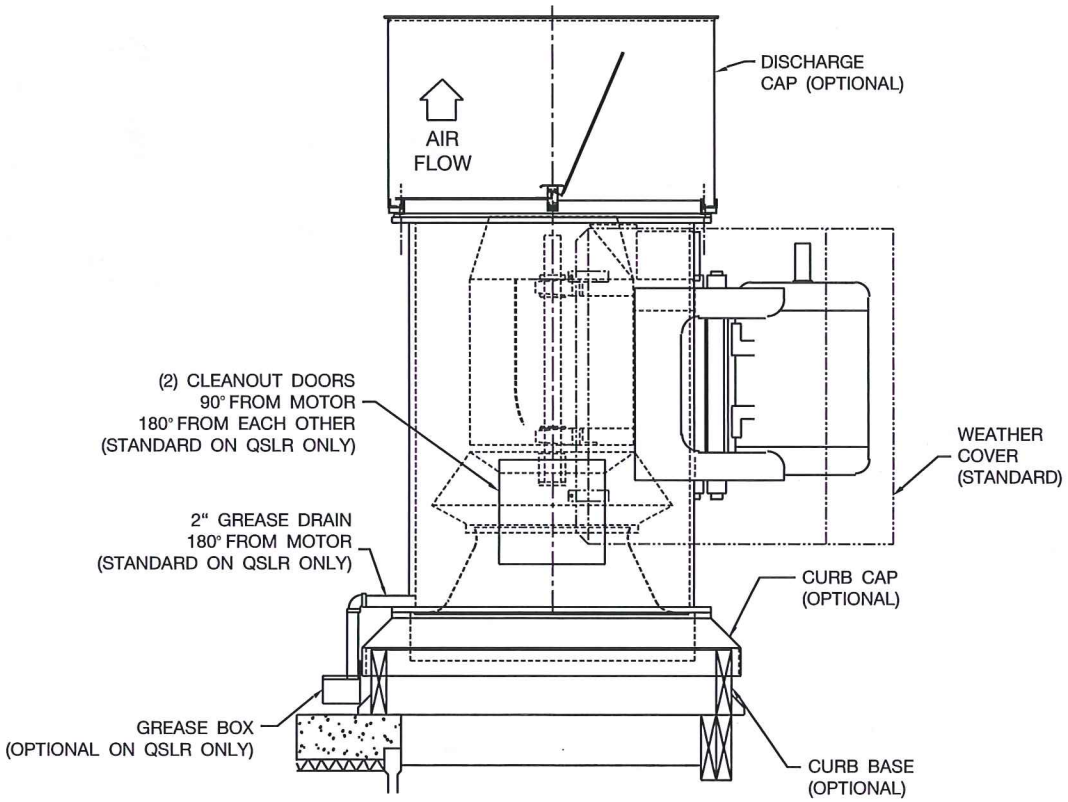
Twin City Fan & Blower offers a specially modified version of the QSL fan designated as "QSLSH" (Mixed Flow Smoke and Heat Exhaust) for smoke control applications where temperatures can reach 1000°F. QSLSH is available in sizes 150 through 730.

Model QSLSH is cULus 705 listed and cULus listed for smoke control systems for 500°F for 4 hours or 1000°F for 15 minutes. Vertical roof mounted configuration, with discharge cap, meets UL 793 Snow Load Test requirements for butterfly dampers. QSLSH is licensed to bear the AMCA certified ratings seal for sound and air performance.

The QSLSH fan is available in all configurations with the exception of vertical down (VDN, VDO and VDI).

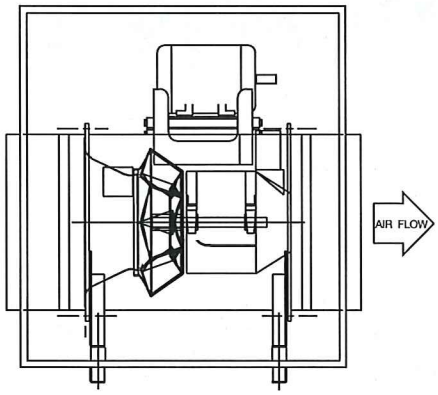
Standard Product Features

- Belt guard, ventilated (weather cover for VRM)
- Belt tube, sealed
- Two-groove drive minimum w/2.0 SF
- Cooling fins on wheel
- Stack cap with fusible link (for VRM)
- Continuously welded housing



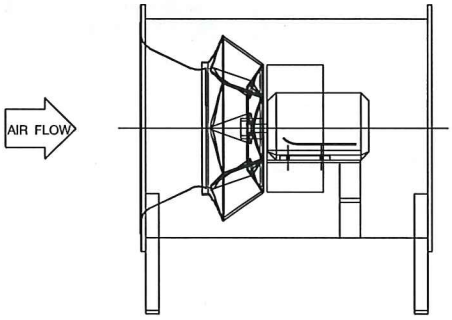
Insulated Enclosure

To further reduce case radiated sound and motor noise, an optional Insulated Enclosure is available. The enclosure consists of a box with 2 inch thick, dual density fiberglass. Consult the factory for dimensions and sound reduction values.



Arrangement 4 (Direct Drive)

Where space constraints require the use of a complete "in line" fan or the desire is for a simple, dependable fan with minimum maintenance requirements, the direct drive Arrangement 4 QSL is available. Constructed with the fan wheel mounted directly on the motor shaft, this fan provides premium efficiency with minimal obstructions in the airstream. The use of a variable frequency drive (VFD) may be necessary for some applications.



Arrangement 3

Where space is a premium, the QSL arrangement 3 is available to shorten the overall fan length. The table below shows the overall savings in length versus an arrangement 9 fan.

FAN SIZE	ARR. 3 OVERALL LENGTH (TA)	LENGTH SAVINGS (IN.)
182	26.75	7.13
200	28.81	8.38
222	30.88	9.25
245	33.94	10.38
270	36.50	12.31
300	40.88	13.69
330	44.94	14.94
365	49.44	16.94
402	54.31	18.69
445	59.06	21.88
490	64.06	24.94
542	71.38	27.38

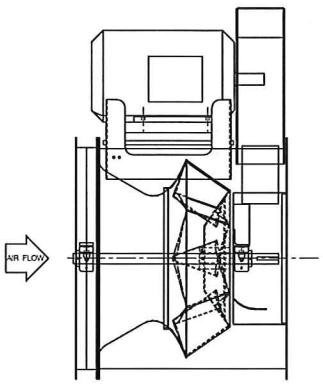


Table 1. Maximum RPM, Wheel Weights, and WR^2 (moment of inertia in lb-ft²)

FAN SIZE	CLASS I			CLASS II		
	MAX. RPM	WEIGHT LB	WR^2 LB-FT²	MAX. RPM	WEIGHT LB	WR^2 LB-FT²
150	2721	24	5.5	3558	28	7.1
165	2483	32	8.0	3247	36	10.3
182	2232	38	12	2918	44	15
200	2027	48	20	2650	52	23
222	1839	57	29	2405	62	34
245	1655	69	45	2165	75	52
270	1505	82	66	1968	90	76
300	1360	140	133	1779	150	145
330	1234	167	197	1613	179	215
365	1116	233	320	1459	247	347
402	1013	324	588	1325	324	588
445	915	393	883	1197	393	883
490	828	478	1321	1082	478	1321
542	752	591	1934	984	591	1934
600	680	715	2893	890	715	2893
660	615	867	4334	804	867	4334
730	558	1064	6396	730	1064	6396

Table 2. Bare Fan Weights (lb)

FAN SIZE	ARRANGEMENT 9	
	CLASS I	CLASS II
150	168	175
165	202	210
182	215	227
200	257	267
222	303	315
245	367	377
270	434	450
300	660	690
330	802	821
365	1019	1048
402	1332	1357
445	1595	1627
490	1992	2008
542	2504	2537
600	3006	3034
660	3880	3979
730	4719	4758

Table 3. Temperature and Altitude Density Ratios

AIR TEMP °F	ALTITUDE IN FEET ABOVE SEA LEVEL											
	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	15000
	BAROMETRIC PRESSURE IN INCHES OF MERCURY											
	29.92	28.86	27.82	26.82	25.84	24.90	23.98	23.09	22.22	21.39	20.58	16.89
-50	1.293	1.247	1.201	1.159	1.116	1.076	1.036	0.997	0.960	0.924	0.889	0.729
0	1.152	1.111	1.071	1.032	0.995	0.959	0.923	0.889	0.856	0.824	0.792	0.650
70	1.000	0.964	0.930	0.896	0.864	0.832	0.801	0.772	0.743	0.714	0.688	0.564
100	0.946	0.912	0.880	0.848	0.818	0.787	0.758	0.730	0.703	0.676	0.651	0.534
150	0.869	0.838	0.808	0.770	0.751	0.723	0.696	0.671	0.646	0.620	0.598	0.490
200	0.803	0.774	0.747	0.720	0.694	0.668	0.643	0.620	0.596	0.573	0.552	0.453

Table 4. Bearing Specifications

FAN SIZE	CLASS I			CLASS II		
	SHAFT DIA. (IN.)	HORIZ.	VERT.	SHAFT DIA. (IN.)	HORIZ.	VERT.
150	1.000	SDB	SDB	1.187	SDB	SDB
165	1.000	SDB	SDB	1.437	SDB	SDB
182	1.000	SDB	SDB	1.437	HDB	HDB
200	1.187	SDB	SDB	1.437	HDB	HDB
222	1.187	SDB	SDB	1.437	HDB	HDB
245	1.437	SDB	SDB	1.687	HDB	HDB
270	1.437	SDB	SDB	1.687	HDB	RB
300	1.437	HDB	HDB	1.937	HDB	RB
330	1.687	HDB	HDB	2.187	HDB	RB
365	1.937	HDB	HDB	2.187	RB	RB
402	1.937	HDB	RB	2.187	RB	RB
445	1.937	HDB	RB	2.437	RB	RB
490	2.187	HDB	RB	2.437	RB	RB
542	2.437	HDB	RB	2.687	RB	RB
600	2.687	HDB	—	2.937	RB	—
660	2.937	HDB	—	3.437	RB	—
730	2.937	HDB	—	3.937	RB	—

NOTES:

1. BEARINGS CODES:
   SDB — Standard-Duty Ball such as Dodge SCAH or SKF SY Series
   HDB — Heavy-Duty Ball such as Dodge SCMAH or SKF SYM Series
   RB — Roller Bearing such as Dodge S2000 or SKF SYR Series

2. Standard bearings are selected to exceed L-10 life of 40,000 hours at the maximum operating speed.

Table 5. Minimum CFM Required to Open Discharge Cap

FAN SIZE	CFM
150	1051
165	1707
182	2532
200	3527
222	3527
245	4693
270	6574
300	7605
330	8712
365	11158
402	15891
445	15891
490	20904
542	26613

150 QSL

Wheel Dia.: 18.25"
Outlet Dia.: 20.31"

Max. BHP = 0.20 (RPM ÷ 1000)³
Tip Speed FPM = 4.78 x RPM

Outlet Area: 2.25 ft²
Fan Efficiency Grade: FEG71

CFM	OV	0.5" SP		1" SP		1.5" SP		2" SP		2.5" SP		3" SP		4" SP		5" SP		6" SP		7" SP		8" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
1300	583	930	0.16	1208	0.33																		
1500	673	984	0.19	1241	0.37	1466	0.59																
1700	762	1045	0.22	1282	0.41	1496	0.65	1689	0.89														
1900	852	1109	0.26	1331	0.46	1532	0.70	1717	0.97	1888	1.25												
2100	942	1177	0.30	1386	0.52	1574	0.76	1751	1.05	1916	1.34	2071	1.65										
2400	1076	1281	0.38	1476	0.62	1649	0.88	1812	1.17	1968	1.49	2115	1.82	2388	2.52								
2700	1211	1389	0.47	1573	0.74	1735	1.01	1885	1.31	2030	1.64	2169	1.99	2430	2.75	2672	3.54						
3000	1345	1499	0.58	1675	0.88	1827	1.17	1969	1.49	2103	1.82	2233	2.18	2482	2.98	2714	3.82	2933	4.70	3138	5.61		
3300	1480	1613	0.71	1779	1.03	1924	1.35	2058	1.68	2186	2.04	2307	2.41	2542	3.22	2765	4.11	2975	5.04	3175	6.00	3366	7.00
3600	1614	1730	0.86	1885	1.20	2026	1.56	2153	1.91	2274	2.28	2390	2.66	2611	3.49	2823	4.41	3026	5.39	3219	6.4	3405	7.45
4000	1794			2030	1.46	2164	1.86	2286	2.25	2399	2.64	2508	3.05	2716	3.92	2913	4.85	3105	5.86	3289	6.94	3467	8.06
4400	1973			2179	1.77	2306	2.20	2423	2.64	2531	3.06	2634	3.49	2831	4.41	3016	5.37	3195	6.40	3370	7.50	3540	8.67
4800	2152			2333	2.13	2450	2.59	2563	3.07	2668	3.54	2766	4.00	2952	4.95	3130	5.97	3299	7.03	3463	8.14		
5200	2332					2598	3.03	2705	3.54	2807	4.05	2902	4.56	3080	5.57	3249	6.62	3411	7.73				
5800	2601					2827	3.81	2924	4.35	3019	4.92	3111	5.50	3281	6.63	3439	7.76						
6200	2780					2983	4.41	3074	4.97	3164	5.57	3252	6.18	3419	7.41								

MAXIMUM RPM: Class I — 2721 Class II — 3558

MAX. MOTOR FRAME: 215T

165 QSL

Wheel Dia.: 20.00"
Outlet Dia.: 22.33"

Max. BHP = 0.31 (RPM ÷ 1000)³
Tip Speed FPM = 5.24 x RPM

Outlet Area: 2.72 ft²
Fan Efficiency Grade: FEG71

CFM	OV	0.5" SP		1" SP		1.5" SP		2" SP		2.5" SP		3" SP		4" SP		5" SP		6" SP		7" SP		8" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
1500	551	837	0.18	1095	0.39																		
1700	625	876	0.21	1119	0.43	1328	0.68																
1900	699	920	0.24	1147	0.47	1348	0.73	1528	1.02														
2100	772	967	0.27	1180	0.51	1372	0.79	1547	1.09														
2400	882	1042	0.34	1239	0.59	1416	0.88	1582	1.21	1735	1.55	1878	1.91										
2700	993	1121	0.41	1305	0.68	1469	0.98	1624	1.32	1770	1.70	1908	2.08	2163	2.90								
3000	1103	1201	0.49	1375	0.79	1530	1.11	1674	1.45	1813	1.84	1945	2.26	2191	3.12	2416	4.03						
3400	1250	1311	0.62	1476	0.96	1619	1.30	1753	1.66	1880	2.06	2004	2.49	2237	3.42	2454	4.40	2657	5.42				
3800	1397	1425	0.78	1580	1.15	1715	1.52	1841	1.91	1960	2.33	2074	2.76	2294	3.73	2501	4.78	2696	5.87	2882	7.00	3057	8.17
4200	1544	1542	0.97	1687	1.37	1817	1.78	1934	2.19	2047	2.63	2154	3.09	2360	4.07	2557	5.17	2745	6.33	2923	7.52	3094	8.75
4600	1691			1796	1.62	1921	2.08	2034	2.52	2140	2.98	2242	3.46	2436	4.48	2622	5.59	2801	6.79	2973	8.06	3138	9.36
5000	1838			1907	1.90	2027	2.40	2137	2.89	2238	3.37	2335	3.87	2520	4.93	2695	6.06	2865	7.29	3031	8.61	3190	9.98
5500	2022			2051	2.31	2163	2.85	2268	3.39	2365	3.92	2457	4.46	2632	5.57	2798	6.76	2957	8.01	3112	9.34		
6000	2206			2199	2.80	2301	3.35	2402	3.95	2496	4.54	2585	5.13	2750	6.30	2909	7.54	3060	8.84	3206	10.21		
6500	2390					2444	3.94	2538	4.57	2629	5.22	2715	5.86	2875	7.12	3025	8.41	3170	9.77				
7000	2574					2589	4.62	2678	5.27	2764	5.96	2848	6.66	3003	8.03	3147	9.39						

MAXIMUM RPM: Class I — 2483 Class II — 3247

MAX. MOTOR FRAME: 215T

182 QSL

Wheel Dia.: 22.25"
Outlet Dia.: 24.75"

Max. BHP = 0.53 (RPM ÷ 1000)³
Tip Speed FPM = 5.83 x RPM

Outlet Area: 3.34 ft²
Fan Efficiency Grade: FEG71

CFM	OV	0.5" SP		1" SP		1.5" SP		2" SP		2.5" SP		3" SP		4" SP		5" SP		6" SP		7" SP		8" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
1700	512	733	0.21	974	0.45																		
2000	602	772	0.24	996	0.51																		
2300	693	819	0.29	1025	0.57	1208	0.89																
2600	783	870	0.34	1061	0.63	1234	0.98	1391	1.36														
3000	904	943	0.42	1118	0.74	1276	1.10	1424	1.51	1562	1.94	1690	2.38										
3400	1024	1019	0.52	1182	0.86	1328	1.24	1466	1.66	1597	2.13	1720	2.61	1948	3.63								
3800	1145	1097	0.64	1252	1.01	1389	1.41	1516	1.84	1639	2.32	1757	2.84	1976	3.93	2177	5.06						
4200	1265	1177	0.77	1325	1.18	1454	1.60	1574	2.05	1689	2.55	1800	3.08	2010	4.23	2205	5.44	2388	6.70				
4600	1386	1259	0.92	1401	1.37	1523	1.82	1638	2.30	1746	2.81	1850	3.34	2051	4.54	2239	5.82	2416	7.15	2583	8.52		
5100	1536	1365	1.15	1497	1.64	1615	2.14	1722	2.64	1824	3.18	1922	3.74	2109	4.95	2288	6.30	2458	7.72	2620	9.19	2774	10.69
5600	1687			1596	1.94	1709	2.50	1811	3.04	1907	3.60	2000	4.19	2176	5.44	2345	6.81	2508	8.30	2664	9.86	2813	11.45
6100	1837			1697	2.29	1805	2.89	1904	3.49	1995	4.08	2083	4.69	2251	6.00	2410	7.39	2565	8.91	2714	10.52	2859	12.22
6600	1988			1800	2.68	1903	3.33	1999	3.98	2087	4.62	2171	5.26	2332	6.63	2483	8.06	2629	9.60	2772	11.25	2910	12.98
7100	2139			1906	3.14	2002	3.81	2095	4.51	2182	5.22	2262	5.90	2415	7.31	2561	8.81	2701	10.39	2836	12.05		
7600	2289			2014	3.65	2104	4.35	2193	5.10	2277	5.85	2356	6.59	2503	8.07	2643	9.62	2778	11.26	2907	12.96		
8100	2440					2208	4.95	2292	5.73	2374	6.54	2451	7.34	2594	8.91	2729	10.52	2858	12.20				

MAXIMUM RPM: Class I — 2232 Class II — 2918

MAX. MOTOR FRAME: 256T

Legend:
Class I = Regular face to left of Class II
Class II = Regular face in light shaded area

Performance certified is for installation Type B: Free inlet, ducted outlet.
Power rating (BHP) does not include transmission losses.
Performance ratings do not include the effects of appurtenances (accessories).
Underlined figures indicate maximum static efficiency.

200 QSL

Wheel Dia.: 24.50"
Outlet Dia.: 27.22"

Max. BHP = 0.82 (RPM ÷ 1000)³
Tip Speed FPM = 6.41 x RPM

Outlet Area: 4.04 ft²
Fan Efficiency Grade: FEG71

CFM	OV	0.5" SP		1" SP		1.5" SP		2" SP		2.5" SP		3" SP		4" SP		5" SP		6" SP		7" SP		8" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
2400	602	699	0.29	903	0.61																		
2800	702	745	0.35	932	0.69	1098	1.09																
3200	802	796	0.42	968	0.78	1124	1.20	1266	1.66	1396	2.15												
3600	902	851	0.51	1011	0.88	1156	1.32	1291	1.81	1416	2.33	1533	2.87										
4100	1028	922	0.63	1071	1.04	1204	1.49	1330	2.01	1449	2.57	1561	3.16	1768	4.38								
4600	1153	995	0.77	1136	1.22	1260	1.70	1376	2.23	1488	2.81	1595	3.44	1794	4.75	1977	6.14						
5100	1278	1070	0.93	1204	1.43	1322	1.95	1431	2.50	1535	3.09	1636	3.74	1826	5.13	2003	6.60	2169	8.14				
5600	1404	1147	1.13	1275	1.68	1386	2.22	1490	2.80	1588	3.42	1682	4.07	1864	5.52	2035	7.08	2195	8.69	2347	10.37		
6100	1529	1226	1.35	1347	1.94	1455	2.54	1553	3.14	1646	3.78	1736	4.46	1907	5.93	2071	7.56	2227	9.27	2374	11.02	2515	12.83
6700	1679			1436	2.30	1539	2.96	1632	3.61	1721	4.29	1806	5.00	1967	6.50	2122	8.17	2271	9.96	2413	11.83	2549	13.74
7300	1830			1526	2.70	1625	3.43	1715	4.14	1799	4.85	1880	5.59	2033	7.16	2179	8.85	2321	10.68	2457	12.63	2589	14.66
7900	1980			1619	3.17	1713	3.94	1801	4.73	1881	5.48	1958	6.26	2105	7.90	2244	9.64	2377	11.48	2508	13.48	2635	15.59
8500	2130			1714	3.70	1802	4.51	1887	5.35	1966	6.19	2040	7.01	2180	8.71	2313	10.51	2441	12.42	2565	14.43		
9200	2306			1827	4.41	1909	5.26	1989	6.16	2066	7.08	2138	7.98	2271	9.76	2399	11.65	2521	13.62	2638	15.67		
9900	2481					2018	6.11	2094	7.06	2168	8.05	2238	9.03	2367	10.94	2488	12.89	2606	14.96				
10600	2657					2129	7.07	2200	8.05	2271	9.10	2339	10.16	2465	12.23	2582	14.29						

MAXIMUM RPM: Class I — 2027 Class II — 2650

MAX. MOTOR FRAME: 256T

222 QSL

Wheel Dia.: 27.00"
Outlet Dia.: 30.19"

Max. BHP = 1.37 (RPM ÷ 1000)³
Tip Speed FPM = 7.07 x RPM

Outlet Area: 4.97 ft²
Fan Efficiency Grade: FEG75

CFM	OV	0.5" SP		1" SP		1.5" SP		2" SP		2.5" SP		3" SP		4" SP		5" SP		6" SP		7" SP		8" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
2500	508	600	0.29	793	0.61																		
3000	610	632	0.34	818	0.71	968	1.11																
3500	711	669	0.39	847	0.81	993	1.25	1120	1.72														
4000	813	711	0.46	878	0.91	1020	1.40	1144	1.91	1256	2.45												
4500	915	759	0.55	911	1.01	1050	1.56	1171	2.11	1281	2.69	1381	3.28										
5000	1016	811	0.64	950	1.13	1082	1.71	1200	2.31	1308	2.94	1407	3.58	1586	4.91								
5500	1118	866	0.76	992	1.26	1116	1.86	1232	2.52	1337	3.19	1434	3.87	1610	5.29	1769	6.78						
6000	1220	923	0.89	1038	1.42	1153	2.02	1264	2.72	1367	3.44	1463	4.18	1636	5.68	1793	7.25	1937	8.89				
6500	1321	981	1.04	1087	1.59	1194	2.21	1299	2.92	1400	3.70	1493	4.48	1664	6.08	1818	7.73	1960	9.44	2093	11.23		
7000	1423	1041	1.21	1140	1.79	1239	2.44	1337	3.15	1433	3.94	1525	4.78	1693	6.48	1845	8.22	1986	10.04	2116	11.87	2239	13.78
8000	1626	1163	1.61	1250	2.26	1336	2.95	1423	3.70	1509	4.51	1593	5.38	1756	7.30	1904	9.25	2040	11.21	2168	13.24	2288	15.30
9000	1829			1365	2.82	1442	3.57	1518	4.36	1596	5.22	1673	6.11	1823	8.09	1967	10.27	2100	12.45	2224	14.63	2342	16.87
10000	2033			1484	3.49	1553	4.30	1622	5.15	1691	6.04	1761	6.99	1899	9.00	2034	11.25	2164	13.66	2286	16.09	2401	18.52
11000	2236			1606	4.28	1669	5.16	1732	6.07	1795	7.01	1857	7.99	1984	10.09	2109	12.36	2231	14.84	2350	17.48		
12000	2439			1730	5.21	1788	6.15	1846	7.12	1903	8.12	1961	9.16	2076	11.34	2192	13.67	2306	16.17				
13000	2642					1909	7.28	1962	8.31	2016	9.38	2069	10.47	2175	12.75	2282	15.18	2389	17.74				

MAXIMUM RPM: Class I — 1839 Class II — 2405

MAX. MOTOR FRAME: 256T

245 QSL

Wheel Dia.: 30.00"
Outlet Dia.: 33.20"

Max. BHP = 2.31 (RPM ÷ 1000)³
Tip Speed FPM = 7.85 x RPM

Outlet Area: 6.01 ft²
Fan Efficiency Grade: FEG75

CFM	OV	0.5" SP		1" SP		1.5" SP		2" SP		2.5" SP		3" SP		4" SP		5" SP		6" SP		7" SP		8" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
3500	585	559	0.40	728	0.84																		
4000	669	584	0.45	748	0.93	882	1.46																
4500	753	612	0.51	770	1.04	900	1.60	1014	2.20														
5000	836	644	0.58	793	1.14	921	1.75	1032	2.39	1132	3.05												
5500	920	679	0.66	817	1.24	942	1.90	1052	2.58	1151	3.30	1241	4.02										
6000	1003	717	0.76	845	1.35	966	2.06	1073	2.79	1170	3.54	1259	4.31	1422	5.94								
7000	1171	797	0.99	907	1.62	1015	2.36	1118	3.19	1212	4.04	1299	4.90	1457	6.70	1599	8.56						
8000	1338	881	1.28	977	1.96	1073	2.72	1168	3.59	1259	4.56	1343	5.52	1497	7.49	1636	9.54	1763	11.63	1883	13.83		
9000	1505	968	1.62	1054	2.37	1139	3.18	1225	4.07	1308	5.04	1390	6.12	1540	8.31	1676	10.52	1801	12.81	1918	15.15	2028	17.56
10000	1672	1058	2.05	1135	2.85	1212	3.72	1289	4.65	1366	5.65	1441	6.73	1586	9.11	1719	11.55	1841	13.99	1956	16.51	2064	19.09
11000	1839			1219	3.41	1289	4.33	1358	5.31	1429	6.36	1499	7.46	1635	9.90	1765	12.56	1885	15.23	1997	17.91	2104	20.68
12000	2007			1305	4.06	1369	5.04	1433	6.07	1497	7.16	1562	8.31	1689	10.77	1813	13.54	1931	16.45	2041	19.35	2145	22.27
13000	2174			1394	4.81	1453	5.85	1512	6.94	1571	8.08	1630	9.27	1749	11.80	1865	14.57	1979	17.63	2088	20.80		
14000	2341			1483	5.66	1538	6.76	1593	7.91	1648	9.10	1703	10.34	1813	12.96	1923	15.79	2030	18.84	2135	22.14		
16000	2676					1714	8.93	1762	10.20	1810	11.51	1858	12.85	1954	15.67	2050	18.65	2147	21.81				
18000	3010					1894	11.61	1937	13.01	1979	14.42	2022	15.89	2107	18.91								

MAXIMUM RPM: Class I — 1655 Class II — 2165

MAX. MOTOR FRAME: 286T

Legend:
Class I = Regular face to left of Class II
Class II = Regular face in light shaded area

Performance certified is for installation Type B: Free inlet, ducted outlet.
Power rating (BHP) does not include transmission losses.
Performance ratings do not include the effects of appurtenances (accessories).
Underlined figures indicate maximum static efficiency.

270 QSL

Wheel Dia.: 33.00"
Outlet Dia.: 36.54"

Max. BHP = 3.71 (RPM ÷ 1000)³
Tip Speed FPM = 8.64 x RPM

Outlet Area: 7.28 ft²
Fan Efficiency Grade: FEG75

CFM	OV	0.5" SP		1" SP		1.5" SP		2" SP		2.5" SP		3" SP		4" SP		5" SP		6" SP		7" SP		8" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
4500	620	518	0.51	670	1.06	793	1.67																
5000	689	537	0.56	685	1.16	806	1.81	911	2.50														
5500	758	559	0.62	702	1.27	820	1.95	923	2.67														
6000	826	583	0.69	719	1.37	835	2.10	937	2.87	1028	3.67												
6500	895	609	0.78	737	1.46	852	2.26	951	3.06	1042	3.91	1124	4.78										
7000	964	637	0.87	757	1.57	869	2.41	967	3.27	1056	4.15	1138	5.07	1286	7.00								
8000	1102	695	1.08	801	1.82	904	2.70	1000	3.67	1087	4.66	1167	5.66	1311	7.73	1442	9.94						
9000	1240	757	1.34	851	2.13	945	3.03	1036	4.08	1120	5.16	1198	6.26	1340	8.52	1468	10.87	1585	13.31				
10000	1377	822	1.65	906	2.49	991	3.43	1074	4.48	1156	5.67	1232	6.88	1371	9.32	1496	11.84	1612	14.46	1719	17.13	1821	19.94
11000	1515	888	2.01	964	2.91	1041	3.90	1119	4.99	1194	6.17	1268	7.48	1404	10.15	1527	12.84	1640	15.61	1746	18.46	1846	21.40
12000	1653	955	2.43	1025	3.39	1096	4.44	1167	5.57	1237	6.77	1306	8.08	1439	10.96	1559	13.86	1671	16.82	1775	19.84	1874	22.96
13000	1791	1023	2.92	1088	3.94	1153	5.04	1218	6.21	1284	7.46	1349	8.79	1475	11.74	1594	14.90	1703	18.04	1806	21.24	1903	24.51
14000	1928			1153	4.57	1213	5.72	1273	6.93	1334	8.23	1395	9.60	1514	12.57	1629	15.87	1737	19.27	1838	22.67	1934	26.12
15000	2066			1218	5.26	1275	6.48	1331	7.75	1387	9.08	1444	10.50	1557	13.52	1666	16.85	1773	20.49	1872	24.11	1966	27.75
17000	2342			1352	6.90	1402	8.24	1452	9.63	1502	11.08	1551	12.57	1651	15.75	1751	19.18	1848	22.88	1943	26.87		
19000	2617					1534	10.38	1578	11.88	1623	13.45	1667	15.05	1756	18.43	1846	22.02	1935	25.80				

MAXIMUM RPM: Class I — 1505 Class II — 1968

MAX. MOTOR FRAME: 286T

300 QSL

Wheel Dia.: 36.50"
Outlet Dia.: 40.62"

Max. BHP = 6.16 (RPM ÷ 1000)³
Tip Speed FPM = 9.56 x RPM

Outlet Area: 9.00 ft²
Fan Efficiency Grade: FEG75

CFM	OV	0.5" SP		1" SP		1.5" SP		2" SP		2.5" SP		3" SP		4" SP		5" SP		6" SP		7" SP		8" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
5000	558	455	0.57	595	1.20																		
5750	642	475	0.65	611	1.35	721	2.10																
6500	725	498	0.73	629	1.50	737	2.33	830	3.19														
7250	809	524	0.84	648	1.66	753	2.54	845	3.47	928	4.45												
8000	893	553	0.96	668	1.80	771	2.77	861	3.76	943	4.81	1018	5.89										
8750	977	583	1.09	690	1.96	790	3.00	879	4.08	959	5.18	1032	6.30	1166	8.69								
9500	1060	616	1.26	715	2.15	810	3.23	897	4.38	976	5.55	1048	6.74	1180	9.25								
11000	1228	684	1.63	769	2.60	854	3.71	936	4.98	1012	6.31	1083	7.66	1211	10.41	1327	13.29	1433	16.27				
12500	1395	756	2.11	830	3.15	906	4.33	980	5.61	1052	7.05	1121	8.58	1245	11.60	1359	14.76	1463	18.00	1560	21.33	1651	24.76
14000	1562	829	2.67	896	3.81	963	5.05	1030	6.39	1096	7.85	1161	9.46	1283	12.85	1393	16.25	1495	19.75	1590	23.33	1680	27.02
15500	1730	905	3.37	965	4.59	1025	5.91	1086	7.33	1146	8.82	1206	10.44	1322	14.03	1430	17.79	1530	21.57	1623	25.39	1712	29.38
17000	1897			1036	5.50	1091	6.90	1146	8.39	1201	9.96	1257	11.64	1365	15.26	1470	19.31	1567	23.41	1659	27.56	1745	31.72
19000	2121			1133	6.92	1183	8.46	1232	10.05	1281	11.72	1330	13.46	1429	17.20	1525	21.29	1620	25.81	1710	30.46		
21000	2344			1233	8.63	1278	10.29	1322	11.99	1367	13.79	1411	15.62	1500	19.52	1590	23.74	1677	28.27	1763	33.19		
23000	2567					1375	12.42	1416	14.27	1456	16.14	1497	18.10	1578	22.20	1660	26.57	1741	31.17				
25000	2790					1474	14.88	1511	16.83	1549	18.86	1586	20.92	1661	25.23	1736	29.79						

MAXIMUM RPM: Class I — 1360 Class II — 1779

MAX. MOTOR FRAME: 326T

330 QSL

Wheel Dia.: 40.25
Outlet Dia.: 44.68"

Max. BHP = 10.03 (RPM ÷ 1000)³
Tip Speed FPM = 10.54 x RPM

Outlet Area: 10.89 ft²
Fan Efficiency Grade: FEG75

CFM	OV	0.5" SP		1" SP		1.5" SP		2" SP		2.5" SP		3" SP		4" SP		5" SP		6" SP		7" SP		8" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
7250	668	436	0.81	559	1.70	658	2.63																
8000	737	454	0.90	572	1.85	670	2.86	754	3.91														
8750	806	473	1.00	586	2.00	682	3.07	765	4.19	841	5.39												
9500	876	494	1.12	601	2.15	695	3.30	777	4.49	851	5.72	920	7.03										
10250	945	517	1.26	617	2.30	709	3.53	790	4.79	863	6.10	930	7.44										
11000	1014	541	1.41	634	2.47	724	3.77	803	5.09	875	6.46	942	7.88	1062	10.83								
12500	1152	590	1.75	673	2.89	754	4.20	832	5.72	902	7.24	966	8.75	1084	11.96	1190	15.31						
14000	1290	642	2.17	716	3.38	790	4.75	862	6.31	930	7.99	993	9.68	1109	13.16	1213	16.77	1308	20.47	1398	24.39		
15500	1429	696	2.66	763	3.96	829	5.38	896	6.97	960	8.72	1022	10.60	1135	14.38	1237	18.23	1331	22.22	1419	26.33	1501	30.53
17000	1567	751	3.24	812	4.63	872	6.12	934	7.78	993	9.52	1052	11.48	1163	15.61	1263	19.75	1355	23.97	1442	28.37	1523	32.81
19000	1751	826	4.17	880	5.66	935	7.29	989	9.01	1044	10.86	1097	12.80	1202	17.18	1300	21.80	1390	26.41	1475	31.13	1555	35.96
21000	1935			951	6.90	1000	8.62	1049	10.44	1099	12.40	1148	14.42	1245	18.84	1339	23.78	1428	28.91	1510	33.96	1588	39.10
23000	2120			1024	8.34	1069	10.20	1114	12.14	1158	14.14	1203	16.27	1293	20.79	1381	25.79	1467	31.27	1548	36.84		
25000	2304			1098	10.01	1139	11.97	1181	14.05	1222	16.17	1263	18.39	1346	23.10	1428	28.14	1509	33.69	1588	39.64		
27000	2488			1173	11.91	1211	14.00	1250	16.21	1288	18.44	1326	20.76	1402	25.64	1479	30.85	1555	36.42				
29000	2673					1285	16.33	1320	18.60	1356	20.99	1391	23.39	1462	28.48	1534	33.92	1605	39.57				

MAXIMUM RPM: Class I — 1234 Class II — 1613

MAX. MOTOR FRAME: 326T

Legend:
Class I = Regular face to left of Class II
Class II = Regular face in light shaded area

Performance certified is for installation Type B: Free inlet, ducted outlet.
Power rating (BHP) does not include transmission losses.
Performance ratings do not include the effects of appurtenances (accessories).
Underlined figures indicate maximum static efficiency.

365 QSL

Wheel Dia.: 44.50"
Outlet Dia.: 49.44"

Max. BHP = 17.44 (RPM ÷ 1000)³
Tip Speed FPM = 11.65 x RPM

Outlet Area: 13.33 ft²
Fan Efficiency Grade: FEG80

CFM	OV	0.5" SP		1" SP		1.5" SP		2" SP		2.5" SP		3" SP		4" SP		5" SP		6" SP		7" SP		8" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
8000	602	371	0.88	484	1.88																		
9000	677	386	0.99	495	2.07																		
10000	752	403	1.11	507	2.24	595	3.52																
12000	903	445	1.43	535	2.64	618	4.06	692	5.59														
14000	1053	491	1.84	567	3.10	645	4.63	715	6.29	780	8.07	840	9.86										
16000	1204	538	2.32	608	3.71	675	5.27	742	7.05	804	8.96	862	10.96	968	15.05								
18000	1354	586	2.88	653	4.46	711	6.05	772	7.91	832	9.94	887	12.04	990	16.55	1084	21.17						
20000	1505	636	3.56	699	5.30	754	7.04	806	8.88	861	10.97	915	13.22	1014	17.96	1105	22.98	1190	28.13				
22000	1655	687	4.37	746	6.24	798	8.14	846	10.06	895	12.19	944	14.46	1041	19.47	1129	24.76	1212	30.35	1289	35.92	1363	41.64
24000	1806			794	7.30	844	9.38	890	11.46	934	13.62	978	15.92	1070	21.12	1156	26.65	1236	32.49	1312	38.55	1384	44.69
26000	1956			843	8.50	891	10.75	936	13.04	977	15.29	1017	17.63	1100	22.83	1184	28.63	1262	34.67	1336	41.03	1406	47.53
28000	2107			893	9.88	938	12.23	981	14.69	1022	17.16	1060	19.61	1135	24.83	1213	30.70	1290	37.04	1362	43.59	1431	50.45
30000	2257			943	11.41	987	13.92	1028	16.52	1067	19.14	1104	21.76	1174	27.12	1245	32.98	1319	39.52	1390	46.34	1457	53.36
32000	2408			994	13.15	1036	15.76	1076	18.53	1113	21.30	1149	24.09	1216	29.69	1282	35.65	1350	42.18	1419	49.24		
34000	2558					1086	17.81	1124	20.68	1160	23.63	1195	26.62	1260	32.52	1322	38.61	1384	45.09	1449	52.23		
36000	2709					1136	20.06	1173	23.06	1208	26.16	1242	29.34	1306	35.64	1365	41.93	1423	48.50				

MAXIMUM RPM: Class I — 1116 Class II — 1459

MAX. MOTOR FRAME: 365T

402 QSL

Wheel Dia.: 49.00"
Outlet Dia.: 54.43"

Max. BHP = 28.23 (RPM ÷ 1000)³
Tip Speed FPM = 12.83 x RPM

Outlet Area: 16.16 ft²
Fan Efficiency Grade: FEG80

CFM	OV	0.5" SP		1" SP		1.5" SP		2" SP		2.5" SP		3" SP		4" SP		5" SP		6" SP		7" SP		8" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
10000	620	340	1.10	442	2.34																		
11000	682	351	1.20	450	2.52																		
12000	744	364	1.33	459	2.69	539	4.22																
14000	868	395	1.64	480	3.09	556	4.77	624	6.56														
16000	993	429	2.02	502	3.51	575	5.31	641	7.30	700	9.32												
18000	1117	464	2.47	530	4.05	597	5.93	660	8.03	717	10.23	771	12.54										
20000	1241	499	2.96	562	4.71	620	6.59	681	8.82	736	11.13	788	13.60	884	18.72								
22000	1365	536	3.55	596	5.47	649	7.44	703	9.66	757	12.11	807	14.67	900	20.15	986	25.85						
24000	1489	573	4.22	630	6.30	680	8.38	729	10.65	779	13.16	828	15.85	919	21.63	1002	27.69	1079	33.84				
26000	1613	611	5.01	665	7.21	714	9.50	758	11.79	803	14.30	850	17.11	938	23.05	1019	29.42	1095	36.07	1166	42.74		
29000	1799			719	8.78	765	11.32	807	13.85	847	16.45	887	19.23	970	25.47	1048	32.15	1121	39.22	1190	46.55	1256	54.03
32000	1985			774	10.60	817	13.35	858	16.19	895	18.96	931	21.82	1005	28.14	1080	35.16	1151	42.59	1218	50.37	1281	58.30
35000	2171			830	12.73	871	15.69	910	18.79	946	21.84	980	24.90	1045	31.20	1114	38.41	1183	46.22	1248	54.29	1309	62.58
38000	2357			888	15.25	926	18.34	963	21.66	997	24.95	1030	28.26	1092	34.98	1153	42.14	1216	49.99	1280	58.54		
41000	2543					982	21.35	1017	24.85	1050	28.42	1082	32.04	1141	39.14	1197	46.45	1254	54.34	1313	62.94		
44000	2730					1039	24.79	1072	28.42	1103	32.15	1134	36.05	1192	43.77	1245	51.39	1297	59.35				

MAXIMUM RPM: Class I — 1013 Class II — 1325

MAX. MOTOR FRAME: 365T

445 QSL

Wheel Dia.: 54.25"
Outlet Dia.: 60.25"

Max. BHP = 46.94 (RPM ÷ 1000)³
Tip Speed FPM = 14.20 x RPM

Outlet Area: 19.80 ft²
Fan Efficiency Grade: FEG80

CFM	OV	0.5" SP		1" SP		1.5" SP		2" SP		2.5" SP		3" SP		4" SP		5" SP		6" SP		7" SP		8" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
13000	658	313	1.42	404	3.01																		
15000	759	332	1.67	417	3.36	489	5.27																
17000	861	355	1.98	432	3.75	501	5.80	563	8.00														
19000	962	380	2.36	448	4.16	515	6.34	575	8.73	629	11.15												
21000	1063	405	2.77	467	4.65	531	6.96	588	9.43	641	12.08	690	14.76										
23000	1165	431	3.24	490	5.27	547	7.58	603	10.19	654	12.96	702	15.87	790	21.79								
25000	1266	457	3.76	514	5.96	565	8.27	619	11.01	669	13.91	715	16.92	801	23.28								
28000	1418	498	4.68	551	7.11	598	9.60	644	12.30	692	15.38	737	18.60	820	25.46	896	32.60						
31000	1570	540	5.80	589	8.42	634	11.15	675	13.93	717	17.00	761	20.45	841	27.62	915	35.34	984	43.29	1048	51.19		
34000	1722	582	7.09	629	9.93	671	12.88	710	15.87	747	18.95	786	22.39	864	29.96	936	38.07	1002	46.42	1065	55.07	1125	63.82
37000	1873			669	11.61	709	14.80	747	18.07	782	21.34	816	24.73	888	32.45	958	40.85	1023	49.69	1085	58.98	1143	68.31
40000	2025			710	13.53	748	16.93	785	20.51	818	23.95	850	27.50	915	35.24	982	43.95	1045	53.02	1105	62.62	1162	72.53
43000	2177			751	15.67	788	19.31	823	23.11	855	26.80	886	30.59	945	38.37	1007	47.18	1069	56.72	1128	66.69	1183	76.85
47000	2380			808	19.08	842	22.86	875	26.94	906	31.05	936	35.19	991	43.39	1046	52.25	1102	61.85	1159	72.27		
51000	2582					897	26.95	928	31.25	958	35.73	986	40.15	1040	49.12	1090	58.15	1140	67.75	1193	78.43		
55000	2785					953	31.66	982	36.11	1011	40.91	1038	45.69	1090	55.36	1137	64.80	1184	74.79				

MAXIMUM RPM: Class I — 915 Class II — 1197

MAX. MOTOR FRAME: 405T

Legend:
Class I = Regular face to left of Class II
Class II = Regular face in light shaded area

Performance certified is for installation Type B: Free inlet, ducted outlet.
Power rating (BHP) does not include transmission losses.
Performance ratings do not include the effects of appurtenances (accessories).
Underlined figures indicate maximum static efficiency.

490 QSL

Wheel Dia.: 60.00"
Outlet Dia.: 66.31"

Max. BHP = 74.47 (RPM ÷ 1000)³
Tip Speed FPM = 15.71 x RPM

Outlet Area: 23.98 ft²
Fan Efficiency Grade: FEG80

CFM	OV	0.5" SP		1" SP		1.5" SP		2" SP		2.5" SP		3" SP		4" SP		5" SP		6" SP		7" SP		8" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
18000	753	298	2.00	375	4.05	441	6.36																
20000	836	314	2.29	386	4.42	449	6.88	506	9.49														
22000	920	332	2.65	398	4.84	459	7.42	514	10.22														
24000	1003	350	3.03	410	5.26	470	7.98	523	10.92	572	14.00												
27000	1129	379	3.70	433	6.08	487	8.87	539	12.04	586	15.37	630	18.83										
30000	1254	408	4.45	459	7.06	507	9.92	556	13.21	601	16.68	644	20.43	722	28.07								
33000	1380	438	5.34	487	8.22	530	11.15	574	14.47	618	18.15	659	22.00	735	30.21	805	38.73						
36000	1505	468	6.34	515	9.47	556	12.61	595	15.94	636	19.72	677	23.86	750	32.36	818	41.48	881	50.71				
40000	1672	510	7.97	553	11.32	592	14.80	628	18.35	664	22.18	701	26.38	772	35.38	838	45.13	899	55.19	956	65.31	1011	75.72
44000	1839			592	13.44	630	17.34	664	21.17	696	25.07	728	29.21	795	38.58	859	48.73	918	59.34	975	70.59	1028	81.77
48000	2007			632	15.89	668	20.09	701	24.30	731	28.43	760	32.67	821	42.23	882	52.72	940	63.86	994	75.37	1046	87.38
52000	2174			673	18.73	707	23.17	738	27.67	768	32.25	796	36.81	850	46.31	907	57.11	963	68.64	1016	80.64	1067	93.28
56000	2341			715	22.02	747	26.65	777	31.50	805	36.34	832	41.21	883	51.11	934	61.83	987	73.68	1039	86.21		
60000	2508			756	25.60	787	30.48	816	35.63	843	40.82	870	46.18	918	56.48	965	67.34	1014	79.36	1063	92.10		
64000	2676					828	34.82	855	40.09	882	45.73	907	51.29	955	62.49	999	73.64	1044	85.72				
68000	2843					869	39.61	896	45.24	921	50.99	945	56.84	992	68.84	1035	80.65	1076	92.67				

MAXIMUM RPM: Class I — 828 Class II — 1082

MAX. MOTOR FRAME: 405T

542 QSL

Wheel Dia.: 66.00"
Outlet Dia.: 73.37"

Max. BHP = 125.16 (RPM ÷ 1000)³
Tip Speed FPM = 17.28 x RPM

Outlet Area: 29.36 ft²
Fan Efficiency Grade: FEG80

CFM	OV	0.5" SP		1" SP		1.5" SP		2" SP		2.5" SP		3" SP		4" SP		5" SP		6" SP		7" SP		8" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
22000	750	272	2.45	342	4.94	401	7.72																
25500	869	294	2.99	357	5.63	413	8.67	464	11.98														
29000	988	318	3.66	373	6.38	427	9.64	475	13.18	520	16.94												
32500	1107	343	4.43	393	7.32	442	10.68	489	14.47	532	18.52	572	22.67										
36000	1227	369	5.32	415	8.42	459	11.87	504	15.85	545	20.03	584	24.52	655	33.68								
39500	1346	395	6.33	439	9.72	479	13.28	520	17.34	560	21.75	598	26.47	667	36.30	730	46.37						
43500	1482	425	7.64	468	11.45	505	15.23	541	19.30	578	23.84	615	28.80	682	39.19	743	50.05	801	61.36				
47500	1618	456	9.22	496	13.24	532	17.39	565	21.61	598	26.17	633	31.32	698	42.11	758	53.72	814	65.78	867	78.05		
51500	1755	488	11.08	526	15.35	560	19.82	591	24.25	622	29.02	652	33.96	715	45.24	774	57.40	828	69.96	880	83.16	929	96.40
55500	1891			555	17.58	588	22.41	619	27.30	647	32.11	675	37.22	734	48.79	791	61.28	844	74.39	894	88.04	942	102.15
59500	2027			586	20.24	617	25.28	647	30.56	674	35.66	701	41.06	754	52.52	808	65.24	861	79.04	910	93.23	957	108.02
64000	2181			620	23.47	651	28.96	679	34.52	706	40.16	731	45.71	779	57.22	830	70.37	880	84.32	928	98.97	974	114.33
68500	2334			655	27.18	684	32.83	711	38.73	737	44.76	762	50.83	808	62.92	853	75.72	901	90.20	948	105.44		
73000	2487			691	31.44	718	37.21	744	43.41	769	49.81	793	56.23	838	69.09	880	82.15	924	96.64	968	111.96		
77500	2641					753	42.17	778	48.64	802	55.36	825	62.15	868	75.55	909	89.33	949	103.68				
82000	2794					788	47.61	812	54.29	835	61.27	857	68.36	900	82.88	939	97.09	977	111.81				

MAXIMUM RPM: Class I — 752 Class II — 984

MAX. MOTOR FRAME: 405T

600 QSL

Wheel Dia.: 73.00"
Outlet Dia.: 81.18"

Max. BHP = 207.58 (RPM ÷ 1000)³
Tip Speed FPM = 19.11 x RPM

Outlet Area: 35.94 ft²
Fan Efficiency Grade: FEG80

CFM	OV	0.5" SP		1" SP		1.5" SP		2" SP		2.5" SP		3" SP		4" SP		5" SP		6" SP		7" SP		8" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
28000	779	250	3.12	312	6.22	365	9.74																
32000	890	270	3.81	325	7.03	376	10.86	421	14.91														
36000	1002	290	4.57	339	7.91	388	11.97	431	16.32	471	20.91	508	25.55										
40000	1113	311	5.45	356	9.00	401	13.20	443	17.82	482	22.81	518	27.91										
44000	1224	333	6.48	375	10.29	415	14.52	456	19.43	493	24.55	528	30.00	592	41.15								
48000	1336	355	7.62	396	11.84	432	16.15	469	21.07	506	26.56	539	32.07	602	44.13	660	56.61						
52000	1447	377	8.89	416	13.40	450	17.93	484	22.96	519	28.61	552	34.48	613	47.03	669	60.21	721	73.55				
57000	1586	406	10.82	443	15.72	475	20.60	506	25.80	536	31.27	568	37.50	628	50.76	682	64.66	733	79.21	781	93.91		
62000	1725	435	13.04	470	18.23	501	23.60	530	29.07	557	34.61	586	40.90	644	54.74	697	69.36	746	84.57	793	100.44	837	116.19
67000	1864			497	20.99	527	26.82	555	32.70	581	38.62	607	44.92	660	58.77	712	73.99	760	89.88	806	106.67	849	123.51
72000	2003			525	24.18	554	30.41	581	36.75	606	43.03	630	49.46	678	63.30	728	79.01	776	95.79	820	112.87	863	131.00
78000	2170			559	28.50	587	35.19	612	41.89	636	48.65	659	55.50	703	69.67	749	85.64	795	102.93	838	120.63	880	139.57
84000	2337			594	33.54	620	40.44	644	47.60	668	55.14	690	62.43	731	77.08	772	92.88	815	110.49	858	129.40		
90000	2504			629	39.18	653	46.23	677	54.00	699	61.77	721	69.80	761	85.48	799	101.62	838	119.21	878	138.23		
96000	2671					688	53.07	710	60.94	732	69.38	752	77.60	791	94.32	828	111.42	863	128.76				
102000	2838					722	60.36	744	68.77	764	77.24	784	86.14	822	104.01	857	121.64						

MAXIMUM RPM: Class I — 680 Class II — 890

MAX. MOTOR FRAME: 445T

Legend:
Class I = Regular face to left of Class II
Class II = Regular face in light shaded area

Performance certified is for installation Type B: Free inlet, ducted outlet.
Power rating (BHP) does not include transmission losses.
Performance ratings do not include the effects of appurtenances (accessories).
Underlined figures indicate maximum static efficiency.

660 QSL

Wheel Dia.: 80.75"
Outlet Dia.: 89.31"

Max. BHP = 342.30 (RPM ÷ 1000)³
Tip Speed FPM = 21.14 x RPM

Outlet Area: 43.50 ft²
Fan Efficiency Grade: FEG80

CFM	OV	0.5" SP		1" SP		1.5" SP		2" SP		2.5" SP		3" SP		4" SP		5" SP		6" SP		7" SP		8" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
33000	759	222	3.65	280	7.44	328	11.60																
37000	851	236	4.28	289	8.19	335	12.65	377	17.45														
41000	943	251	5.01	298	8.96	344	13.80	384	18.93	421	24.24												
45000	1035	266	5.80	309	9.90	353	14.93	392	20.37	428	26.11	461	31.84										
50000	1150	286	6.97	326	11.39	365	16.47	403	22.22	437	28.21	470	34.68										
55000	1265	306	8.26	344	13.08	379	18.27	415	24.25	448	30.52	480	37.39	538	51.45								
60000	1380	326	9.70	363	15.01	394	20.20	427	26.29	460	33.04	491	40.17	547	55.01	598	70.18						
67500	1552	358	12.40	391	18.09	421	23.96	450	30.26	479	37.10	508	44.48	562	60.21	612	77.10	659	94.61	702	111.79		
75000	1725	390	15.60	421	21.79	450	28.42	476	34.98	501	41.81	527	49.33	580	66.23	628	83.99	673	102.71	715	121.64	755	140.76
82500	1897			452	26.10	479	33.29	504	40.49	527	47.66	550	55.27	598	72.37	645	91.10	688	110.45	730	131.33	769	152.17
90000	2069			483	30.97	508	38.55	532	46.43	555	54.43	576	62.29	619	79.56	663	98.76	706	119.47	746	140.85	784	162.96
97500	2242			514	36.48	539	44.79	562	53.35	583	61.67	604	70.37	643	87.90	683	107.31	724	128.67	763	150.80	800	173.75
105000	2414			546	42.92	569	51.41	591	60.48	612	69.75	632	78.96	669	97.35	705	116.72	743	138.39	781	161.53		
112500	2587					601	59.31	622	68.85	642	78.68	661	88.50	697	108.15	730	127.75	765	149.70	800	172.88		
120000	2759					632	67.73	652	77.61	672	88.24	690	98.57	725	119.55	757	140.27	789	162.24				
127500	2932					664	77.35	684	87.92	702	98.52	720	109.69	754	132.10	785	153.94						

MAXIMUM RPM: Class I — 615 Class II — 804

MAX. MOTOR FRAME: 445T

730 QSL

Wheel Dia.: 89.00"
Outlet Dia.: 98.81"

Max. BHP = 556.14 (RPM ÷ 1000)³
Tip Speed FPM = 23.30 x RPM

Outlet Area: 53.25 ft²
Fan Efficiency Grade: FEG80

CFM	OV	0.5" SP		1" SP		1.5" SP		2" SP		2.5" SP		3" SP		4" SP		5" SP		6" SP		7" SP		8" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
40000	752	202	4.47	254	9.03	298	14.13																
45000	846	214	5.19	262	9.93	304	15.37	342	21.20														
50000	940	228	6.10	271	10.96	312	16.75	349	23.13	382	29.49												
57500	1081	250	7.71	287	12.79	325	18.95	360	25.73	392	32.92	422	40.32										
65000	1222	272	9.53	307	15.23	340	21.53	373	28.65	404	36.38	432	44.23	485	60.85								
72500	1364	295	11.71	328	18.03	357	24.47	387	31.85	417	40.03	444	48.31	496	66.65	542	84.86						
80000	1505	318	14.23	349	21.09	377	28.17	403	35.51	430	43.74	457	52.69	507	71.83	553	92.19	595	112.50				
87500	1646	342	17.28	371	24.59	398	32.35	422	40.03	446	48.31	471	57.48	520	77.64	564	98.76	605	120.69	644	143.15	681	165.88
95000	1787	366	20.77	394	28.63	419	36.85	442	45.06	464	53.56	487	62.98	533	83.54	576	105.50	616	128.59	654	152.57	690	176.78
102500	1928			417	33.09	441	41.93	463	50.73	484	59.71	505	69.27	547	89.94	589	112.81	628	136.70	666	162.51	701	188.15
110000	2069			440	38.01	463	47.37	485	57.11	505	66.58	524	76.16	563	97.27	603	120.81	641	145.42	678	172.00	712	198.61
120000	2257			472	45.79	493	55.50	514	66.09	534	76.79	552	87.05	587	108.47	623	132.25	659	157.73	695	185.35	728	213.00
130000	2445			504	54.66	524	64.92	544	76.22	563	87.77	580	98.71	614	121.83	646	145.53	679	171.44	713	199.74		
140000	2633					555	75.44	574	87.29	592	99.51	609	111.71	641	135.93	672	161.19	702	187.36				
150000	2821					587	87.61	605	99.94	622	112.69	639	126.10	670	152.20	699	178.30	727	205.14				
160000	3009					619	101.14	636	113.86	653	127.58	668	140.88	699	169.47	727	197.09						

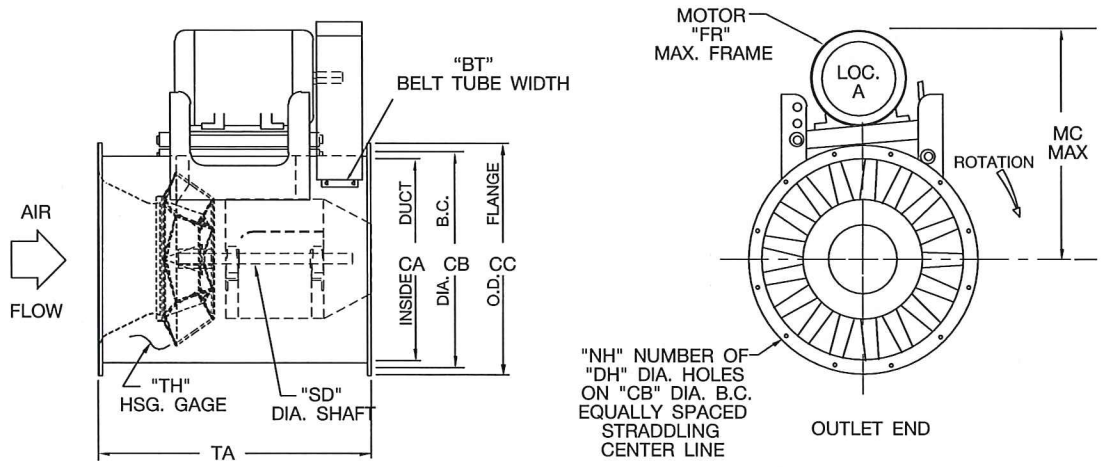
MAXIMUM RPM: Class I — 558 Class II — 730

MAX. MOTOR FRAME: 445T

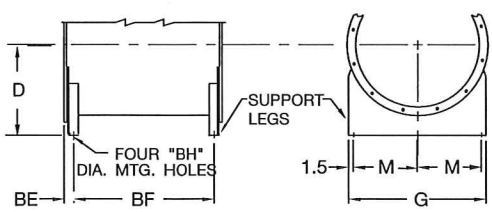
Legend:
Class I = Regular face to left of Class II
Class II = Regular face in light shaded area

Performance certified is for installation Type B: Free inlet, ducted outlet.
Power rating (BHP) does not include transmission losses.
Performance ratings do not include the effects of appurtenances (accessories).
Underlined figures indicate maximum static efficiency.

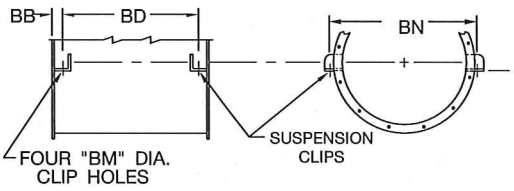
Horizontal



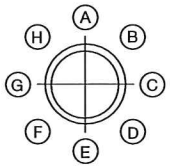
TYPE "QSL" HORIZONTAL DISCHARGE



HBM HORIZONTAL BASE MOUNTED



HCH HORIZONTAL CEILING HUNG



MOTOR LOCATION

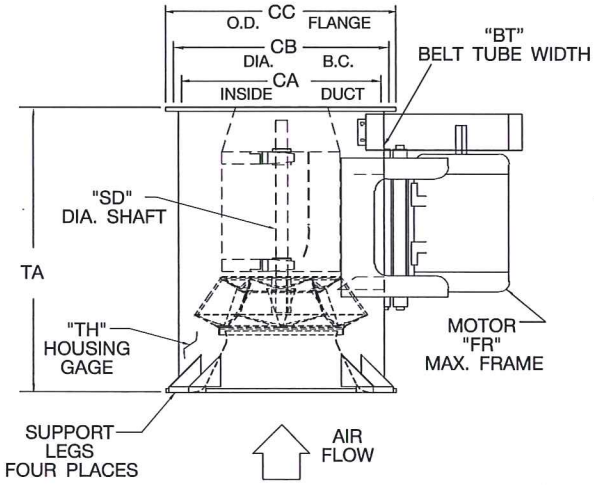
VIEWED FROM
OUTLET END

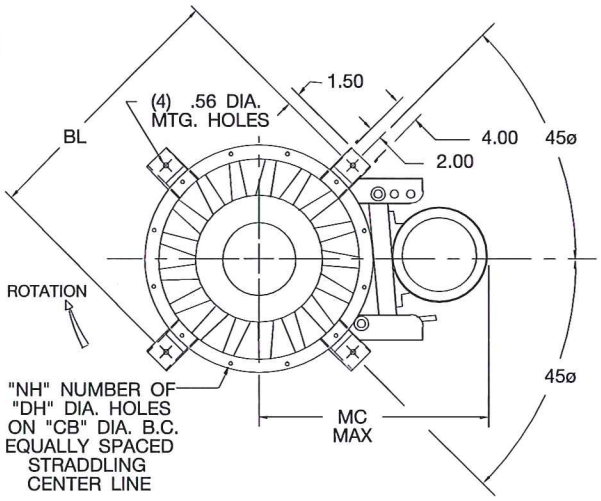
SIZE	BB	BD	BE	BF	BH	BM	BN	BT	CA	CB	CC	D	DH	FR	G	M	MC	NH	SD		TA	TH
																			CL I	CL II		
150	1.00	25.78	1.06	25.65	0.44	0.56	23.50	6.50	20.25	22.13	23.38	14.00	0.56	215T	23.38	10.19	25.73	8	1.000	1.187	27.78	10
165	1.00	28.63	1.06	28.50	0.44	0.56	25.88	6.50	22.31	24.38	25.75	15.00	0.69	215T	25.75	11.25	27.79	8	1.000	1.437	30.62	10
182	1.50	30.89	1.06	31.76	0.44	0.56	27.75	6.50	24.69	26.75	28.00	16.00	0.69	256T	28.00	12.50	34.45	12	1.000	1.437	33.89	12
200	1.50	34.18	1.06	35.05	0.56	0.56	30.13	7.25	27.06	29.13	30.31	18.00	0.81	256T	30.31	13.66	36.20	12	1.187	1.437	37.18	12
222	1.50	37.19	1.31	37.57	0.56	0.56	33.13	8.00	30.06	32.13	33.38	20.00	0.81	256T	33.38	15.19	37.65	12	1.187	1.437	40.19	12
245	1.50	41.31	1.31	41.69	0.56	0.81	36.25	8.93	33.13	35.13	36.38	21.00	0.81	286T	36.38	16.69	37.8	12	1.437	1.687	44.31	12
270	1.50	45.83	1.31	46.20	0.56	0.81	39.63	9.75	36.50	38.50	39.75	23.00	0.81	286T	39.75	18.38	42.16	12	1.437	1.687	48.83	12
300	1.50	51.52	1.31	51.89	0.56	0.81	43.75	10.93	40.56	43.13	44.88	25.00	0.81	326T	44.88	20.94	45.13	16	1.437	1.937	54.52	10
330	1.50	56.90	1.31	57.28	0.56	0.81	47.88	12.00	44.63	47.25	49.00	27.00	0.81	326T	49.00	23.00	46.56	16	1.687	2.187	59.90	10
365	2.00	62.37	1.56	63.25	0.81	0.81	52.56	13.25	49.38	52.00	53.75	29.00	0.81	365T	53.75	25.38	51.50	16	1.937	2.187	66.37	10
405	2.00	69.00	1.69	69.63	0.81	0.81	57.56	14.75	54.38	57.50	59.75	33.00	0.81	365T	59.75	28.38	59.77	16	1.937	2.187	73.00	10
445	2.00	76.92	1.69	77.54	0.81	0.81	63.38	16.25	60.19	63.25	65.50	36.00	0.81	405T	65.50	31.25	62.22	16	1.937	2.437	80.92	10
490	2.00	84.99	1.69	85.62	0.81	0.81	69.44	18.00	66.25	69.38	71.63	39.00	0.81	405T	71.63	34.31	67.68	24	2.187	2.437	88.99	10
542	2.00	94.71	2.44	93.84	0.81	1.06	76.56	19.88	73.38	77.00	79.75	43.00	0.81	445T	79.75	38.38	71.57	24	2.437	2.687	98.71	10
600	2.50	103.74	2.44	103.87	0.81	1.06	85.38	22.13	81.19	84.75	87.50	47.00	0.81	445T	87.50	42.25	78.47	24	2.687	2.937	108.74	10
660	2.50	115.11	2.44	115.24	1.06	1.06	93.56	24.25	89.31	92.88	95.63	52.00	0.81	445T	95.63	46.37	82.77	24	2.937	3.437	120.11	10
730	2.50	127.71	2.44	127.84	1.06	1.06	102.94	26.88	98.75	104.38	107.13	57.00	0.81	445T	107.13	52.06	87.75	24	2.937	3.937	132.77	10

QSL-AC1000023
QSLR-AC1001672
QSLSH-AC1001666A

DIMENSIONS ARE SUBJECT TO CHANGE. CERTIFIED DRAWINGS AVAILABLE ON REQUEST.

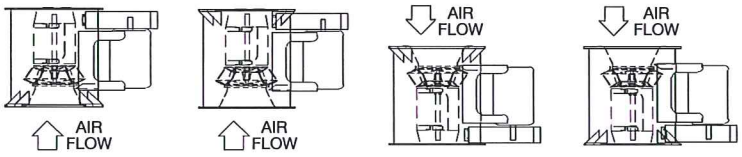
Vertical





VIEWED FROM OUTLET END

TYPE "QSL" VERTICAL UP DISCHARGE WITH FLOOR MOUNT SUPPORT LEGS



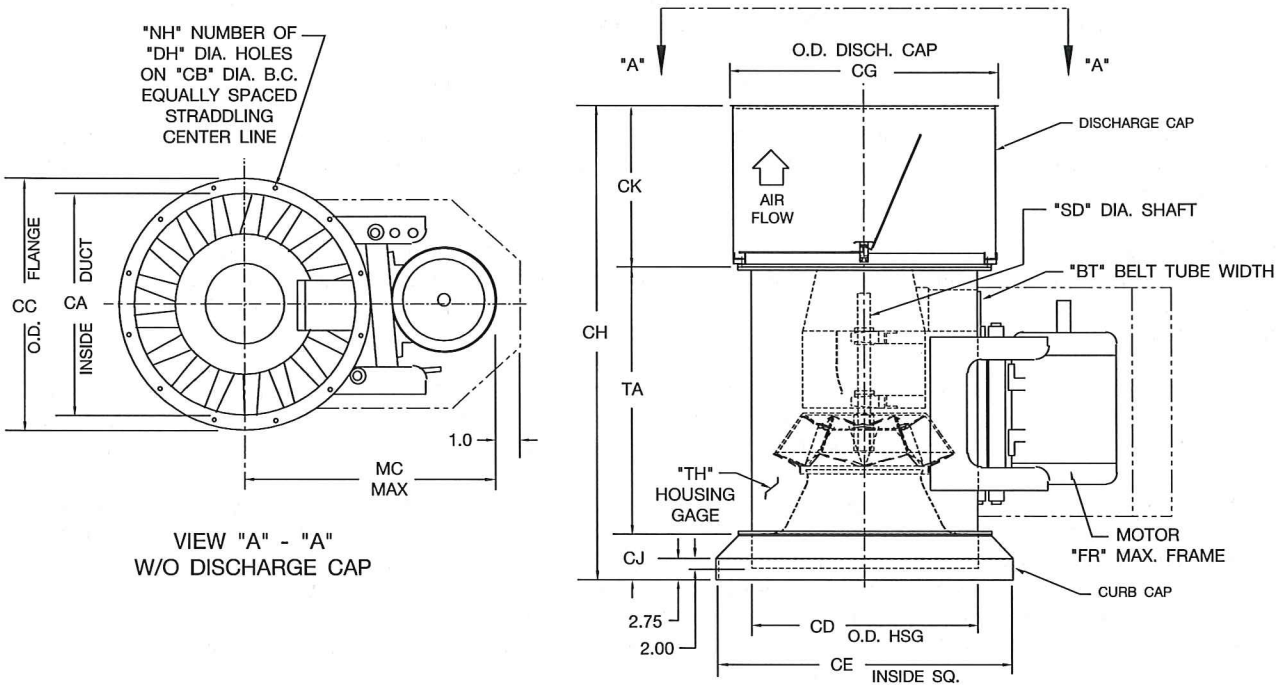
VUI DISCHARGE UP FLOOR MOUNT | VUO DISCHARGE UP CEILING HUNG | VDI DISCH. DOWN CEILING HUNG | VDO DISCH. DOWN FLOOR MOUNT

SIZE	BL	BT	CA	CB	CC	DH	FR	MC	NH	SD		TA	TH
										CLI	CLII		
150	25.38	6.50	20.25	22.13	23.38	0.56	215T	25.73	8	1.000	1.187	27.75	10
165	27.94	6.50	22.31	24.38	25.75	0.69	215T	27.73	8	1.000	1.437	30.36	10
182	33.00	6.50	24.69	26.75	28.00	0.69	256T	34.45	12	1.000	1.437	33.88	12
200	35.38	7.25	27.06	29.13	30.31	0.81	256T	36.20	12	1.187	1.437	37.19	12
222	38.00	8.00	30.06	32.13	33.38	0.81	256T	37.65	12	1.187	1.437	40.19	12
245	41.38	8.93	33.13	35.13	36.38	0.81	286T	37.86	12	1.437	1.687	44.31	12
270	44.75	9.75	36.50	38.50	39.75	0.81	286T	42.16	12	1.437	1.687	48.81	12
300	49.88	10.93	40.56	43.13	44.88	0.81	326T	45.13	16	1.437	1.937	54.56	10
330	54.00	12.00	44.63	47.25	49.00	0.81	326T	46.56	16	1.687	2.187	59.88	10
365	58.75	13.25	49.38	52.00	53.75	0.81	365T	51.50	16	1.937	2.187	66.38	10
402	64.75	14.75	54.38	57.50	59.75	0.81	365T	59.77	16	1.937	2.187	73.00	10
445	70.50	16.25	60.19	63.25	65.50	0.81	405T	62.22	16	1.937	2.437	80.94	10
490	76.63	18.00	66.25	69.38	71.63	0.81	405T	67.68	24	2.187	2.437	88.00	10
542	84.75	19.88	73.38	77.00	79.75	0.81	445T	71.51	24	2.437	2.687	98.69	10

QSL-AC1000024
QSLR-AC1001675
QSLSH-AC1001667A

DIMENSIONS ARE SUBJECT TO CHANGE. CERTIFIED DRAWINGS AVAILABLE ON REQUEST.

Vertical Roof



TYPE "QSL" VERTICAL DISCHARGE WITH DISCHARGE CAP AND CURB CAP

SIZE	BL	BT	CA	CB	CC	CD	CE	CG	CH	CJ	CK	DH	FR	MC	NH	SD		TA	TH
																CLI	CLII		
150	25.38	6.50	20.25	22.13	23.38	20.50	27.38	30.00	48.75	6.00	15.00	0.56	215T	25.73	8	1.000	1.187	27.75	10
165	27.94	6.50	22.31	24.38	25.75	22.56	30.88	32.00	54.94	6.31	18.00	0.69	215T	27.73	8	1.000	1.437	30.36	10
182	33.00	6.50	24.69	26.75	28.00	24.88	34.88	34.00	58.50	6.63	18.00	0.69	256T	34.45	12	1.000	1.437	33.88	12
200	35.38	7.25	27.06	29.13	30.31	27.25	37.38	40.00	64.94	6.75	21.00	0.81	256T	36.20	12	1.187	1.437	37.19	12
222	38.00	8.00	30.06	32.13	33.38	30.25	40.38	40.00	67.94	6.75	21.00	0.81	256T	37.65	12	1.187	1.437	40.19	12
245	41.38	8.93	33.13	35.13	36.38	33.31	43.38	46.00	75.31	7.00	24.00	0.81	286T	37.86	12	1.437	1.687	44.31	12
270	44.75	9.75	36.50	38.50	39.75	36.69	46.75	46.00	80.06	7.25	24.00	0.81	286T	42.16	12	1.437	1.687	48.81	12
300	49.88	10.93	40.56	43.13	44.88	40.81	51.00	53.00	89.31	7.75	27.00	0.81	326T	45.13	16	1.437	1.937	54.56	10
330	54.00	12.00	44.63	47.25	49.00	44.88	55.13	59.00	97.63	7.75	30.00	0.81	326T	46.56	16	1.687	2.187	59.88	10
365	58.75	13.25	49.38	52.00	53.75	49.63	59.88	60.00	104.13	7.75	30.00	0.81	365T	51.50	16	1.937	2.187	66.38	10
402	64.75	14.75	54.38	57.50	59.75	54.63	64.88	67.00	114.00	8.00	33.00	0.81	365T	59.77	16	1.937	2.187	73.00	10
445	70.50	16.25	60.19	63.25	65.50	60.44	69.63	73.00	125.44	8.50	36.00	0.81	405T	62.22	16	1.937	2.437	80.94	10
490	76.63	18.00	66.25	69.38	71.63	66.50	78.00	80.00	138.00	9.00	40.00	0.81	405T	67.68	24	2.187	2.437	88.00	10
542	84.75	19.88	73.38	77.00	79.75	73.63	88.75	86.50	157.56	9.25	49.63	0.81	445T	71.51	24	2.437	2.687	98.69	10

QSL-AC1000567
QSLR-AC1001673
QSLSH-AC1001674

DIMENSIONS ARE SUBJECT TO CHANGE. CERTIFIED DRAWINGS AVAILABLE ON REQUEST.

QSL/QSLR/QSLSH

Fans shall be Model QSL (standard mixed flow), Model QSLR (restaurant), Model QSLSH (smoke and heat) of the non-overloading design, as manufactured by Twin City Fan & Blower, Minneapolis, Minnesota.

PERFORMANCE — Performance ratings shall conform to AMCA Standard 205 (fan efficiency grade), 211 (air performance) and 311 (sound performance). Fans shall be tested in accordance with ANSI/AMCA Standard 210 (air performance) and 300 (sound performance) in an AMCA accredited laboratory. Fans shall be licensed to bear the AMCA certified ratings seal for both sound and air, and fan efficiency grade (FEG). Sound certification shall apply to both inlet and outlet sound power levels.

Fans shall be designed for maximum efficiency. Fans shall have a sharply rising pressure characteristic extending through the operating range and continuing to rise well beyond the efficiency peak to assure quiet and stable operation under all conditions. Horsepower characteristics shall be truly self-limiting and shall reach a peak in the normal selection area.

Model QSL shall be available UL 705 listed. Model QSLR shall be UL 762 listed for the exhaust of grease-laden air. Model QSLSH shall be UL listed for Smoke Control Systems (500°F for 4 hours and 1000°F for 15 minutes). Fans shall bear a permanently attached nameplate displaying model and serial number of the unit for future identification.

HOUSING — Housings shall be cylindrical and welded steel throughout. Inlets shall be fully streamlined. Housings shall be suitably braced to prevent vibration or pulsation. Totally enclosed belt guard shall enclose motor sheave and V-belt drives. Punched inlet and outlet flanges shall be equipped for duct mounting. Extended lube lines shall be provided for ease of lubrication. Model QSL shall include bolted access door for inspection and maintenance of wheel. Model QSLR shall include a belt tube, 2 wheel cleanout doors (located 180° apart) for inspection and maintenance of the wheel and a 2" drain. Model QSLSH shall include a belt tube for the protection of belts and drive components from the airstream and bolted access door.

WHEEL — Fan wheels shall have die-formed hollow airfoil blades designed for maximum efficiency, and quiet and stable operation. Blades shall be continuously welded to the back plate and wheel cone. Wheels shall be statically and dynamically balanced and the complete fan assembly including motor and drive shall be test balanced at or near the operating speed at the factory prior to shipment. Wheels on models QSLR and QSLSH shall have cooling fins to draw cool air over shaft and bearings.

SHAFT — Shafts shall be AISI 1040 or 1045 hot rolled steel, accurately turned, ground, polished, and ring gauged for accuracy. Shafts shall be sized for the first critical speed of at least 1.43 times the maximum speed.

BEARINGS — Bearings shall be heavy duty, grease lubricated, anti-friction ball or roller, self-aligning, pillow block type and selected for a minimum L-10 life of 40,000 hours at the maximum fan RPM. Bearings shall be equipped with extended lubrication lines with grease fittings outside of the fan housing.

DRIVE — Motor sheaves shall be cast iron, variable pitch on applications 10 HP and smaller, and fixed pitch on 15 HP and larger. Model QSLSH shall be equipped with a two-groove drive minimum.

INLET VANES — Inlet vanes, where specified, shall be of the nested design. Inlet vanes shall be designed for economical, stable, and efficient air volume control at partial load conditions.

FINISH AND COATING — The entire fan assembly, excluding the shaft, shall be thoroughly degreased and deburred before application of a rust-preventative primer. After the fan is completely assembled, a finish coat of paint shall be applied to the entire assembly. The fan shaft shall be coated with a petroleum-based rust protectant. Aluminum components shall be unpainted.

FACTORY RUN TEST — All fans with motors and drives mounted by Twin City Fan & Blower shall be completely assembled and test run as a unit at the specified operating speed prior to shipment. Each wheel shall be statically and dynamically balanced in accordance with ANSI/AMCA 204-96 "Balance Quality and Vibration Levels for Fans" to Fan Application Category BV-3, Balance Quality Grade G6.3. Balance readings shall be taken by electronic type equipment in the axial, vertical, and horizontal directions on each of the bearings. Records shall be maintained and a written copy shall be available upon request.

GUARANTEE — The manufacturer shall guarantee the workmanship and materials for its QSL, QSLR, QSLSH Mixed Flow Fans for at least one (1) year from startup or eighteen (18) months from shipment, whichever occurs first.

Fans & Blowers
Twin City

©2012 Twin City Fan Companies, Ltd., Minneapolis, MN. All rights reserved. Catalog illustrations cover the general appearance of Twin City Fan & Blower products at the time of publication and we reserve the right to make changes in design and construction at any time without notice.

INDUSTRIAL & COMMERCIAL FANS

Centrifugal Fans | Utility Sets | Plenum & Plug Fans | Inline Centrifugal Fans
Mixed Flow Fans | Tubeaxial & Vaneaxial Fans | Propeller Wall Fans | Propeller Roof Ventilators
Centrifugal Roof & Wall Exhausters | Ceiling Ventilators | Gravity Ventilators | Duct Blowers
Radial Bladed Fans | Radial Tip Fans | High Efficiency Industrial Fans | Pressure Blowers
Laboratory Exhaust Fans | Filtered Supply Fans | Mancoolers | Fiberglass Fans | Custom Fans

Fans & Blowers
Twin City

A Twin City Fan Company

TWIN CITY FAN & BLOWER | WWW.TCF.COM
5959 Trenton Lane N | Minneapolis, MN 55442 | Phone: 763-551-7600 | Fax: 763-551-7601

1.5MWG02/11

Twin City Fan & Blower

A Twin City Fan Company

5959 Trenton Lane · Minneapolis, MN 55442-3238
Phone (763) 551-7600 · Fax (763) 551-7601 · www.tcf.com

ISO 9001 CERTIFIED

Customer: W/A
Job Name:
Job ID: GEMState1

December 07, 2015

Fan Description		Fan Performance		Motor Data	
Tag	2	CFM	40,000	HP	60
Quantity	6	Operating SP (in.wg)	5	RPM	1800
Type	QSL	Standard SP (in.wg)	6.26	Voltage	230/460V
Size	402	RPM	1257	Phase	3
Width	SWSI	Tip Speed (fpm)	16,125	Hz	60
Arrangement	9	Oper. BHP	43.98	Enclosure	TEFC
Class	II	Standard BHP	55.06	Efficiency	Prm.Eff.
Rotation	CW	Outlet area (sq. ft)	16.2	Frame	364T
Discharge	W/A	Outlet Velocity (fpm)	2,475		
Wheel diameter (in.)	49	Temperature (°F)	110		
Drive method	60 Hz belt drive	Altitude (ft)	4,150		
Percentage width	100%	Density (lb/ft³)	0.06		
Percentage diameter	100%	Max RPM for Class	1312		
		Static Efficiency	71.49		
		Total Efficiency	75.85		

Sound

Sound Power Levels in dB re. 10-12 Watts:

Octave Bands	1	2	3	4	5	6	7	8	LwA
Level at Inlet	92	99	93	91	90	86	81	77	95
Level at Outlet	101	100	99	98	96	91	84	78	100

Estimated sound pressure level in dBA (re: 0.0002 microbar) based on a single* ducted installation:

Distance in ft	1	3	5
dBA at Inlet	95	85	81
dBA at Outlet	100	90	86

*To estimate dBA level for ducted inlet and ducted outlet (into and out of the room) type installation, deduct 20 from the LwA value shown.

Using a directivity factor of 1.

Estimated Sound Pressure based on free field, spherical (Q = 1) radiation at the stated distance.

Definitions:

LwA — The overall (single value) fan sound power level, 'A' weighted.

dBA — The environment for each fan installation influences its measured sound value, therefore dBA levels cannot be guaranteed. Consult AMCA Publication 303 for further details. A fan's dBA is influenced by nearby reflective surfaces.

All quotations per Twin City Fan Terms and Conditions found at http://www.twincityfan.com/TC_TCF.pdf

Twin City Fan & Blower

A Twin City Fan Company

5959 Trenton Lane · Minneapolis, MN 55442-3238
Phone (763) 551-7600 · Fax (763) 551-7601 · www.tcf.com

ISO 9001 CERTIFIED

Customer: W/A
Job Name:
Job ID: GEMState1

Accessories Included

QSL 402, Class II, Arrangement 9 Bare fan	1357 lb.
Access Door - Bolted	0 lb.
Flanges - Inlet / Outlet, Punched	0 lb.
Guard - Belt, OSHA Type	36 lb.
Disc Switch - Unfused, Not Wired - Type RT (NEMA 3R) E5-93	0 lb.
Extended Lube Lines	0 lb.
All Stainless Steel Construction	0 lb.
60 HP, 1800 RPM, 230/460V, 3Ph, 60Hz, TEFC, Prm.Eff., 364T	744 lb.
Mount TCF Motor	0 lb.
Constant Speed V-belt Drive, 1.5 SF	100 lb.
Total Weight	13,422 lb.

All quotations per Twin City Fan Terms and Conditions found at http://www.twincityfan.com/TC_TCF.pdf

Twin City Fan & Blower

A Twin City Fan Company

5959 Trenton Lane · Minneapolis, MN 55442-3238
Phone (763) 551-7600 · Fax (763) 551-7601 · www.tcf.com

ISO 9001 CERTIFIED

AMCA Statements

Tag : 2

1. Twin City Fan and Blower certifies that the model QSL is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.
2. Performance certified is for Installation Type B: Free inlet, Ducted outlet.
3. Power rating (BHP) does not include transmission losses.
4. Performance ratings do not include the effects of appurtenances (accessories).
5. The sound power level ratings shown are in decibels, referred to 10 E-12 watts calculated per AMCA Standard 301.
6. Ratings do not include the effects of duct end correction.
7. The A-weighted sound ratings shown have been calculated per AMCA Standard 301.
8. The AMCA Certified Ratings Seal applies to LwA, LwiA and LwoA ratings only.
9. dBA levels are not licensed by AMCA International.

All quotations per Twin City Fan Terms and Conditions found at http://www.twincityfan.com/TC_TCF.pdf

Twin City Fan & Blower

A Twin City Fan Company

5959 Trenton Lane · Minneapolis, MN 55442-3238
Phone (763) 551-7600 · Fax (763) 551-7601 · www.tcf.com

ISO 9001 CERTIFIED

Customer: W/A
Job Name:
Job ID: GEMState1

December 07, 2015

Specification
Type: QSL
Mixed Flow Fan - Belt drive

Fans shall be Type QSL (standard mixed flow) of the non-overloading design, as manufactured by Twin City Fan & Blower, Minneapolis, Minnesota.

PERFORMANCE - Performance ratings shall conform to AMCA Standard 205 (fan efficiency grade), 211 (air performance) and 311 (sound performance). Fans shall be tested in accordance with ANSI/AMCA Standard 210 (air performance) and 300 (sound performance) in an AMCA accredited laboratory. Fans shall be licensed to bear the AMCA certified ratings seal for both sound and air, and fan efficiency grade (FEG). Sound certification shall apply to both inlet and outlet sound power levels.

Fans shall be designed for maximum efficiency. Fans shall have a sharply rising pressure characteristic extending through the operating range and continuing to rise well beyond the efficiency peak to assure quiet and stable operation under all conditions. Horsepower characteristics shall be truly self-limiting and shall reach a peak in the normal selection area.

Model QSL shall be available UL 705 listed. Fans shall bear a permanently attached nameplate displaying model and serial number of the unit for future identification.

HOUSING - Housings shall be cylindrical and welded steel throughout. Inlets shall be fully streamlined. Housings shall be suitably braced to prevent vibration or pulsation. Totally enclosed belt guard shall enclose motor sheave and V-belt drives. Punched inlet and outlet flanges shall be equipped for duct mounting. Extended lube lines shall be provided for ease of lubrication. Model QSL shall include bolted access door for inspection and maintenance of wheel.

WHEEL - Fan wheels shall have die-formed hollow airfoil blades designed for maximum efficiency, and quiet and stable operation. Blades shall be continuously welded to the back plate and wheel cone. Wheels shall be statically and dynamically balanced and the complete fan assembly including motor and drive shall be test balanced at or near the operating speed at the factory prior to shipment.

SHAFT - Shafts shall be AISI 1040 or 1045 hot rolled steel, accurately turned, ground, polished, and ring gauged for accuracy. Shafts shall be sized for the first critical speed of at least 1.43 times the maximum speed.

BEARINGS - Bearings shall be heavy duty, grease lubricated, anti-friction ball or roller, self-aligning, pillow block type and selected for a minimum L-10 life of 40,000 hours at the maximum fan RPM. Bearings shall be equipped with extended lubrication lines with grease fittings outside of the fan housing.

DRIVE - Motor sheaves shall be cast iron, variable pitch on applications 10 HP and smaller, and fixed pitch on 15 HP and larger.

INLET VANES - Inlet vanes, where specified, shall be of the nested design. Inlet vanes shall be designed for economical, stable, and efficient air volume control at partial load conditions.

FINISH AND COATING - The entire fan assembly, excluding the shaft, shall be thoroughly degreased and deburred before application of a rust-preventative primer. After the fan is completely assembled, a finish coat of paint shall be applied to the entire assembly. The fan shaft shall be coated with a petroleum-based rust protectant. Aluminum components shall be unpainted.

All quotations per Twin City Fan Terms and Conditions found at http://www.twincityfan.com/TC_TCF.pdf

Twin City Fan & Blower

A Twin City Fan Company

5959 Trenton Lane · Minneapolis, MN 55442-3238
Phone (763) 551-7600 · Fax (763) 551-7601 · www.tcf.com

ISO 9001 CERTIFIED

Specification (continued)

FACTORY RUN TEST - All fans with motors and drives mounted by Twin City Fan & Blower shall be completely assembled and test run as a unit at the specified operating speed prior to shipment. Each wheel shall be statically and dynamically balanced in accordance with ANSI/AMCA 204-96 "Balance Quality and Vibration Levels for Fans" to Fan Application Category BV-3, Balance Quality Grade G6.3. Balance readings shall be taken by electronic type equipment in the axial, vertical, and horizontal directions on each of the bearings. Records shall be maintained and a written copy shall be available upon request.

GUARANTEE - The manufacturer shall guarantee the workmanship and materials for its QSL Mixed Flow Fans for at least one (1) year from startup or eighteen (18) months from shipment, whichever occurs first.

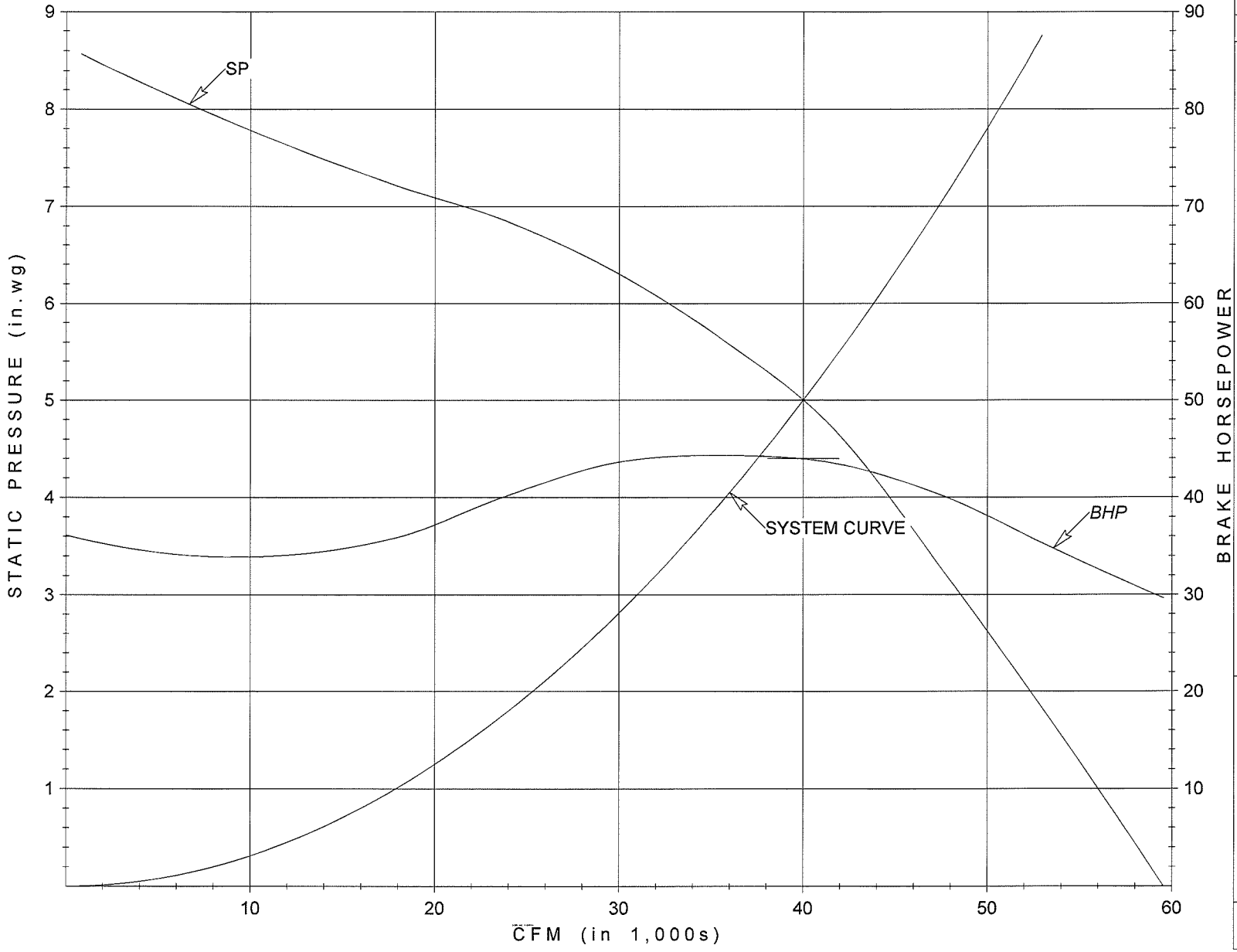
All quotations per Twin City Fan Terms and Conditions found at http://www.twincityfan.com/TC_TCF.pdf

95

Customer: W/A	Fan Tag: 2	CFM: 40,000
Job ID: GEMState1	Model: 402 QSL	SP: 5 in.wg
		RPM: 1257
		BHP: 43.98
		Outlet Velocity: 2,475
		Density: 0.06

Corrected for:
Altitude 4,150
Temperature 110°F

TWIN CITY FAN AND BLOWER PERFORMANCE CURVE

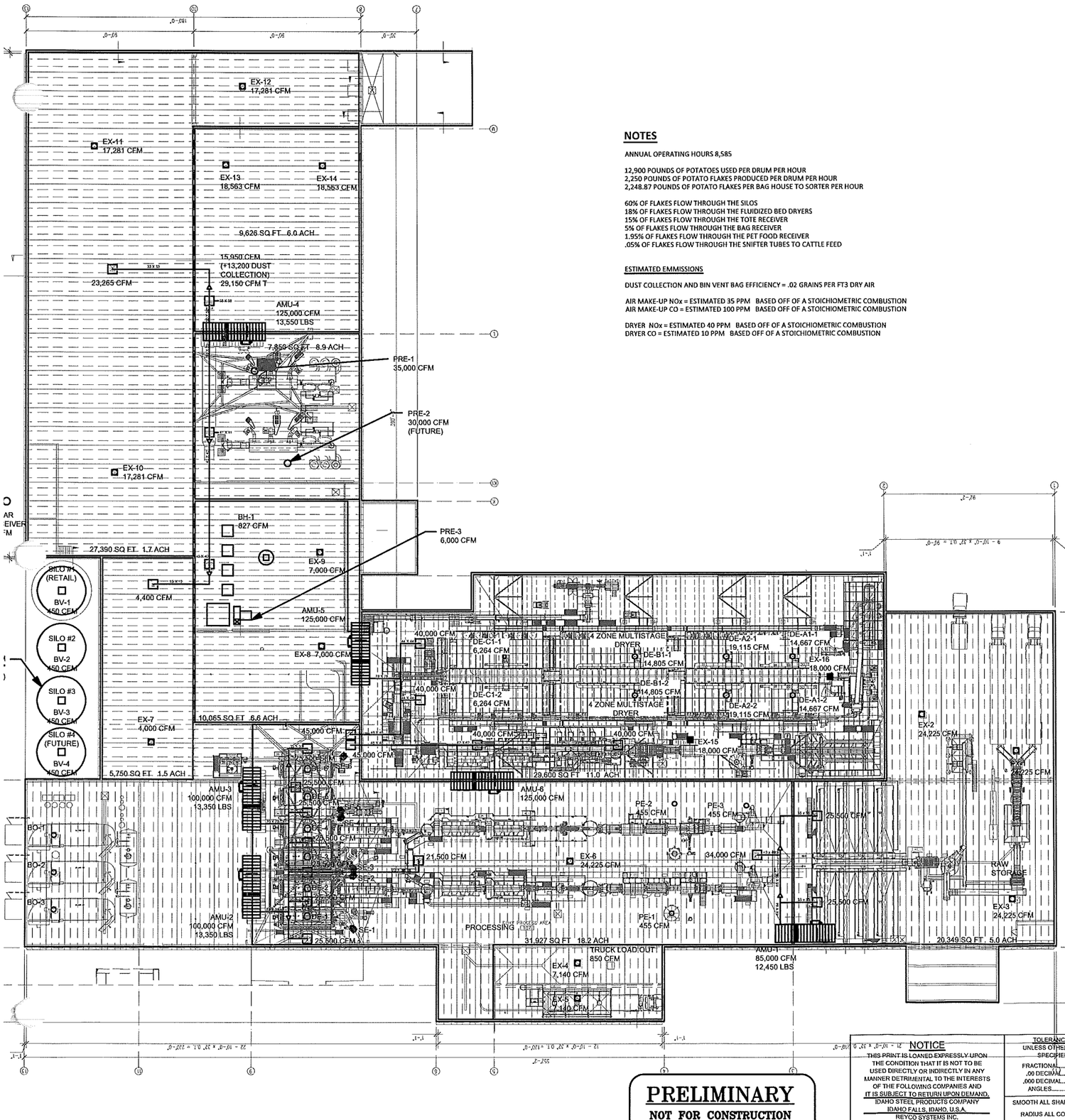


Sound Power Level

Octave	In/Out
1	92 / 101
2	99 / 100
3	93 / 99
4	91 / 98
5	90 / 96
6	86 / 91
7	81 / 84
8	77 / 78

in db re 10^{-12} watts

12/7/2015



NOTES

ANNUAL OPERATING HOURS 8,585

12,900 POUNDS OF POTATOES USED PER DRUM PER HOUR
2,250 POUNDS OF POTATO FLAKES PRODUCED PER DRUM PER HOUR
2,248.87 POUNDS OF POTATO FLAKES PER BAG HOUSE TO SORTER PER HOUR

60% OF FLAKES FLOW THROUGH THE SILOS
18% OF FLAKES FLOW THROUGH THE FLUIDIZED BED DRYERS
15% OF FLAKES FLOW THROUGH THE TOTE RECEIVER
5% OF FLAKES FLOW THROUGH THE BAG RECEIVER
1.95% OF FLAKES FLOW THROUGH THE PET FOOD RECEIVER
.05% OF FLAKES FLOW THROUGH THE SNIFTER TUBES TO CATTLE FEED

ESTIMATED EMMISSIONS

DUST COLLECTION AND BIN VENT BAG EFFICIENCY = .02 GRAINS PER FT3 DRY AIR

AIR MAKE-UP NOx = ESTIMATED 35 PPM BASED OFF OF A STOICHIOMETRIC COMBUSTION
AIR MAKE-UP CO = ESTIMATED 100 PPM BASED OFF OF A STOICHIOMETRIC COMBUSTION

DRYER NOx = ESTIMATED 40 PPM BASED OFF OF A STOICHIOMETRIC COMBUSTION
DRYER CO = ESTIMATED 10 PPM BASED OFF OF A STOICHIOMETRIC COMBUSTION

ZONE #1

ITEM	DESCRIPTION	SUPPLY	PROCESS	EXHAUST	TOTAL EX	DIA (in)	HEIGHT (ft)	TEMP (°F)	NOTES	CONTROL
AMU-1	REYCO GASPAC 850	85,000							NATURAL GAS FIRED - 9.00 MMBTUH	ENVIRONMENT
AMU-2	REYCO GASPAC 1000	100,000							NATURAL GAS FIRED - 9.00 MMBTUH	ENVIRONMENT
AMU-3	REYCO GASPAC 1000	100,000							NATURAL GAS FIRED - 9.00 MMBTUH	ENVIRONMENT
DE-1	DRUM FAN HOOD #1		4500	35,500	*45,000	36	83	119		PROCESS
SE-1	SNIFTER FAN DRUM #1			*5,000		18			*5,000 FROM SE-1 DISC. INTO DE-1	PROCESS
DE-2	DRUM FAN HOOD #2		4500	35,500	*45,000	36	83	119		PROCESS
SE-2	SNIFTER FAN DRUM #2			*5,000		18			*5,000 FROM SE-1 DISC. INTO DE-1	PROCESS
DE-3	DRUM FAN HOOD #3		4500	35,500	*45,000	36	83	119		PROCESS
SE-3	SNIFTER FAN DRUM #3			*5,000		18			*5,000 FROM SE-1 DISC. INTO DE-1	PROCESS
DE-4	DRUM FAN HOOD #4		4500	35,500	*45,000	36	83	119		PROCESS
SE-4	SNIFTER FAN DRUM #4			*5,000		18			*5,000 FROM SE-1 DISC. INTO DE-1	PROCESS
DE-5	DRUM FAN HOOD #5		4500	35,500	*45,000	36	83	119		PROCESS
SE-5	SNIFTER FAN DRUM #5			*5,000		18			*5,000 FROM SE-1 DISC. INTO DE-1	PROCESS
DE-6	DRUM FAN HOOD #6		4500	35,500	*45,000	36	83	119		PROCESS
SE-6	SNIFTER FAN DRUM #6			*5,000		18			*5,000 FROM SE-1 DISC. INTO DE-1	PROCESS
EX-1	EXHAUST			24,225		44	38.8	80		PROCESS
EX-2	EXHAUST			24,225		44	38.8	80		PROCESS
EX-3	EXHAUST			24,225		44	38.8	80		PROCESS
EX-4	EXHAUST			7,140		30	38.8	80		PROCESS
EX-5	EXHAUST			7,140		30	38.8	80		PROCESS
EX-6	EXHAUST			24,225		44	38.8	80		PROCESS
PE-1	PEELER EXHAUST #1		*455			30	42	150-200	LOW GRADE STEAM - 911 CFM EXHAUST ESTIMATED 50% COLLAPSE IN GAS VOLUME	PROCESS
PE-2	PEELER EXHAUST #2		*455			30	42	150-200	LOW GRADE STEAM - 911 CFM EXHAUST ESTIMATED 50% COLLAPSE IN GAS VOLUME	PROCESS
	DUCT FROM AMU #5	45,000								
	DUCT FROM AMU #6	45,000								
TOTALS		375,000		354,180						
PRESSURIZATION FACTOR		1.06								
SQUARE FOOTAGE		52,276	AIR CHANGES / HOUR			14.4				

ZONE #2

ITEM	DESCRIPTION	SUPPLY	PROCESS	EXHAUST	TOTAL EX	DIA (in)	HEIGHT (ft)	TEMP (°F)	NOTES	CONTROL
AMU-4	REYCO GASPAC 1250	125,000							NATURAL GAS FIRED -10.00 MMBTUH	ENVIRONMENT
PRE-1	PROCESS EXHAUST #1			35,000		32	83	131		PROCESS
PRE-2	PROCESS EXHAUST #2		30,000			38	83	150		PROCESS
PRE-3	PROCESS EXHAUST #3			6000		20	60	100	BAG HOUSE COLLECT HDR FAN	PROCESS
BH-1	DUST COLLECT BAGHS			867		16	40	100		PROCESS
EX-7	EXHAUST			4,000		24	38	80		PROCESS
EX-8	EXHAUST			7,000		30	38	80		PROCESS
EX-9	EXHAUST			7,000		30	38	80		PROCESS
EX-10	EXHAUST			17,281		48	36	80		PROCESS
EX-11	EXHAUST			17,281		48	36	80		PROCESS
EX-12	EXHAUST			17,281		48	36	80		PROCESS
EX-13	EXHAUST			18,563		48	36	80		PROCESS
EX-14	EXHAUST			18,563		48	36	80		PROCESS
TOTALS		125,000		148,836						
PRESSURIZATION FACTOR		.84								
SQUARE FOOTAGE		55,920	AIR CHANGES / HOUR			4.04				

ZONE #3

ITEM	DESCRIPTION	SUPPLY	PROCESS	EXHAUST	TOTAL EX	DIA (in)	HEIGHT (ft)	TEMP (°F)	NOTES	CONTROL
DR-1	DRYER									
	ZONE A1			14,667		32	60	235		PROCESS
	ZONE A2			19,115		36	60	232		PROCESS
	ZONE B1			14,805		32	60	186		PROCESS
	ZONE C1			6,264		22	60	176		PROCESS
DR-2	DRYER									
	ZONE A1			14,667		32	60	235		PROCESS
	ZONE A2			19,115		36	60	232		PROCESS
	ZONE B1			14,805		32	60	186		PROCESS
	ZONE C1			6,264		22	60	176		PROCESS
AMU-5	REYCO GASPAC 1250	125,000							NATURAL GAS FIRED - 9.00 MMBTUH	ENVIRONMENT
AMU-6	REYCO GASPAC 1250	125,000							NATURAL GAS FIRED - 9.00 MMBTUH	ENVIRONMENT
EX-15	EXHAUST			18,000		36	36	90		PROCESS
EX-16	EXHAUST			18,000		36	36	90		PROCESS
	AMU DUCTING TO ZONE 1			45,000						
	AMU DUCTING TO ZONE 1			45,000						
PE-3	PEELER EXHAUST #3		*455			30	42	150-200	LOW GRADE STEAM - 911 CFM EXHAUST ESTIMATED 50% COLLAPSE IN GAS VOLUME	PROCESS
TOTALS		250,000		235,702						
PRESSURIZATION FACTOR		1.06								
SQUARE FOOTAGE		29,600	AIR CHANGES / HOUR			11.0				

BOILER ROOM

ITEM	DESCRIPTION	SUPPLY	PROCESS	EXHAUST	TOTAL EX	DIA (in)	HEIGHT (ft)	TEMP (°F)	NOTES	CONTROL
BO-1	1200 LB / HR BOILER		14,912			36	61	314		PROCESS
BO-2	1200 LB / HR BOILER		14,912			36	61	314		PROCESS
BO-3	1600 LB / HR BOILER		14,912			36	61	314		PROCESS

SILOS

ITEM	DESCRIPTION	SUPPLY	PROCESS	EXHAUST	TOTAL EX	DIA (in)	HEIGHT (in)	TEMP (°F)	NOTES	CONTROL
BV-1	BIN VENT #1			450					NOMINAL SIZE 44 x 44	PROCESS
BV-2	BIN VENT #2			450					NOMINAL SIZE 44 x 44	PROCESS
BV-3	BIN VENT #3			450					NOMINAL SIZE 44 x 44	PROCESS
BV-4	BIN VENT #4			450					NOMINAL SIZE 44 x 44 (FUTURE)	PROCESS

PRELIMINARY
NOT FOR CONSTRUCTION

NOTICE
THIS PRINT IS LOANED EXPRESSLY UPON THE CONDITION THAT IT IS NOT TO BE USED DIRECTLY OR INDIRECTLY IN ANY MANNER DETRIMENTAL TO THE INTERESTS OF THE FOLLOWING COMPANIES AND IT IS SUBJECT TO RETURN UPON DEMAND.
IDAHO STEEL PRODUCTS COMPANY
IDAHO FALLS, IDAHO, U.S.A.
REYCO SYSTEMS INC.
CALDWELL, ID, U.S.A.

TOLERANCES
UNLESS OTHERWISE SPECIFIED
FRACTIONAL..... ±1/32"
.00 DECIMAL..... ±.01
.000 DECIMAL..... ±.005
ANGLES..... ±.5°

SMOOTH ALL SHARP EDGES
RADIUS ALL CORNERS
DEBURR ALL HOLES

Kiremko
Food Processing Equipment
REYCO SYSTEMS

Designed and Manufactured by:
IDAHOSTEEL
IDAHO STEEL PRODUCTS CO.

TITLE: GEM STATE PROCESSING-VENTILATION PLAN

DATE	SCALE	DRAWN BY	DESIGNED BY	CHECKED BY
1/12/16	N.T.S.	JTD		

CUSTOMER	WORK ORDER NO.	SHEET #
GEM STATE PROCESSING		1

PLANT LOCATION | DRAWING NAME | REVISION

Appendix E AMBIENT AIR ANALYSIS

Idaho DEQ Impact Modeling Analyses Report Form

1.0 Summary

This air quality modeling report documents the methodology used to prepare an air quality analysis in support of an Idaho Department of Environmental Quality (IDEQ) Permit to Construct (PTC) application for potato processing operations at the Gem State Processing, LLC (Gem State) facility located in Heyburn, ID. The previous permitting action inadvertently requested an incorrect hourly dry potato throughput. This modeling demonstration shows facility-wide compliance for all applicable pollutants using the correct throughput of 2,708 lb/hr.

Only particulate emissions are increased due to the throughput changes. However, all previous averaging periods for gaseous pollutants as well were evaluated. Modeling of $PM_{2.5}$ (both annual and 24-hr), PM_{10} and NO_2 (both 1-hr and annual) was performed. All other criteria pollutant emissions are below modeling thresholds; however, 1-hr SO_2 facility-wide modeling was also conducted to ensure compliance as it has not been performed previously.

2.0 Project Description and Background as it Relates to Modeling Analyses

Gem State Processing, LLC is a potato processing company that processes, dehydrates and packs various potato products. The Heyburn facility will produce dehydrated potato flakes, seasoned agglomerated flakes, and other dehydrated potato products. Potatoes may be steam peeled, dry scrubbed, sorted, sliced, blanched, cooled, steam cooked, air chilled and dried. Products are dried to approximately 8% moisture and are broken up and ground to customer specifications, packaged or stored, and then sold. The process includes natural gas fired boilers, steam drum dryers (flakers), and fluidized bed dryers and utilizes pneumatic equipment to transport their products from production to storage or packaging.

Raw potatoes are delivered to the facility and unloaded inside the potato receiving area of the facility building. The potatoes then go through a rock trap where they are rinsed with water to remove any large debris. Conveyors transfer the wet potatoes to storage bins until they are ready to be processed. The potatoes are transferred from the potato storage bin through an additional washing process and then are transferred via vertical conveyor belt to the steam peelers. After the peels are separated from the potato in the steam peeler, the potatoes are transferred to the brush scrubber and washer where the peel and any remaining dirt and debris are removed. Following inspection of the peeled and washed potatoes, they are transferred via vertical auger to the slicer and then into a blancher where they are cooked. The potatoes are then cooled in water and transferred to the steam cooker. Following the steam cooker, the cooked potatoes are transferred through a ricer plate. The riced pieces are then transferred via auger into steam powered drum dryers (flakers). The drum dryers reduce the moisture in the potatoes from approximately 80% to 8%. Dried flakes are then either transferred to the packaging lines and silos or through the agglomeration line where oil and flavorings are added. The seasoned flakes from the agglomeration line are then transferred to the fluidized bed dryer (agglomeration line) and subsequently to the packaging lines. Steam for the steam peelers and drum dryers will be supplied by boilers operating on natural gas.

The new dehydrator units will dry potato slices, dices and shreds rather than flakes. The process is the same as the potato flake process through the cooled in water step and then instead of going through a steam cooker they are either directed to one of the new dehydrator units, or air chilled and then to one of the dehydrator units. Finished product is typically dried to 7% plus or minus 1% moisture content and then loaded into corrugated tote bins.

2.1 General Facility/Project Descriptions

Modeled emissions include all sources of particulates and NO_2 listed below. Emission rates represent the maximum anticipated operating rates for the averaging period modeled, taking into account the maximum daily hours of operation and throughputs requested in the application for all averaging periods. Emissions sources included in the model are listed below:

- Boiler Emissions
- Air Makeup Units Emissions
- Fluidized Bed Dryer Emissions
- Drum Dryer Emissions
- Baghouse Emissions
- Dehydration Units Emissions

Gem State Facility

Boilers

The Gem State facility utilizes one 1600 hp and two 1200 hp natural gas fired boilers to produce steam for the various potato processing equipment installed at the facility. The boilers have low NO_x burners for control of NO_x and CO. The boilers are a source of natural gas combustion emissions. Emission factors from AP-42, Section 1.4 were used to calculate natural gas combustion emissions. Emission factors for NO_x and CO were provided by the manufacturer. Manufacturer information on the boilers is included in Appendix D of the application (this information was also provided in the previous permitting application). There are no emission changes to these units from the current permit.

Air Makeup Units

Five 9.0 MMBtu/hr and one 10.0 MMBtu/hr Reyco Air Makeup Unit (AMU) are used to provide fresh air into the facility, provide heating for employee comfort, and maintain positive pressure inside the processing areas. The air makeup unit burners are natural gas fired and exhaust into the facility building. During the warmer spring, summer and fall months, the facility does not need to be heated and the air makeup burners only run a limited number of hours. Gem State estimates that the air makeup burners will run 20% of the time in May, June, and September, 5% of the time in July and August, 50% of the time in October, and 100% of the time when the facility is operating in the remaining months of the year, for a total of 5,270.4 operating hours per year. This is a conservative estimate because the burners may actually be shut off in mid-June through the end of August, when heat is not required for employee comfort. The air makeup unit fans run on electric power, and run whenever the facility is operating. The

facility exhaust system, consisting of several rooftop exhaust stacks, is used to exhaust pollutants from the air makeup unit burners. The air makeup unit burners are a source of natural gas combustion emissions. Emission factors from AP-42, Section 1.4 were used to calculate natural gas combustion emissions. There are no emission changes to these units from the current permit with the exception of the addition of AMU #5 and #6.

Bubble Sheet Dryers

The Gem State facility utilizes two natural gas fired bubble sheet dryers (fluidized bed dryers) for operation of the processing agglomeration line. Oils and other flavorings are added to the flakes coming out of the drum dryers. The flakes then pass through the bubble sheet dryers. The dryers are a source of both natural gas combustion emissions and process particulates.

A process emission rate of 0.71 lb/hr was established during the previous permitting action and remains unchanged here. Along with a combustion emission rate of 0.05 lb/hr, the total modeled rate is 0.76 lb/hr. This rate was determined using previous performance test results and mathematical calculations as derived by Idaho DEQ. Emission rates remain unchanged.

Drum Dryers (Flakers)

Gem State operates six steam powered drum dryers. Emissions from the drum dryers include process particulate and exhaust through the drum fan hood or snifter fan drum exhausts. The primary purpose of the snifter fan drum is to pull moisture off of the drum dryers. Only a very small portion, approximately 0.05% of flakes passing through the drum dryer, enters the snifter fan drum. Emissions from the snifter fan drums are controlled by a Snifter Fan Collection System, designed and manufactured by Idaho Steel. Idaho Steel guarantees a collection efficiency of 80% of 10 micron or larger particles. The manufacturer guarantee is included in Appendix D of the application. Any particulate not captured by the Snifter Fan Collection System exhausts through the snifter fan hood rooftop exhausts.

A performance test conducted on July 19, 2011 indicated that the Gem State drum dryer emission rate is 0.63 lb PM_{10}/ton (0.71 lb/hr). Snifter stacks performance tests results indicate the emission rate is 0.02 lb PM_{10}/hr. All rates are consistent with the previous permitting analysis. The drum dryer emission rate and snifter are now combined into one stack with an aggregated rate of 0.73 lb/hr. Therefore, 12 emission points has been reduced to six.

Baghouses

Baghouses are used to convey the dried flakes to the different packaging areas, and include a pneumatic conveying line (conveys flakes from the drum dryers), six plant receiver baghouses, truck loadout baghouse, rail load baghouse, and four silo bin vent baghouses (only one of the four silo bin vent baghouses will operate at a time). There are also three negative air baghouses that are associated with the plant receiver baghouses. These baghouses are used as process equipment but also control PM_{10} emissions. With the exception of the rail load baghouse and silo bin vent baghouses, all the above listed baghouses initially discharged into the facility building. A nuisance dust collector baghouse used to control fugitive emissions from process equipment and the above mentioned indoor discharging baghouses will now be exhausted outside the building. An emission factor of 0.007 grain/dscf (manufacturer's guarantee) was assumed for the indoor discharge baghouses, silo bin vent baghouses and

rail load baghouse. Emissions from the nuisance dust collector were calculated by assuming 99.9% control of emissions from the indoor discharging baghouses. The manufacturer control guarantee for the nuisance dust collector baghouse has been included in Appendix D of the previous application.

Dehydration Dryer Units

Gem State is proposing to update the throughput of the two new dehydration dryer units on site. The total throughput on a dry basis is 65,000 lb/day amongst each of the three stages. The proposed hourly throughput is 2,708 lb/hr through all six stages, simultaneously. The new dehydration dryer units will operate on the same schedule as the other natural gas units, which is 8,520 hr/yr.

Process emissions factors for both the Wolverine dryers are based on performance test results conducted on one active unit in September, 2015. Because this test was not submitted to DEQ and not been determined accepted, to ensure conservatism, and to account for any minor differences between potential testing procedures, emissions estimates for the Wolverine dryers was increased by 20%.

2.2 Location of Project

AERMOD includes rural and urban algorithm options. These options affect the wind speed profile, dispersion rates, and mixing-height formula used in calculating ground-level pollutant concentrations. A protocol was developed by USEPA to classify an area as either rural or urban for dispersion modeling purposes. The classification is based on average heat flux, land use, or population density within a three-km radius from the plant site. Of these techniques, the USEPA has specified that land use is the most definitive criterion (USEPA, 1987). The urban/rural classification scheme based on land use is as follows:

> *The land use within the total area, A_0, circumscribed by a 3-km circle about the source, is classified using the meteorological land use typing scheme proposed by Auer (1978). The classification scheme requires that more than 50% of the area, A0, be from the following land use types in order to be considered urban for dispersion modeling purposes: heavy industrial (I1); light-moderate industrial (I2); commercial (C1); single-family compact residential (R2); and multi-family compact residential (R3). Otherwise, the use of rural dispersion coefficients is appropriate.*

The Gem State facility is located in a light industrial area, in Heyburn, ID. Although the immediate vicinity of the site is industrial and commercial, site and map reconnaissance showed that the area A_0 within a 3-km circle of the source is below the 50% urban land use criteria necessary for use of urban dispersion coefficients. Rural dispersion coefficients were therefore used in the air quality dispersion modeling.

Minidoka County is designated as an attainment area for all criteria pollutants. The facility is located at 273,441 mE and 4,714,591 mN, UTM zone 12 NAD 83. A map showing the geographical location of the facility is provided within Appendix A of the application.

2.3 Existing Permits and Modeling Analyses Performed

Any existing air quality permits are listed and described in this section, and any associated air quality modeling analyses have been described and referenced, and submitted if appropriate.

- Issued March 5, 2015 – P-2010.0183, Project # 61406
    - This project combined the drum dryer and sniffer stack into one stack per line. Two dehydration units were added, all other units unchanged

3.0 Modeling Analyses Applicability

Due to Federal Aviation Administration (FAA) requirements, drum dryer stacks must be lowered by 18 feet. Additionally, the current permit allows for 902.8 lb/hr dried potato product throughput into each dehydration unit. The request of this modification is to increase that to 2,708 lb/hr or 65,000 lb/day for each unit. To ensure National Ambient Air Quality Standards (NAAQS) compliance, adjustments are needed for each drum dryer stack. Only particulate emissions are increased due to the throughput changes. However, in addition to particulate, all previous averaging periods for gaseous pollutants will be evaluated as well. Modeling of $PM_{2.5}$ (both annual and 24-hr), PM_{10} and NO_2 (both 1-hr and annual). All other criteria pollutant emissions are below modeling thresholds; however, 1-hr SO_2 facility-wide modeling will be conducted to ensure compliance. Although there is no increase of natural gas consumption, appropriate toxic air pollutants (TAPs) will be evaluated for the dehydrators and two new AMUs.

3.1 Applicable Standards

Criteria pollutant NAAQS are listed in Table 1, along with significant impact levels (SILs).

Table 1 APPLICABLE REGULATORY LIMITS

Pollutant	Averaging Period	Significant Impact Levels[a] ($\mu g/m^3$)[b]	Regulatory Limit[c] ($\mu g/m^3$)	Modeled Design Value Used[d]
PM_{10}[e]	24-hour	5.0	150[f]	Maximum 6th highest[g]
$PM_{2.5}$[h]	24-hour	1.2	35[i]	Mean of maximum 8th highest[j]
	Annual	0.3	12[k]	Mean of maximum 1st highest[l]
Carbon monoxide (CO)	1-hour	2,000	40,000[m]	Maximum 2nd highest[n]
	8-hour	500	10,000[m]	Maximum 2nd highest[n]
Sulfur Dioxide (SO_2)	1-hour	3 ppb[o] (7.8 $\mu g/m^3$)	75 ppb[p] (196 $\mu g/m^3$)	Mean of maximum 4th highest[q]
	3-hour	25	1,300[m]	Maximum 2nd highest[n]
	24-hour	5	365[m]	Maximum 2nd highest[n]
	Annual	1.0	80[r]	Maximum 1st highest[n]
Nitrogen Dioxide (NO_2)	1-hour	4 ppb (7.5 $\mu g/m^3$)	100 ppb[s] (188 $\mu g/m^3$)	Mean of maximum 8th highest[t]
	Annual	1.0	100[r]	Maximum 1st highest[n]
Lead (Pb)	3-month[u]	NA	0.15[r]	Maximum 1st highest[n]
	Quarterly	NA	1.5[r]	Maximum 1st highest[n]
Ozone (O_3)	8-hour	40 TPY VOC[v]	70 ppb[w]	Not typically modeled

a. Idaho Air Rules Section 006 (definition for significant contribution) or as incorporated by reference as per Idaho Air Rules Section 107.03.b.
b. Micrograms/cubic meter.
c. Incorporated into Idaho Air Rules by reference, as per Idaho Air Rules Section 107.
d. The maximum 1st highest modeled value is always used for the significant impact analysis unless indicated otherwise. Modeled design values are calculated for each ambient air receptor.
e. Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers.
f. Not to be exceeded more than once per year on average over 3 years.
g. Concentration at any modeled receptor when using five years of meteorological data.
h. Particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.
i. 3-year mean of the upper 98th percentile of the annual distribution of 24-hour concentrations.
j. 5-year mean of the 8th highest modeled 24-hour concentrations at the modeled receptor for each year of meteorological data modeled. For the SIL analysis, the 5-year mean of the 1st highest modeled 24-hour impacts at the modeled receptor for each year.
k. 3-year mean of annual concentration.
l. 5-year mean of annual averages at the modeled receptor.
m. Not to be exceeded more than once per year.
n. Concentration at any modeled receptor.
o. Interim SIL established by EPA policy memorandum.
p. 3-year mean of the upper 99th percentile of the annual distribution of maximum daily 1-hour concentrations.
q. 5-year mean of the 4th highest daily 1-hour maximum modeled concentrations for each year of meteorological data modeled. For the significant impact analysis, the 5-year mean of 1st highest modeled 1-hour impacts for each year is used.
r. Not to be exceeded in any calendar year.
s. 3-year mean of the upper 98th percentile of the annual distribution of maximum daily 1-hour concentrations.
t. 5-year mean of the 8th highest daily 1-hour maximum modeled concentrations for each year of meteorological data modeled. For the significant impact analysis, the 5-year mean of maximum modeled 1-hour impacts for each year is used.
u. 3-month rolling average.
v. An annual emissions rate of 40 ton/year of VOCs is considered significant for O_3.
w. Annual 4th highest daily maximum 8-hour concentration averaged over three years.

Applicable TAP-specific increment standards are provided in Idaho Air Rules Section 585 and 586. A table of identified TAP emissions resulting from the proposed project is provided in this section of the Modeling Report. TAP emissions increases resulting from the project are identified in Table 2.

Table 2 TAP ELS AND AACS/AACCS

TAP	Non-Carcinogen or Carcinogen	Screening Emissions Level (EL)[a] (lb/hr)	AAC or AACC[b] (µg/m³)
Arsenic	Carcinogenic	1.5E-06	2.3E-04
Cadmium	Carcinogenic	3.7E-06	5.6E-04
Formaldehyde	Carcinogenic	5.1E-04	7.7E-02
Nickel	Carcinogenic	2.7E-05	4.2E-03

a. ELs from Idaho Air Rules Section 585 and 586 in pounds/hour.
b. Acceptable Ambient Concentration (AAC) or Acceptable Ambient Concentration for a Carcinogen (AACC) from Idaho Air Rules Section 585 and 586, in micrograms/cubic meter or milligrams/cubic meter. Note that AACs listed in Idaho Air Rules Section 585 are expressed in units of milligrams/cubic meter rather than micrograms/cubic meter.

All TAPs identified in the emissions inventory for the project are listed in the TAPs EL and AAC/AACC Table in this section.

3.2 Criteria Pollutant Modeling Applicability

All criteria pollutants and averaging periods that were modeling during the previous permitting action will be modeled again on a facility-wide basis. CO and SO_2 annual are not modeled because the Level I Thresholds are not exceeded. Please see the associated emission Inventory for details.

Table 3 lists criteria pollutants for which site-specific modeling analyses were performed to demonstrate compliance with NAAQS.

Table 3 MODELING APPLICABILITY

Criteria Pollutant	Modeled (yes/no)	Basis for Exclusion from Modeling
$PM_{2.5}$ 24-hour	Yes	___BRC Exempt[a] ___Emissions Below Level I Thresholds[b] ___Emissions Below Level II Thresholds[c]
$PM_{2.5}$ annual	Yes	___BRC Exempt ___Emissions Below Level I Thresholds ___Emissions Below Level II Thresholds
PM_{10} 24-hour	Yes	___BRC Exempt ___Emissions Below Level I Thresholds ___Emissions Below Level II Thresholds
NO_2 1-hour	Yes	___BRC Exempt ___Emissions Below Level I Thresholds ___Emissions Below Level II Thresholds
NO_2 annual	Yes	___BRC Exempt ___Emissions Below Level I Thresholds ___Emissions Below Level II Thresholds
SO_2 1-hour, 3-hour	Yes	___BRC Exempt ___Emissions Below Level I Thresholds ___Emissions Below Level II Thresholds
SO_2 annual	No	___BRC Exempt _X_Emissions Below Level I Thresholds ___Emissions Below Level II Thresholds
CO 1-hour, 8-hour	No	___BRC Exempt _X_Emissions Below Level I Thresholds ___Emissions Below Level II Thresholds

a. If the project would have qualified for a Category I BRC permitting exemption for the criteria pollutant in question, as per Idaho Air Rules Section 221.01, except for the emissions quantities of another criteria pollutant, then a NAAQS compliance analysis is not required under Section 203.02 or 403.02 for that criteria pollutant.

b. Level I Modeling Thresholds from Table 2 in Section 3 of the DEQ Modeling Guideline. NAAQS compliance is assured through DEQ's non-site-specific modeling analyses.

c. Level II Modeling Thresholds from Table 2 in Section 3 of the DEQ Modeling Guideline. NAAQS compliance is assured through DEQ's non-site-specific modeling analyses. Level II Modeling Thresholds can only be used with prior DEQ approval.

Emissions calculations that clearly show how the modeling applicability determination was performed are provided in Appendix C of the application.

3.3 TAP Modeling Applicability

All combustion sources associated with the dehydration stacks and AMUs were evaluated for TAPs modeling. All calculations and assumptions can be found in Appendix C of the application. The emission rates have not changed from the March 5, 2015 permit, but stack parameters have changed as has the number of exhaust points from the AMU (reduced from 6 to 4). Therefore, the same four carcinogenic pollutants (arsenic, cadmium, formaldehyde and nickel) were evaluated.

3.4 Modeling Protocol

A modeling protocol was submitted to DEQ on December 11, 2015. This is a replacement for the previously accepted protocol due to the fact that is has been more than six months after the first protocol. The delay was due to negotiations with the Burley airport and the FAA. IDEQ modeling personnel indicated that a review of the protocol will likely take a minimum of four weeks. Also, the IDEQ Twin Falls regional office stated that the application for modification can be submitted without a protocol approval letter. Due to the fact IDEQ model staff is well acquainted with the project and that all of the questions presented in the previous approval letter are accounted for, it was determined to submit the report without an approval letter.

4.0 Modeled Emissions Sources

All the sources described in Section 2.1 of this report were modeled. Only the dehydration units and associated AMU were evaluated for TAPs. This is appropriate because they are only areas that show an increase from the March 5, 2015 permitting action. All combustion sources are assumed to operate 5,270 or 8,520 hours per year depending on the source. All AMUs are operated for 5,270 hours. The boilers and agglomerator operate 8,520 hours. Drum Dryers and dehydration units are assumed to operate 8,520 hours as well.

The modeling emissions inventory and the emissions inventory presented in other parts of the permit application are consistent.

4.1 Criteria Pollutants

Most emission rates remain unchanged from the previous modeling analysis. Exceptions include: the hourly throughput of dry potato slices traveling through the Wolverine dehydration units, AMU Zone #3 exhaust and SO_2 associated with the three boilers. The March 5, 2015 modeling demonstration limited the throughput to 1/3 of the hourly rate that was desired by the facility. Also, the AMU combustion emission rates for Zone #3 of the facility remain unchanged in total, but the number of exhaust points has decreased from six to four. Therefore, the emission rate of each individual stack has increased. During the development of this permitting action it was determined that previous modeling demonstrations inadvertently applied CO emission rates for SO_2 lb/hr. This has been adjusted which results in an emission rate decrease.

4.1.1 Modeled Emissions Rates for Cumulative Impact Analyses

All emission rates used in the modeling analysis is equivalent to those rates identified in Appendix C of the application. The Emission Inventory also includes a new "Modeling" tab that demonstrates how the modeled emission rates were calculated from data provided within the inventory. The table and tab within the emission inventory spreadsheet are representative of all three boilers running at lower than capacity and #1 representing the lower fuel consumption.

Table 4 lists criteria pollutant emissions rates used in the cumulative NAAQS impact analyses.

Table 4 MODELED EMISSIONS RATES FOR CUMULATIVE NAAQS IMPACT ANALYSES							
Source ID	**Source Description**	**$PM_{2.5}$ (24-hr)**	**$PM_{2.5}$ (Ann)**	**PM_{10} (24-hr)**	**NO_x (1-hr)**	**NO_x (Ann)**	**SO_2 (1-hr)**
Rates in pounds per hour							
DFH#1	Drum Fan Hood & Sniffer #1	0.73	0.71	0.73	0	0	0
DFH#2	Drum Fan Hood & Sniffer #2	0.73	0.71	0.73	0	0	0
DFH#3	Drum Fan Hood & Sniffer #3	0.73	0.71	0.73	0	0	0
DFH#4	Drum Fan Hood & Sniffer #4	0.73	0.71	0.73	0	0	0
DFH#5	Drum Fan Hood & Sniffer #5	0.73	0.71	0.73	0	0	0
DFH#6	Drum Fan Hood & Sniffer #6	0.73	0.71	0.73	0	0	0
EX1	AMU Exhaust #1	4.38E-02	2.65E-02	4.38E-02	0.288	0.174	3.46E-03
EX2	AMU Exhaust #2	4.38E-02	2.65E-02	4.38E-02	0.288	0.174	3.46E-03
EX3	AMU Exhaust #3	4.38E-02	2.65E-02	4.38E-02	0.288	0.174	3.46E-03
EX4	AMU Exhaust#4	1.29E-02	7.76E-03	1.29E-02	0.085	0.051	1.02E-03
EX5	AMU Exhaust#5	1.29E-02	7.76E-03	1.29E-02	0.085	0.051	1.02E-03
EX6	AMU Exhaust#6	4.38E-02	2.65E-02	4.38E-02	0.288	0.174	3.46E-03
EX7	AMU Exhaust#7	2.79E-03	1.68E-03	2.79E-03	0.018	0.011	2.20E-04
EX8	AMU Exhaust#8	4.88E-03	2.92E-03	4.88E-03	0.032	0.019	3.85E-04
EX9	AMU Exhaust#9	4.88E-03	2.92E-03	4.88E-03	0.032	0.019	3.85E-04
EX10	AMU Exhaust#10	1.20E-02	7.24E-03	1.20E-02	0.079	0.048	9.50E-04
EX11	AMU Exhaust#11	1.20E-02	7.24E-03	1.20E-02	0.079	0.048	9.50E-04
EX12	AMU Exhaust#12	1.20E-02	7.24E-03	1.20E-02	0.079	0.048	9.50E-04
EX13	AMU Exhaust#13	1.29E-02	7.79E-03	1.29E-02	0.085	0.051	1.02E-03
EX14	AMU Exhaust#14	1.29E-02	7.79E-03	1.29E-02	0.085	0.051	1.02E-03
EX15	AMU Exhaust#15	3.35E-02	4.22E-03	3.35E-02	0.221	0.133	2.65E-03
EX16	AMU Exhaust#16	3.35E-02	4.22E-03	3.35E-02	0.221	0.133	2.65E-03
EX17	AMU Exhaust#17	3.35E-02	4.22E-03	3.35E-02	0.221	0.133	2.65E-03
EX18	AMU Exhaust#18	3.35E-02	4.22E-03	3.35E-02	0.221	0.133	2.65E-03
BO1	Boiler #1	0.048	0.047	0.048	1.74	1.69	2.66E-02
BO2	Boiler #2	0.048	0.047	0.048	1.74	1.69	2.66E-02
BO3	Boiler #3	0.065	0.063	0.065	2.16	2.16	3.55E-02
PRE1	Bubble Sheet Dryer #1	0.76	0.74	0.76	0.686	0.668	0.004
PRE2	Bubble Sheet Dryer #2	0	0	0	0	0	0
PRE3	Pneumatic Conveying	0.06	0.058	0.06	0	0	0
BH1	Nuisance Dust Collector	3.00E-04	2.92E-04	3.00E-04	0	0	0
WDRY1A1	Wolv Dryer #1 Stage A Stack 1	0.984	0.957	0.984	0.256	0.249	0.00426
WDRY2A1	Wolv Dryer #2 Stage A Stack 1	0.984	0.957	0.984	0.256	0.249	0.00426
WDRY1A2	Wolv Dryer #1 Stage A Stack 2	0.548	0.532	0.548	0.142	0.139	0.00237
WDRY2A2	Wolv Dryer #2 Stage A Stack 2	0.548	0.532	0.548	0.142	0.139	0.00237
WDRY1B	Wolv Dryer #1 Stage B	0.347	0.338	0.347	0.135	0.130	0.0022

Table 4 MODELED EMISSIONS RATES FOR CUMULATIVE NAAQS IMPACT ANALYSES							
Source ID	**Source Description**	**$PM_{2.5}$ (24-hr)**	**$PM_{2.5}$ (Ann)**	**PM_{10} (24-hr)**	**NO_x (1-hr)**	**NO_x (Ann)**	**SO_2 (1-hr)**
Rates in pounds per hour							
WDRY2B	Wolv Dryer #2 Stage B	0.347	0.338	0.347	0.135	0.130	0.0022
WDRY1C	Wolv Dryer #1 Stage C	0.328	0.320	0.328	0.042	0.041	7.04E-04
WDRY2C	Wolv Dryer #2 Stage C	0.328	0.320	0.328	0.042	0.041	7.04E-04
BV1A	Silo Bin Vent Baghouse#1	0.06	0.059	0.06	0	0	0
RAILROAD	Rail Load Baghouse	0.06	0.059	0.06	0	0	0

4.1.2 NO_2/NOx Ratio for NOx Chemistry Modeling

The oxygen limiting method was implemented to demonstrate compliance with 1-hr NO_2. All combustion sources burn natural gas exclusively. An in-stack NO_2/NO_x ratio (ISR) of 0.2 was applied for all applicable sources with the exception of the three natural gas boilers. A 10% or 0.1 value was applied to the boilers, which is based on the San Joaquin Valley Air District[1] recommendations of 10% for natural gas boilers.

4.2 Toxic Air Pollutants

All TAPs emissions associated with this modeling analysis are identical to those in the March 5, 2015 analysis. The emission rates are identical, but exhaust parameters (stack height increases) of the dehydration units differ as well as the number of AMU exhaust points. They have been reduced from six to four points. The emissions, calculated using fuel usage rates and AP-42 factors, are distributed evenly across the four exhaust stacks. Factors were derived from tables 1.4-3 and 1.4-4 of AP-42.

Table 5 lists TAP emissions rates that were included in modeling analyses. Modeling was performed for each TAP having total project emissions exceeding the TAP-specific screening Emissions Level (EL).

TABLE 5 MODELED EMISSIONS RATES FOR TAP ANALYSES				
Source ID	**Source Description**	**TAP**	**Averaging Period**	**Emissions[a] (lb/hr)**
WDRY1A1	Wolverine Dryer #1 Stage A Stack 1	Arsenic	24-hour/annual	1.38E-06
		Cadmium	24-hour/annual	7.60E-06
		Formaldehyde	24-hour/annual	5.18E-04
		Nickel	24-hour/annual	1.45E-05
WDRY2A1	Wolverine Dryer #2 Stage A Stack 1	Arsenic	24-hour/annual	1.38E-06
		Cadmium	24-hour/annual	7.60E-06

[1] San Joaquin Valley in-stack ratios - https://www.valleyair.org/busind/pto/Tox_Resources/Assessment%20of%20Non-Regulatory%20Option%20in%20AERMOD.pdf

TABLE 5 MODELED EMISSIONS RATES FOR TAP ANALYSES				
Source ID	**Source Description**	**TAP**	**Averaging Period**	**Emissions[a] (lb/hr)**
		Formaldehyde	24-hour/annual	5.18E-04
		Nickel	24-hour/annual	1.45E-05
WDRY1A2	Wolverine Dryer #1 Stage A Stack 2	Arsenic	24-hour/annual	7.69E-07
		Cadmium	24-hour/annual	4.23E-06
		Formaldehyde	24-hour/annual	2.88E-04
		Nickel	24-hour/annual	8.07E-06
WDRY2A2	Wolverine Dryer #2 Stage A Stack 2	Arsenic	24-hour/annual	7.69E-07
		Cadmium	24-hour/annual	4.23E-06
		Formaldehyde	24-hour/annual	2.88E-04
		Nickel	24-hour/annual	8.07E-06
WDRY1B	Wolverine Dryer #1 Stage B	Arsenic	24-hour/annual	7.29E-07
		Cadmium	24-hour/annual	4.01E-06
		Formaldehyde	24-hour/annual	2.73E-04
		Nickel	24-hour/annual	7.65E-06
WDRY2B	Wolverine Dryer #2 Stage B	Arsenic	24-hour/annual	7.29E-07
		Cadmium	24-hour/annual	4.01E-06
		Formaldehyde	24-hour/annual	2.73E-04
		Nickel	24-hour/annual	7.65E-06
WDRY1C	Wolverine Dryer #1 Stage C	Arsenic	24-hour/annual	2.28E-07
		Cadmium	24-hour/annual	1.26E-06
		Formaldehyde	24-hour/annual	8.56E-05
		Nickel	24-hour/annual	2.40E-06
WDRY2C	Wolverine Dryer #2 Stage C	Arsenic	24-hour/annual	2.28E-07
		Cadmium	24-hour/annual	1.26E-06
		Formaldehyde	24-hour/annual	8.56E-05
		Nickel	24-hour/annual	2.40E-06
EX15	AMU Zone #3 Exhaust	Arsenic	24-hour/annual	1.06E-06
		Cadmium	24-hour/annual	5.84E-06
		Formaldehyde	24-hour/annual	3.98E-04
		Nickel	24-hour/annual	1.11E-05
EX16	AMU Zone #3 Exhaust	Arsenic	24-hour/annual	1.06E-06
		Cadmium	24-hour/annual	5.84E-06
		Formaldehyde	24-hour/annual	3.98E-04
		Nickel	24-hour/annual	1.11E-05

[a] Pounds/hour emissions rate modeled is the project-specific increase in potential/allowable emissions increase for the averaging period specified for the TAP.

Emissions rates in Table 5 are identical to those in the model input file for TAP analyses.

4.3 Emissions Release Parameters

All emissions release parameters are equivalent from the March 5, 2015 analysis with the exception of drum dryer, dehydration unit and AMU exhaust Zone #3 stacks. The units that are unchanged had their parameters validated in February 2012. The verification data has been included in this analysis. Idaho

Steel has also provided an updated ventilation system schematic for all sources. Note that only one of the bin vents (BVA1) has an emission rate as only one operates at a time.

The height of each stack is to be elevated from 42 feet from ground level to 60 feet. It should be noted that the stack heights are only be increased as precaution. During the October 1, 2015 test, there appeared to be mechanical issue with Stage C. The resulting emission rate and emission factor are likely overestimated. Stage B and C should have similar emissions. However, to be consistent with the test results, heights were increased accordingly. The diameters, temperature and exit velocity remain unchanged from the current permit. The table below supplies the expected diameters, exit velocities and temperatures for each unit. All parameters were either provided directly by the manufacturer or calculated based on data supplied by the manufacturer.

Table 6 below supplies the expected diameters, exit velocities and temperatures for each unit. All parameters were either provided directly by the manufacturer or calculated based on data supplied by the manufacturer.

TABLE 6 DEHYDRATION DRYER STACK PARAMETERS				
Stack	**Stack Height (ft)**	**Temperature (°F)**	**Stack Diameter (inches)**	**Flow Rate (acfm)**
Wolv 1 (Stage A Stack 1)	60	225	32	14,667
Wolv 2 (Stage A Stack 2)	60	232	36	19,115
Wolv 3 (Stage B)	60	186	32	14,805
Wolv 4 (Stage C)	60	176	22	6,264

The FAA has determined that the currently permitted height of 100 feet is not viable due to close proximity of the Burley Airport and obstruction of flights paths. Therefore, each of the seven stacks will be reduced by 18 feet to 82 feet from ground level. Associated with that reduction are changes to exhaust flow rates and diameters. The exhaust flow rates are increased approximately 10,000 acfm each. The diameters of the drum dryers are decreased by 6 inches to 36 inches or three feet. The increase of flow will be supported by adjustments to the ventilation plan and routing air flow to other areas of the plant. All temperatures remain unchanged. Table 7 summarizes these parameters.

TABLE 7 DRUM DRYER STACK PARAMETERS					
Stack	**Stack Height (ft)**	**Temperature (°F)**	**Stack Diameter (inches)**	**Velocity (m/s)**	**Flow Rate (acfm)**
Stack #1	82	119	36	32.3	45,000
Stack #2	82	119	36	32.3	45,000
Stack #3	82	119	36	32.3	45,000
Stack #4	82	119	36	32.3	45,000
Stack #5	82	119	36	32.3	45,000

TABLE 7 DRUM DRYER STACK PARAMETERS					
Stack	**Stack Height (ft)**	**Temperature (°F)**	**Stack Diameter (inches)**	**Velocity (m/s)**	**Flow Rate (acfm)**
Stack #6	82	119	36	32.3	45,000
Agglomerator	82	131	32	31.8	35,000

Table 8 lists stack parameters for point sources and Table 9 lists release parameters for volume and area sources.

Table 8 POINT SOURCE STACK PARAMETERS								
Release Point	**Description**	**UTM[a] Coordinates**		**Stack Height (ft)**	**Stack Gas Flow Temp. (F)[c]**	**Stack Gas Flow Velocity (m/sec)[d]**	**Modeled Stack Diameter (in)**	**Orient. Of Release[e]**
		Easting-X (m)[b]	**Northing-Y (m)**					
DFH#1	Drum Fan Hood #1	273385	4714654	82	119	32.3	36	Vertical
DFH#2	Drum Fan Hood #2	273388	4714657	82	119	32.3	36	Vertical
DFH#3	Drum Fan Hood #3	273392	4714660	82	119	32.3	36	Vertical
DFH#4	Drum Fan Hood #4	273395	4714663	82	119	32.3	36	Vertical
EX1	Exhaust #1	273481	4714588	38.8	80	11.6	44	Vertical
EX2	Exhaust #2	273476	4714604	38.8	80	11.6	44	Vertical
EX3	Exhaust #3	273463	4714572	38.8	80	11.6	44	Vertical
EX4	Exhaust #4	273407	4714616	38.8	80	7.4	30	Vertical
EX5	Exhaust #5	273403	4714613	38	80	7.4	30	Vertical
EX6	Exhaust #6	273419	4714629	38	80	11.6	44	Vertical
PRE1	Bubble Sheet Dryer #1	273445	4714718	82	131	31.8	32	Vertical
PRE2	Bubble Sheet Dryer #2	273441.6	4714709.3	82	150	19.4	38	Vertical
PRE3	Pneumatic Convey BH	273404.4	4714685.4	60	100	14.0	20	Vertical
BH1	Nuisance BH	273409	4714689.3	40.1	100	3.2	16	Vertical
EX7	Exhaust #7	273385.6	4714692.3	37.7	80	6.5	24	Vertical
EX8	Exhaust #8	273415.9	4714682.1	37.9	80	7.2	30	Vertical
EX9	Exhaust #9	273427.1	4714692.8	37.9	80	7.2	30	Vertical
EX10	Exhaust #10	273414.3	4714726.5	35.9	80	7.0	48	Vertical
EX11	Exhaust #11	273449.2	4714763.2	35.8	80	7.0	48	Vertical
EX12	Exhaust #12	273475	4714754	35.7	80	7.0	48	Vertical
EX13	Exhaust #13	273463.8	4714747.3	36.1	80	7.5	48	Vertical
EX14	Exhaust #14	273474.5	4714735.5	36.1	80	7.5	48	Vertical
BO1	Boiler #1	273362	4714689	60.8	315	10.7	36	Vertical
BO2	Boiler #2	273360	4714687	60.8	315	10.7	36	Vertical
BO3	Boiler #3	273357	4714685	60.8	315	10.7	36	Vertical
DFH#5	Drum Fan Hood #5	273399	4714667	82	119	32.3	36	Vertical
DFH#6	Drum Fan Hood #6	273402	4714670	82	119	32.3	36	Vertical
WDRY1A1	Dryer #1 Stage A #1	273464.3	4714628.6	60	137.5	25	38	Vertical
WDRY2A1	Dryer #2 Stage A #1	273458.3	4714623.5	60	137.5	25	38	Vertical
WDRY1A2	Dryer #1 Stage A #2	273455.4	4714636.6	60	141	25	38	Vertical
WDRY2A2	Dryer #2 Stage A #2	273449.3	4714631	60	141	25	38	Vertical
WDRY1B	Dryer #1 Stage B	273443.9	4714646.9	60	118	25	38	Vertical
WDRY2B	Dryer #2 Stage B	273438.5	4714641.4	60	118	25	38	Vertical
WDRY1C	Dryer #1 Stage C	273430.5	4714660.3	60	113	25	38	Vertical
WDRY2C	Dryer #2 Stage C	273425.1	4714655.8	60	113	25	38	Vertical
EX15	Exhaust #15	273428	4714645.4	36	90	17.5	36	Vertical
EX16	Exhaust #16	273450.1	4714637.4	36	90	17.5	36	Vertical

Table 8 POINT SOURCE STACK PARAMETERS								
Release Point	Description	UTM[a] Coordinates		Stack Height (ft)	Stack Gas Flow Temp. (F)[c]	Stack Gas Flow Velocity (m/sec)[d]	Modeled Stack Diameter (in)	Orient. Of Release[e]
		Easting-X (m)[b]	Northing-Y (m)					
EX17	Exhaust #17	273458.8	4714613.6	36	90	17.5	36	Vertical
EX18	Exhaust #18	273474.8	4714621.2	36	90	17.5	36	Vertical

a. Universal Transverse Mercator.
b. Meters.
c. Fahrenheit.
d. Meters per second.
e. Vertical uninterrupted, rain-capped, or horizontal release.

Table 9 VOLUME AND AREA SOURCE RELEASE PARAMETERS						
Source	Description	UTM[a] Coordinates		Release Height (ft)	Horizontal Dimension (ft)	Vertical Dimension (ft)
		Easting - X (m)[a]	Northing - Y (m)			
BV1A	Silo Bin Vent BH #1	273376	471401	75.5	0.837	36.0
RAILROAD	Rail load BH	273386.5	4714725	41.8	0.837	20.3

a. Universal Transverse Mercator
b. feet

Each volume source is 44 x 44 inches or 3.6 feet x 3.6 feet. During a stack verification exercise in February 2012 it was determined that release height of the bin vent was 75.5 feet from the ground. Also, the release height of the rail loadout was verified at 41.8 feet. These numbers were derived at the midpoint of the square vents as they are to the side of the building.

The initial horizontal dimension of each was calculated by taking the width of 3.6 feet and dividing that by 4.3 for a single source as stated in the IDEQ modeling guidelines. Therefore, the initial horizontal dimension is 0.837 feet.

Also provided in the guidelines is the vertical dimension on or adjacent to a building. Both vents are on the building; thus the divisor is 2.15. The total vertical height of the rail loadout is 40 + 3.6 or 43.6 feet. Therefore, the dimension value is 20.28 feet. The bin vent is 73.7 + 3.6 or 77.3 feet. This would indicate that the dimension value would 35.95 feet.

Lastly, Idaho Steel has supplied an in-depth decision regarding the ventilation layout of the facility.

__X___The specific methods used to determine/calculate given release parameters is described in this section.

__X__The release orientation of all point source stacks (horizontal, rain-capped, or uninterrupted vertical release) has been verified and is documented in this section.

4.3.1 Burley Airport No Longer Active

Gem State was notified last week that there was a small chance of the City of Burley closing the airport and moving its location. If that is the case, the parameters associated with the six drum dryers and the agglomerator line will remain unchanged from the march 5, 2015 permit. This includes stack heights of 100 feet from ground level. Drum dryer diameters will remain 3.5 feet (42 inches) and not be reduced to 3.0 feet. The agglomerator diameter remains 2.67 feet (32 inches) regardless of the airport status. Additionally, exit velocities will remain at 18.48 m/s and 22.68 m/s for the drums and agglomerator, respectively. Lastly, extra fans will not need installed. Note that there was an error in the March 5, 2015 permit indicated the exit velocity of drum dryer #4 was 17.16 m/s. The actual flow would be 18.48 m/s which are consistent with all other drums.

5.0 Modeling Methodology

Table 10 summarizes the key modeling parameters used in the impact analyses.

Table 10 MODELING PARAMETERS

Parameter	Description/Values	Documentation/Addition Description
General Facility Location	Heyburn, Idaho	The area is an attainment or unclassified area for all criteria pollutants
Model	AERMOD	AERMOD with the PRIME downwash algorithm, version 15181
Meteorological Data	Burley surface data Boise upper air data	The meteorological model input files for this project were developed by IDEQ. See Section 5.2 of this memorandum for additional details of the meteorological data.
Terrain	Considered	3-dimensional receptor coordinates were obtained from USGS National Elevation Dataset (NED) files and were used to establish elevation of ground level receptors. AERMAP was used to determine each receptor elevation and hill height scale.
Building Downwash	Considered	Plume downwash was considered for the structures associated with the facility. BPIP-PRIME was used to evaluate building dimensions for consideration of downwash effects in AERMOD.
NOx Chemistry	PVMRV2	Updated Beta option within AERMOD intended to replace current version of PVMRM.
Receptor Grid	**Significant Impact Analyses**	
	Grid 1	10-meter spacing along the ambient air boundary
	Grid 2	10-meter spacing in a 552.3 meter (easting) by 531.6 meter (northing) grid centered on the facility
	Grid 3	25-meter spacing in a 602.7 meter (easting) by 552.3 meter (northing) grid centered on Grid 2
	Grid 4	50-meter spacing in a 800 meter (easting) by 800 meter (northing) grid centered on Grid 3
	Grid 5	100-meter spacing in a 1.2 kilometer (easting) by 1.2 kilometer (northing) grid centered on Grid 4
	Grid 6	250-meter spacing in a 3.0 kilometer (easting) by 2.5 kilometer (northing) grid centered on Grid 5
	Grid 7	500-meter spacing in a 6.0 kilometer (easting) by 5.5 kilometer (northing) grid centered on Grid 6
	NAAQS Analyses	
	List if different from grid used for Significant Impact Analyses	
	TAPs Analyses	
	List if different from grid used for Significant Impact Analyses	

5.1 Model Selection

AERMOD version 15181 was used for the modeling analyses to evaluate impacts of the Gem State facility. This is the current version of the regulatory guideline model.

__X__The current versions of all models and associated programs were used in analyses, or alternate versions were specifically approved by DEQ.

__X__Any non-default model options used were approved by DEQ in advance.

5.2 Meteorological Data

Preprocessed AERMOD ready meteorological files were provided by Darrin Mehr of IDEQ. The data files cover the years 2008 through 2012 from the Burley Municipal Airport. The data is hourly from the National Weather Service Automated Surface Observing System (ASOS). The data presented by IDEQ is model-ready, and was used without alteration or processing. These data originated from IDEQ, but has been included as part of this submittal.

__X__Meteorological data files are provided with the application.

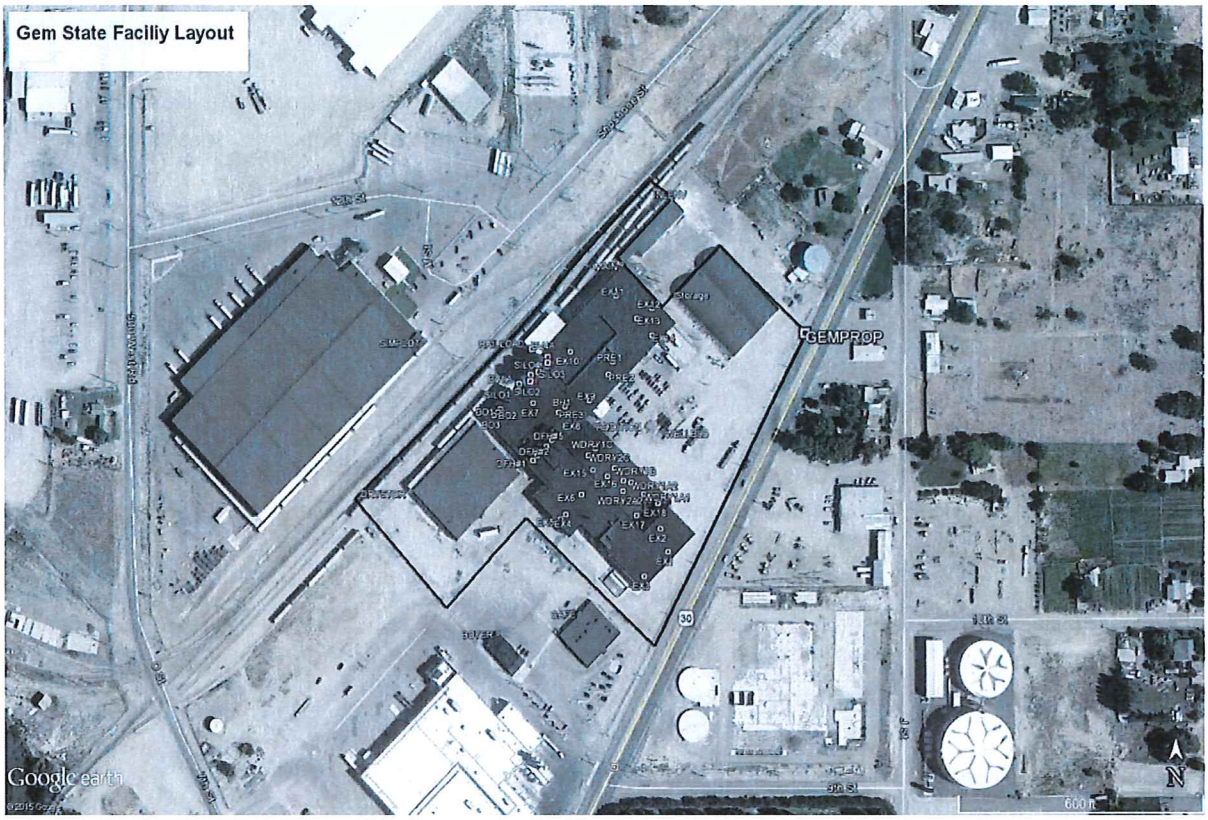
5.3 Effects of Terrain

All source base and receptor elevations were calculated from USGS NED data obtained via the National Map Viewer website using the Bee-Line BEEST preprocessing system. A 1/3 arc second NED file was used in the analysis Input and output files from AERMAP will be included on the associated DVD.

__X__The datum of terrain data, building corner locations, emissions sources, and the ambient air boundary are specified and are consistent such that the modeled plot plan accurately represents the facility and surroundings.

5.4 Facility Layout

The image shown below identifies the general location of the Gem State facility. Also, included is a memorandum written by JBR (now Stantec) on August 2, 2013 that describes the ambient air boundary in explicit detail.



__X__The facility layout plot plan is provided in this section that clearly and accurately depicts buildings, emissions points, and the ambient air boundary.

5.5 Effects of Building Downwash

Building downwash effects were determined using the BPIP – Prime algorithm. There are several surrounding buildings and tanks that were incorporated into the analysis. These include: the main Gem State building, the to-be-constructed addition, a well house, an off-site dry storage building, a nearby cafeteria, the Boyer building, Inland Environmental, Simplot Distribution Center, more onsite storage and four silo tanks.

5.6 Ambient Air Boundary

Please refer to the August 2, 2013 memorandum that is included as part of this submittal.

__X__This section thoroughly describes how the facility can legally preclude public access (and practically preclude access) to areas excluded from ambient air in the modeling analyses.

5.7 Receptor Network

__X__This section of the Modeling Report provides justification that receptor spacing used in the air impact analyses was adequate to reasonably resolve the maximum modeled concentrations to the point that NAAQS or TAP compliance is assured.

The facility is located in a light industrial area in Heyburn, ID. The property covers approximately 10.82 acres. Consistent with IDEQ guidance, the ambient air boundary used in this analysis is the leased property boundary, which also serves as the public access boundary.

Receptor density will be set to a spacing of 10 meters along the ambient air boundary, 10 meters for the first 100 meters past the boundary, then receptors were set at a density of one per 25 meters out to 200 meters away from the ambient air boundary, 50 meters out to 400 meters from the ambient air boundary, 100 meters out to another 400 meters, 250 meter spacing for another 2 kilometers and 500 meters out to 5.5 kilometers past the ambient air boundary.

The receptor network ensures that the analysis meets or exceeds EPA receptor network requirements and captures the maximum impact from the facility. Therefore, no supplemental receptor network or expansion of the model domain is included.

5.8 Background Concentrations

$PM_{2.5}$
Prior to the previous modeling effort, IDEQ Modeling Coordinator, Kevin Schilling, supplied both annual and 24-hr background concentrations from the city of Twin Falls. The concentrations that were provided were 21.3 $\mu g/m^3$ and 7.19 $\mu g/m^3$ for 24-hr and annual averaging periods, respectively. However, based on newer data from the Northwest Airquest Consortium, DEQ implemented the use of 13 $\mu g/m^3$ and 4.3 $\mu g/m^3$. These concentrations were used in the compliance demonstration.

PM_{10}
Also from the NW Airquest Consortium, it suggests the use of 73 $\mu g/m^3$ for PM_{10}, which is used in this analysis.

NO_2
The Plume Volume Molar Ratio Method (PVMRM) was used for modeling of 1-hr NO_2. The NW Airquest Consortium suggests the use of 17 ppb for 1-hr NO_2. This was applied as background. Also, 54 ppb was applied for ozone background. Lastly, 3.1 ppb (5.83 $\mu g/m^3$) was used for NO_2 annual. Please note that the output from AERMOD includes the background values.

SO_2
The NW Airquest Consortium suggests a 1-hr SO_2 background of 1.5 ppb (3.93 $\mu g/m^3$).

__X__Background concentrations have been thoroughly documented and justified for all criteria pollutants where a cumulative NAAQS impact analysis was performed.

5.9 NOx Chemistry

Both the Ozone Limiting Method (OLM) and the Plume Volume Molar Ratio Method (PVMRM) were evaluated. OLM compares the maximum NO_x to the ambient ozone. If ozone is greater than the maximum, total conversion is assumed. Otherwise the formation of NO_2 is limited by the ambient ozone. PVMRM calculates the molar ratio ozone to NOx in an effluent plume using "instantaneous" rates. The ratio is then multiplied by the NO_x concentrations provided by AERMOD to calculate the NO_2 concentrations within a plume.

Both methods tend to over predict NO_2 concentrations. However, according to a September 30, 2014 EPA memorandum, PVMRM tends to be most appropriate for elevated sources, while OLM works best for area sources and near-surface sources. Therefore, PVMRM was implemented because the majority of Gem State sources are individual stacks.

AERMOD version 15181 has included both PVMRM1 and updated version, PVMRM2. The intent with PVMRM2 is to replace the current version within the next AERMOD release. Several modifications were made to the computation of the plume volume. Additionally, "absolute" dispersion coefficients are now used in stable conditions. Lastly, additional miscellaneous bug fixes were made to ensure further improvement. It is also our understanding that Kevin Schilling of IDEQ is in agreement that the PVMRM2 updates are appropriate changes to Appendix W. As a result, PVMRM2 was used as part of the analysis.

6.0 Results and Discussion

The air quality impact limits applicable to this analysis are both the NAAQS and the Idaho ambient impact limits for Toxic Air Pollutants. Model predicted maximum impacts were the 8th high averaged over the 5 years modeled for 24-hr $PM_{2.5}$ and the highest 1st high for annual $PM_{2.5}$. IDEQ modeling staff has also confirmed that secondary aerosol analysis is not required when the impacts occur within a short distance of the ambient air boundary. The NO_2 1-hr shall not exceed the 98th percentile of a three-year average of the annual distribution of 24-hr average concentrations, which equates to the 8th high design value. PM_{10} uses the design value that is one greater than the number of metrological years. That equates to an exceedance no more than once in any calendar year. There are five years of met data meaning the design value is the 6th high over that five year period. 1-hr SO_2 shall not exceed the 99th percentile maximum concentration, averaged over three years, which equates to the 4th high design value. All TAPs that exceed the emission screening level (increase from dehydration units and AMU only) are considered annual carcinogenic pollutants.

6.1 Criteria Pollutant Impact Results

The tables shown below in section 6.1.2 demonstrate that there is no exceedance of any criteria pollutant or incremental exceedance of any toxic air pollutants due to the increase of throughput associated with the dehydrators and AMUs.

6.1.1 Significant Impact Level Analyses

A significance analysis is not necessary for this project because facility-wide modeling has been completed for all applicable criteria pollutants.

6.1.2 Cumulative NAAQS Impact Analyses

Table 11 provides results of Cumulative NAAQS Impact analyses with the airport remaining operational.

Table 11. RESULTS FOR CUMULATIVE NAAQS IMPACT ANALYSES WITH AIRPORT

Pollutant	Averaging Period	Modeled Design Concentration ($\mu g/m^3$)[a]	Background Concentration ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
$PM_{2.5}$[b]	24-hour	21.7[g]	13	34.7[g]	35
	Annual	6.5[h]	4.3	10.8[h]	12
PM_{10}[c]	24-hour	28.6[i]	73	101.6[i]	150
NO_2[d]	1-hour	160.7[g]	PVMRM2	160.7[g]	188
	Annual	12.9	5.83	18.73	100
SO_2[e]	1-hour	2.99[j]	3.93	6.92[j]	196
CO[f]	1-hour	N/A[k]	N/A	N/A[k]	40,000
	8-hour	N/A[k]	N/A	N/A[k]	10,000

[a] Micrograms/cubic meter

b. Particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.
c. Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers.
d. Nitrogen dioxide.
e. Sulfur dioxide.
f. Carbon Monoxide.
g. Maximum of 5-year means (or a lesser averaging period if less than 5 years of meteorological data were used in the analyses) of 8th highest modeled concentrations for each year modeled.
h. Maximum of 5-year means (or a lesser averaging period if less than 5 years of meteorological data were used in the analyses) of maximum modeled concentrations for each year modeled.
i. Maximum of 6th highest modeled concentrations for a 5-year period (or the maximum of the 2nd highest modeled concentrations if only 1 year of meteorological data are modeled).
j. Maximum of 5-year means (or a lesser averaging period if less than 5 years of meteorological data were used in the analyses) of 4th highest modeled concentrations for each year modeled.
k. Maximum of 2nd highest modeled concentrations for each year modeled.

Table 12 provides results of Cumulative NAAQS Impact analyses with the airport closing.

Table 12. RESULTS FOR CUMULATIVE NAAQS IMPACT ANALYSES NO AIRPORT

Pollutant	Averaging Period	Modeled Design Concentration ($\mu g/m^3$)[a]	Background Concentration ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
$PM_{2.5}$[b]	24-hour	17.7[g]	13	30.7[g]	35
	Annual	5.4[h]	4.3	9.7[h]	12
PM_{10}[c]	24-hour	23.6[i]	73	96.6[i]	150
NO_2[d]	1-hour	160.4[g]	PVMRM2	160.4[g]	188
	Annual	12.9	5.83	18.73	100
SO_2[e]	1-hour	2.99[j]	3.93	6.92[j]	196
CO[f]	1-hour	N/A[k]	N/A	N/A[k]	40,000
	8-hour	N/A[k]	N/A	N/A[k]	10,000

a. Micrograms/cubic meter
b. Particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.
c. Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers.
d. Nitrogen dioxide.
e. Sulfur dioxide.
f. Carbon Monoxide.
g. Maximum of 5-year means (or a lesser averaging period if less than 5 years of meteorological data were used in the analyses) of 8th highest modeled concentrations for each year modeled.
h. Maximum of 5-year means (or a lesser averaging period if less than 5 years of meteorological data were used in the analyses) of maximum modeled concentrations for each year modeled.
i. Maximum of 6th highest modeled concentrations for a 5-year period (or the maximum of the 2nd highest modeled concentrations if only 1 year of meteorological data are modeled).
j. Maximum of 5-year means (or a lesser averaging period if less than 5 years of meteorological data were used in the analyses) of 4th highest modeled concentrations for each year modeled.
k. Maximum of 2nd highest modeled concentrations for each year modeled.

__X__Model input and output files for the cumulative NAAQS impact analyses are provided with the application.

_____If there were modeled NAAQS violations, all violations were analyzed and clearly show that the project did not significantly contribute to those modeled violations. If there were multiple violations at a given receptor, all cumulative impacts (including background) for the averaging period analyzed were

ranked along with the project contribution, and the project contributions were below the applicable SIL. A table was included to show all ranked impacts above the NAAQS along with the project contribution.

6.2 TAP Impact Analyses

Table 12 provides results for TAP impact analyses.

Table 12. RESULTS FOR TAP IMPACT ANALYSES

TAP	Averaging Period	Maximum Modeled Impact ($\mu g/m^3$)[a]	AAC or AACC ($\mu g/m^3$)
Arsenic	Annual	2.0E-05	2.3E-04
Cadmium	Annual	1.0E-04	5.6E-04
Formaldehyde	Annual	6.9E-03	7.7E-02
Nickel	Annual	1.9E-04	4.2E-03

[a] Micrograms/cubic meter.

7.0 Quality Assurance/Control

All modeling has been reviewed and expected to be accurate and complete. The results of all ambient modeling suggest that all emissions are compliant with NAAQS and applicable AACC.

Appendix F DEHYDRATOR OCTOBER 2015 SOURCE TEST

Gem State Processing, LLC

Source Test Report
Dehydrator Oven
Heyburn, Idaho
Test Dates: October 1st and 2nd, 2015
Project Number: 203705130

Stantec

Prepared for:
Gem State Processing, LLC.
951 Highway 30
Heyburn, Idaho 83336

Prepared by:
Stantec Consulting Services Inc.
1553 West Elna Rae, Suite 101
Tempe, Arizona 85281

December 2, 2015

CERTIFICATION

This certifies that the data collected and presented herein is true and accurate to the best of our knowledge. All attempts were made to collect and analyze the data within the applicable guidelines established by the United States Environmental Protection Agency.

Kathy Howard, for

Daniel Vandenberg, QSTI
Senior Environmental Technician
Test Team Leader

Jason Nockleby, QEP
Team Lead
Quality Assurance Supervisor

Table of Contents

1.0 INTRODUCTION 1.1
1.1 SOURCE DESCRIPTION 1.1
1.2 FACILITY AND TEST FIRM INFORMATION 1.1
1.3 TEST FIRM PROJECT SPECIFIC PERSONNEL 1.2

2.0 TEST CHRONOLOGY AND RESULTS SUMMARY 2.1
2.1 TEST CHRONOLOGY 2.1
2.2 TEST RESULTS 2.2

3.0 EMISSION UNIT INFORMATION 3.1
3.1 EMISSION UNIT DESCRIPTION 3.1
3.2 PROCESS EQUIPMENT INFORMATION MONITORED 3.1
3.3 EMISSION POINT INFORMATION 3.2

4.0 TESTING METHODS AND PROCEDURES 4.1
4.1 TESTING METHODS 4.1
4.2 SAMPLING EQUIPMENT DESCRIPTION 4.1
4.3 METHOD DESCRIPTIONS 4.3
4.3.1 EPA Method 1: Sampling and Velocity Traverses for Stationary Sources 4.3
4.3.2 EPA Method 2: Determination of Velocity and Volumetric Flow Rates 4.3
4.3.3 EPA Method 3: Determination of CO2, O2, and Dry Molecular Weight 4.3
4.3.4 EPA Method 4: Determination of Stack Gas Moisture Content 4.3
4.3.5 EPA Method 5/202: Determination of Total Particulate Emissions 4.3
4.4 METHOD DEVIATIONS & TEST ANOMALIES 4.4

5.0 QUALITY ASSURANCE / QUALITY CONTROL 5.1

LIST OF TABLES

Table 1 Emission/Control Units, Emission Specie and Emission Limits 1.1
Table 2 Facility and Test Firm Information 1.2
Table 3 Source Testing Chronology Unit 1 ..... 2.1
Table 4 Source Testing Chronology Unit 2 ..... 2.1
Table 5 Source Testing Chronology Unit 3 ..... 2.1
Table 6 Source Testing Chronology Unit 4 ..... 2.2
Table 7 Particulate Matter (PM_{10} / $PM_{2.5}$) Emissions Results – Unit 1 ..... 2.3
Table 8 Particulate Matter (PM_{10} / $PM_{2.5}$) Emissions Results – Unit 2 ..... 2.4
Table 9 Particulate Matter (PM_{10} / $PM_{2.5}$) Emissions Results – Unit 3 ..... 2.5
Table 10 Particulate Matter (PM_{10} / $PM_{2.5}$) Emissions Results – Unit 4 ..... 2.6
Table 11 Process Equipment Information 3.1
Table 12 Average Process Parameters 3.2
Table 13 Velocity and Sampling Traverse Point Locations – Unit 1 ..... 3.2
Table 14 Velocity and Sampling Traverse Point Locations – Unit 2 ..... 3.3
Table 15 Velocity and Sampling Traverse Point Locations – Unit 3 ..... 3.3
Table 16 Velocity and Sampling Traverse Point Locations – Unit 4 ..... 3.3
Table 17 Test Methods 4.1

LIST OF FIGURES

Figure 1 Sample Port Locations – Unit 1 ..... 3.4
Figure 2 Sample Port Locations – Unit 2 ..... 3.5
Figure 3 Sample Port Locations – Unit 3 ..... 3.6
Figure 4 Sample Port Locations – Unit 4 ..... 3.7
Figure 5 Schematic of EPA Methods 5/202 Sampling System 4.2

LIST OF APPENDICES

APPENDIX A TEST RESULTS A.1

APPENDIX B FIELD DATA SHEETS B.1

APPENDIX C LABORATORY RESULTS C.1

APPENDIX D PROCESS EQUIPMENT DATA D.1

APPENDIX E QUALITY ASSURANCE AND CALIBRATION DATA E.1

1.0 INTRODUCTION

Source emission testing was conducted by Stantec Consulting Services Inc. (Stantec) at the Gem State Processing, LLC (Gem State) facility located in Heyburn, Idaho. Testing was performed in order to determine emission factors for particulate matter less than 10 microns nominal aerodynamic diameter (PM_{10}) and particulate matter less than 2.5 microns nominal aerodynamic diameter ($PM_{2.5}$). The emission units and emission species that were tested during the engineering program are presented in Table 1.

Table 1 Emission/Control Units, Emission Specie and Emission Limits

EMISSION UNIT	EMISSION SPECIE	TEST METHODS
Wolverine Dehydrator (Four Separate Stacks)	PM_{10} / $PM_{2.5}$	EPA Methods 5 & 202

This report summarizes data from the test program conducted on October 1st and 2nd, 2015. Daniel Vandenberg, Greg Kendall, and Jesse Allegretto of Stantec conducted the testing. Mr. Vandenberg served as test team leader.

1.1 SOURCE DESCRIPTION

Gem State Processing produces dehydrated potato products. The plant consist of three boilers equipped with low-NO_X burners, two bubble sheet dryers, six drum dryers, one nuisance dust collector, and a material handling, conveying, and storage system. The bubble sheet dryers vent directly to the atmosphere. Each drum dryer has two exhaust stacks, one of which is controlled by a cyclone (snifter stack) and the second vents directly to the atmosphere. Emissions from the material handling, conveying, and storage system are controlled by 12 baghouses.

1.2 FACILITY AND TEST FIRM INFORMATION

Information on the facility location and firms involved with the emissions testing program is provided in Table 2.

Table 2 Facility and Test Firm Information

FACILITY	CONTACT
Gem State Processing, LLC 951 Highway 30 Heyburn, Idaho 83336	Mr. Bill Schow General Manager 208.631.1680 bschow@gemstateprocessing.com
TEST FIRM	**CONTACT**
Stantec Consulting Services Inc. 1553 West Elna Rae, Suite 101 Tempe, Arizona 85281	Jason Nockleby, QEP Team Lead 480.829.0457 jason.nockleby@stantec.com

1.3 TEST FIRM PROJECT SPECIFIC PERSONNEL

The following were the assignments for designated personnel.

Project Manager: Jason Nockleby served as Stantec's primary contact with facility personnel. Mr. Nockleby was also responsible for ensuring that field Quality Assurance/Quality Control (QA/QC) procedures were followed as well as for the final report review.

Test Team Leader: Daniel Vandenberg was in charge of testing activities. Mr. Vandenberg performed the initial velocity traverses and performed pre-test and post-test calibrations.

Support Staff: Greg Kendall and Jesse Allegretto provided assistance with the project. The support staff operated the EPA Method 4 and 5 sampling trains and conducted the volumetric flow rate traverses.

Laboratory Assistant: Brandon Holloway coordinated in-house laboratory operations. Mr. Holloway was responsible for glassware and reagent preparation as well as $PM_{10}/PM_{2.5}$ sample analysis.

2.0 TEST CHRONOLOGY AND RESULTS SUMMARY

2.1 TEST CHRONOLOGY

The chronology of tests that were conducted during the testing program is presented in Tables 3 through 6. The western most unit was labeled as Unit 1 while the eastern most unit was labeled as Unit 4.

Table 3 Source Testing Chronology Unit 1

DATE	TIME	TEST METHODS
10/01/2015	1558-1748	EPA Methods 1, 2, 4, 5, and 202 – Run 1
10/02/2015	0710-0858	EPA Methods 1, 2, 4, 5, and 202 – Run 2
10/02/2015	0903-1050	EPA Methods 1, 2, 4, 5, and 202 – Run 3

Table 4 Source Testing Chronology Unit 2

DATE	TIME	TEST METHODS
10/01/2015	1605-1810	EPA Methods 1, 2, 4, 5, and 202 – Run 1
10/02/2015	0711-0916	EPA Methods 1, 2, 4, 5, and 202 – Run 2
10/02/2015	0920-1125	EPA Methods 1, 2, 4, 5, and 202 – Run 3

Table 5 Source Testing Chronology Unit 3

DATE	TIME	TEST METHODS
10/01/2015	1625-1827	EPA Methods 1, 2, 4, 5, and 202 – Run 1
10/02/2015	0811-1017	EPA Methods 1, 2, 4, 5, and 202 – Run 2
10/02/2015	1019-1224	EPA Methods 1, 2, 4, 5, and 202 – Run 3

Table 6 Source Testing Chronology Unit 4

DATE	TIME	TEST METHODS
10/01/2015	1625-1834	EPA Methods 1, 2, 4, 5, and 202 – Run 1
10/02/2015	0729-0934	EPA Methods 1, 2, 4, 5, and 202 – Run 2
10/02/2015	0937-1142	EPA Methods 1, 2, 4, 5, and 202 – Run 3

2.2 TEST RESULTS

Summaries of results of the tests conducted during the engineering program are presented in Tables 7 through 10. Final test results are 3-run averages, rounded to two significant figures per convention. Complete test results are presented in Appendix A. Field data sheets are presented in Appendix B. Laboratory results are presented in Appendix C. Process data are presented in Appendix D. QA/QC data are presented in Appendix E.

Table 7 Particulate Matter (PM_{10} / $PM_{2.5}$) Emissions Results – Unit 1

PARAMETER	RUN 1	RUN 2	RUN 3	AVERAGE
Date	10/01/2015	10/02/2015	10/02/2015	
Time	1558-1748	0710-0858	0903-1050	
Process Rate (ton/hr)	1.16	0.989	0.886	1.0
STACK GAS PARAMETERS				
Average Temperature (°F)	177	179	180	179
Moisture Content (%)	5.03	3.93	4.18	4.4
Volumetric Flow Rate (dscfm)	5,754	5,710	5,709	5,724
FILTERABLE PM EMISSIONS (EPA Method 5)				
Mass Emission Rate (gr/dscf)	0.000147	0.000122	0.000101	0.00012
Mass Emission Rate (lb/hr)	0.00727	0.00598	0.00493	0.0061
CONDENSABLE PM EMISSIONS (EPA Method 202)				
Mass Emission Rate (gr/dscf)	0.00173	0.00145	0.00174	0.0016
Mass Emission Rate (lb/hr)	0.0852	0.0708	0.0854	0.080
FILTERABLE & CONDENSABLE PM EMISSIONS (EPA Method 5/202)				
PM_{10} / $PM_{2.5}$ Mass Emission Rate (lb/hr)	0.0925	0.0768	0.0903	0.087
PM_{10} / $PM_{2.5}$ Emission Factor (lb/ton)	0.797	.0776	0.102	0.086

Table 8 Particulate Matter (PM_{10} / $PM_{2.5}$) Emissions Results – Unit 2

PARAMETER	RUN 1	RUN 2	RUN 3	AVERAGE
Date	10/01/2015	10/02/2015	10/02/2015	
Time	1605-1810	0711-0916	0920-1125	
Process Rate (ton/hr)	1.16	0.974	0.886	1.0
STACK GAS PARAMETERS				
Average Temperature (°F)	168	171	180	173
Moisture Content (%)	8.45	8.97	8.24	8.6
Volumetric Flow Rate (dscfm)	7,215	6,626	6,591	6,811
FILTERABLE PM EMISSIONS (EPA Method 5)				
Mass Emission Rate (gr/dscf)	0.000164	0.000231	0.000151	0.00018
Mass Emission Rate (lb/hr)	0.0102	0.0131	0.00851	0.011
CONDENSABLE PM EMISSIONS (EPA Method 202)				
Mass Emission Rate (gr/dscf)	0.00185	0.00142	0.00183	0.0017
Mass Emission Rate (lb/hr)	0.114	0.0804	0.103	0.10
FILTERABLE & CONDENSABLE PM EMISSIONS (EPA Method 5/202)				
PM_{10} / $PM_{2.5}$ Mass Emission Rate (lb/hr)	0.124	0.0935	0.112	0.11
PM_{10} / $PM_{2.5}$ Emission Factor (lb/ton)	0.107	.0960	0.126	0.11

Table 9 Particulate Matter (PM_{10} / $PM_{2.5}$) Emissions Results – Unit 3

PARAMETER	RUN 1	RUN 2	RUN 3	AVERAGE
Date	10/01/2015	10/02/2015	10/02/2015	
Time	1625-1827	0811-1017	1019-1224	
Process Rate (ton/hr)	1.16	0.886	0.886	1.0
STACK GAS PARAMETERS				
Average Temperature (°F)	194	209	214	206
Moisture Content (%)	15.6	16.0	17.9	16
Volumetric Flow Rate (dscfm)	6,791	7,394	7,262	7,149
FILTERABLE PM EMISSIONS (EPA Method 5)				
Mass Emission Rate (gr/dscf)	0.000170	0.000150	0.000246	0.00019
Mass Emission Rate (lb/hr)	0.00990	0.00949	0.0153	0.012
CONDENSABLE PM EMISSIONS (EPA Method 202)				
Mass Emission Rate (gr/dscf)	0.00178	0.00156	0.00162	0.0017
Mass Emission Rate (lb/hr)	0.104	0.0987	0.101	0.10
FILTERABLE & CONDENSABLE PM EMISSIONS (EPA Method 5/202)				
PM_{10} / $PM_{2.5}$ Mass Emission Rate (lb/hr)	0.114	0.108	0.116	0.11
PM_{10} / $PM_{2.5}$ Emission Factor (lb/ton)	0.098	0.122	0.131	0.12

Table 10 Particulate Matter (PM_{10} / $PM_{2.5}$) Emissions Results – Unit 4

PARAMETER	RUN 1	RUN 2	RUN 3	AVERAGE
Date	10/01/2015	10/02/2015	10/02/2015	
Time	1625-1834	0729-0934	0937-1142	
Process Rate (ton/hr)	1.16	0.941	0.886	1.0
STACK GAS PARAMETERS				
Average Temperature (°F)	162	155	168	161
Moisture Content (%)	17.8	15.5	16.9	17
Volumetric Flow Rate (dscfm)	11,475	11,392	11,270	11,379
FILTERABLE PM EMISSIONS (EPA Method 5)				
Mass Emission Rate (gr/dscf)	0.000204	0.000103	0.000213	0.00017
Mass Emission Rate (lb/hr)	0.0201	0.0100	0.0205	0.017
CONDENSABLE PM EMISSIONS (EPA Method 202)				
Mass Emission Rate (gr/dscf)	0.00215	0.00232	0.00179	0.0021
Mass Emission Rate (lb/hr)	0.212	0.227	0.173	0.20
FILTERABLE & CONDENSABLE PM EMISSIONS (EPA Method 5/202)				
PM_{10} / $PM_{2.5}$ Mass Emission Rate (lb/hr)	0.232	0.237	0.193	0.22
PM_{10} / $PM_{2.5}$ Emission Factor (lb/ton)	0.200	0.252	0.218	0.22

3.0 EMISSION UNIT INFORMATION

3.1 EMISSION UNIT DESCRIPTION

The applicable emission unit information are presented in Table 11. Emissions from the multistage dryer are uncontrolled.

Table 11 Process Equipment Information

MANUFACTURER	MODEL	HEAT INPUT RATING	MAXIMUM PRODUCTION RATE
National	Maxon NP-1 (3-Stage) Dryer	Stage A (8 MMBtu/hr) Stage B (3.2 MMBtu/hr) Stage C (3.2 MMBtu/hr)	1,000 lb/hr

3.2 PROCESS EQUIPMENT INFORMATION MONITORED

The multistage dryer was operated under normal conditions during testing. Control equipment parameters monitored during the compliance tests are summarized in Table 12. Although the permit specifies that production and natural gas usage shall be recorded for each stage of the dryer, this information is only available for the dryer unit as a whole and not the individual stages. Plant process data are presented in Appendix D.

Table 12 Average Process Parameters

EQUIPMENT / RUN	TOTAL PRODUCTION (LBS)	TOTAL PRODUCTION RATE (TON/HR)	TOTAL NATURAL GAS USAGE (MSCF)
Unit 1 – Run 1	4,180	1.16	12.9
Unit 1 – Run 2	3,562	0.989	12.0
Unit 1 – Run 3	3,190	0.886	11.2
Unit 2 – Run 1	4,838	1.16	14.9
Unit 2 – Run 2	4,057	0.974	13.7
Unit 2 – Run 3	3,693	0.886	13.0
Unit 3 – Run 1	4,838	1.16	14.9
Unit 3 – Run 2	3,693	0.886	14.9
Unit 3 – Run 3	3,693	0.886	13.0
Unit 4 – Run 1	4,838	1.16	14.9
Unit 4 – Run 2	3,923	0.941	13.4
Unit 4 – Run 3	3,693	0.886	13.0

3.3 EMISSION POINT INFORMATION

The sample port locations and appropriate stack dimensions for the multistage dryer stacks are shown in Figures 1 through 4. The traverse point locations for the particulate traverse are provided in Tables 13 through 16.

Table 13 Velocity and Sampling Traverse Point Locations – Unit 1

(17.25" X 23.75" DUCT, 3 X 3 MATRIX, 20.0" EQUIVALENT DIAMETER)			
PORT	DISTANCE FROM STACK WALL (IN)	POINT	DISTANCE FROM STACK WALL (IN)
1	2.88	1	3.96
2	8.63	2	11.88
3	14.38	3	19.79

Table 14 Velocity and Sampling Traverse Point Locations – Unit 2

(31.5" X 23.5" DUCT, 5 X 5 MATRIX, 26.9" EQUIVALENT DIAMETER)			
PORT	DISTANCE FROM STACK WALL (IN)	POINT	DISTANCE FROM STACK WALL (IN)
1	3.15	1	2.35
2	9.45	2	7.05
3	15.75	3	11.75
4	22.05	4	16.45
5	28.35	5	21.15

Table 15 Velocity and Sampling Traverse Point Locations – Unit 3

(31.5" X 23.5" DUCT, 5 X 5 MATRIX, 26.92" EQUIVALENT DIAMETER)			
PORT	DISTANCE FROM STACK WALL (IN)	POINT	DISTANCE FROM STACK WALL (IN)
1	3.15	1	2.35
2	9.45	2	7.05
3	15.75	3	11.75
4	22.05	4	16.45
5	28.35	5	21.15

Table 16 Velocity and Sampling Traverse Point Locations – Unit 4

(36.75" X 24.25" DUCT, 5 X 5 MATRIX, 29.2" EQUIVALENT DIAMETER)			
PORT	DISTANCE FROM STACK WALL (IN)	POINT	DISTANCE FROM STACK WALL (IN)
1	3.68	1	2.43
2	11.03	2	7.28
3	18.38	3	12.13
4	25.73	4	16.98
5	33.08	5	21.83

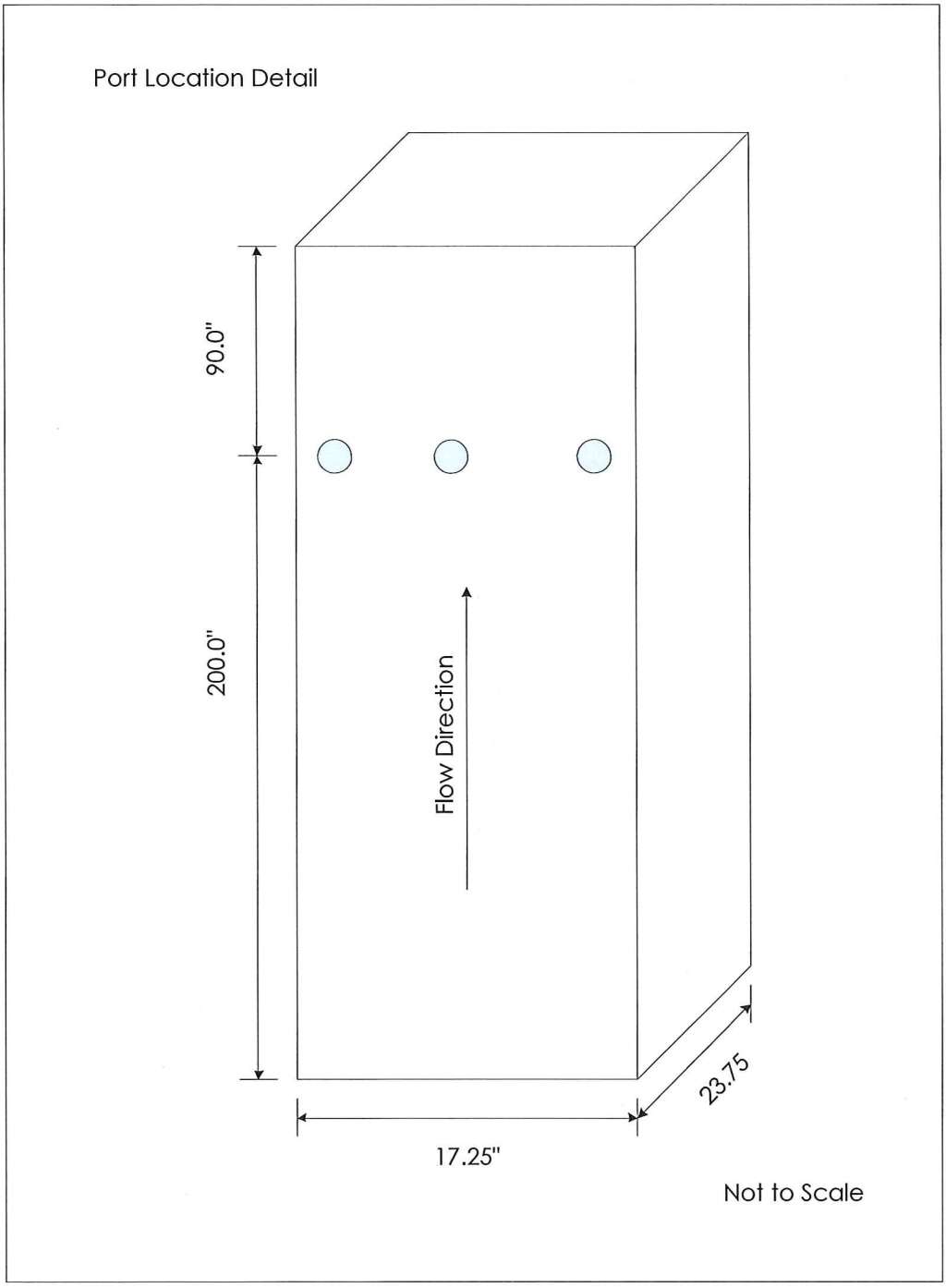


Figure 1 Sample Port Locations – Unit 1

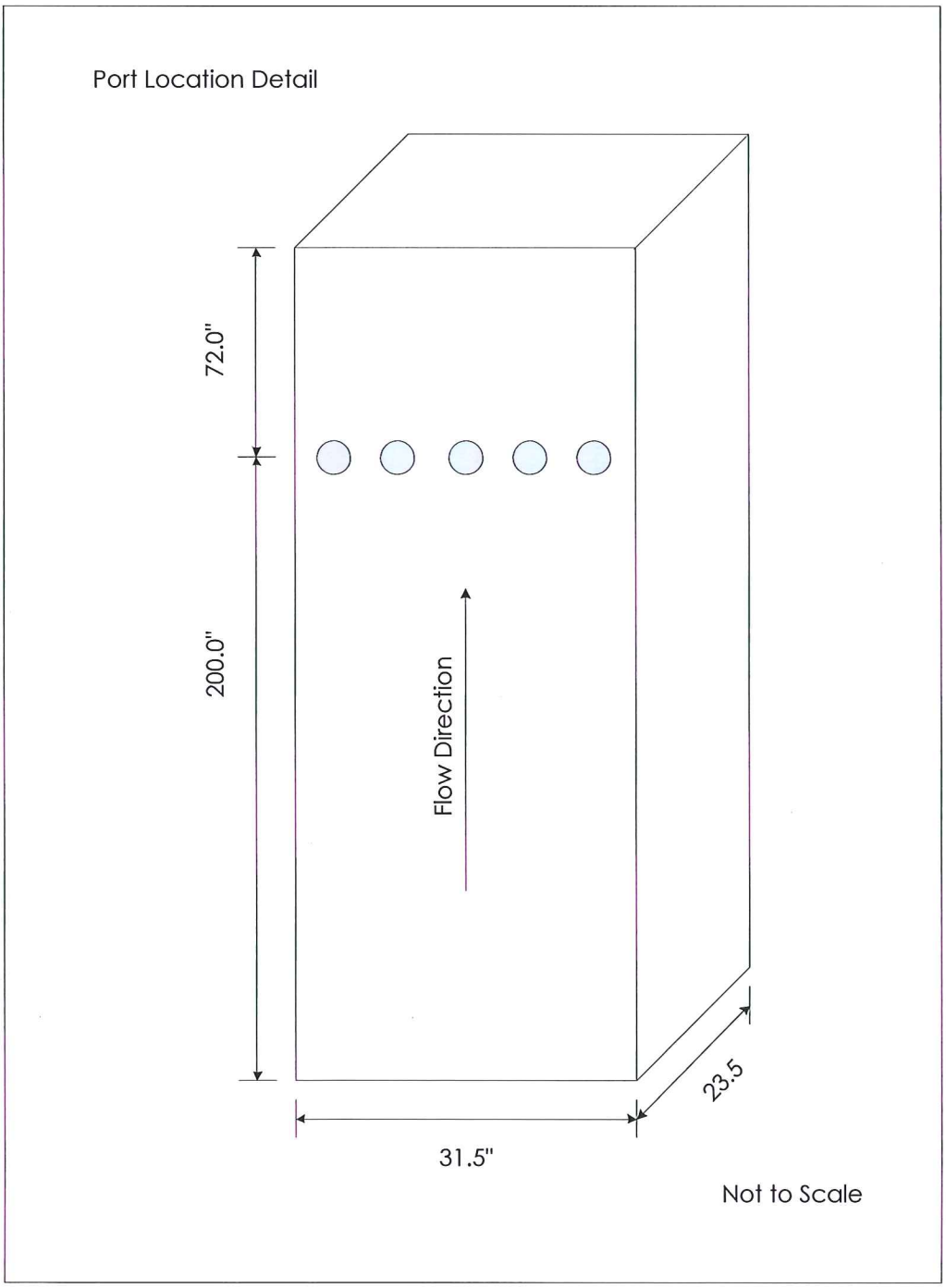


Figure 2 Sample Port Locations – Unit 2

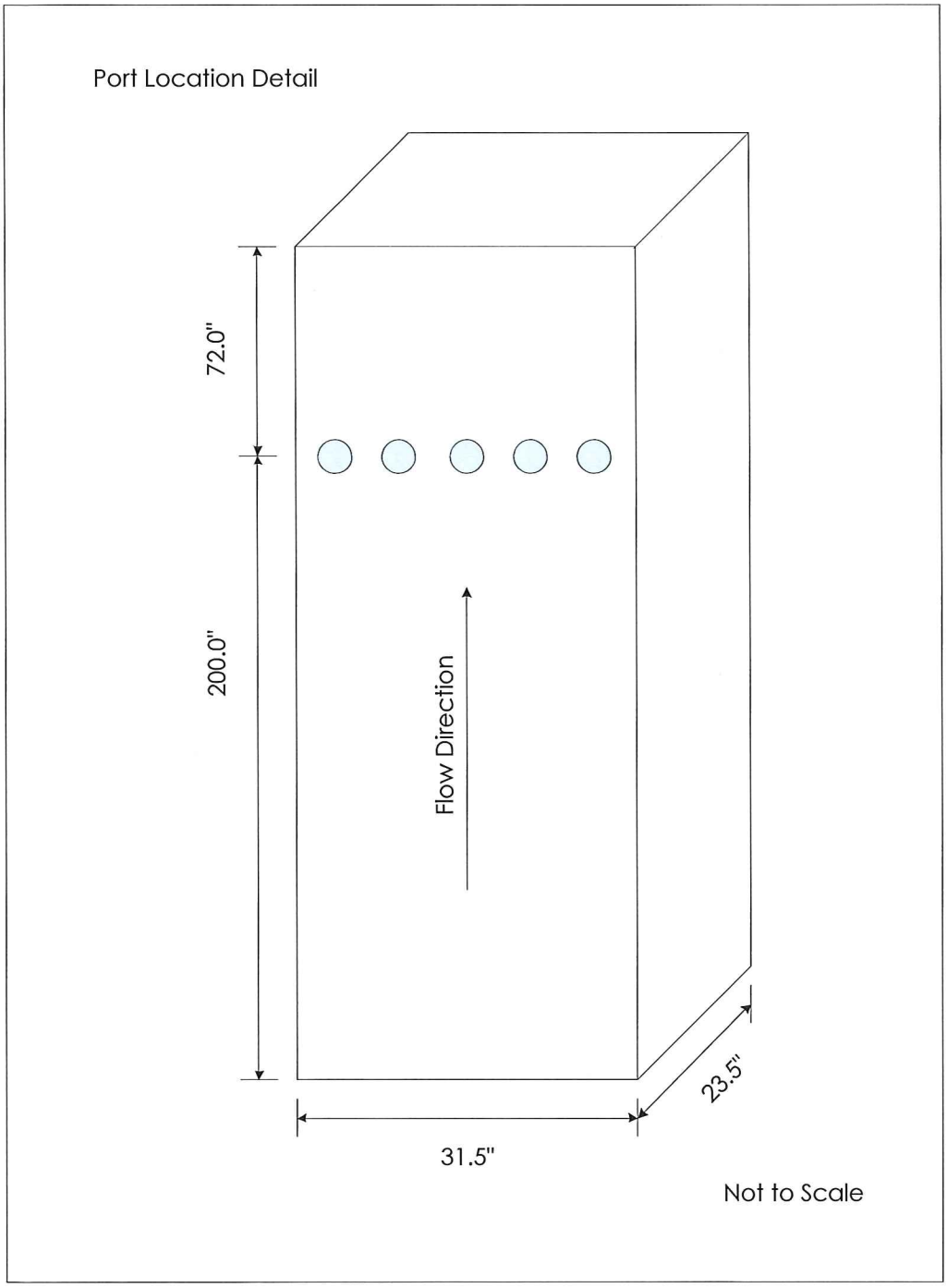


Figure 3 Sample Port Locations – Unit 3

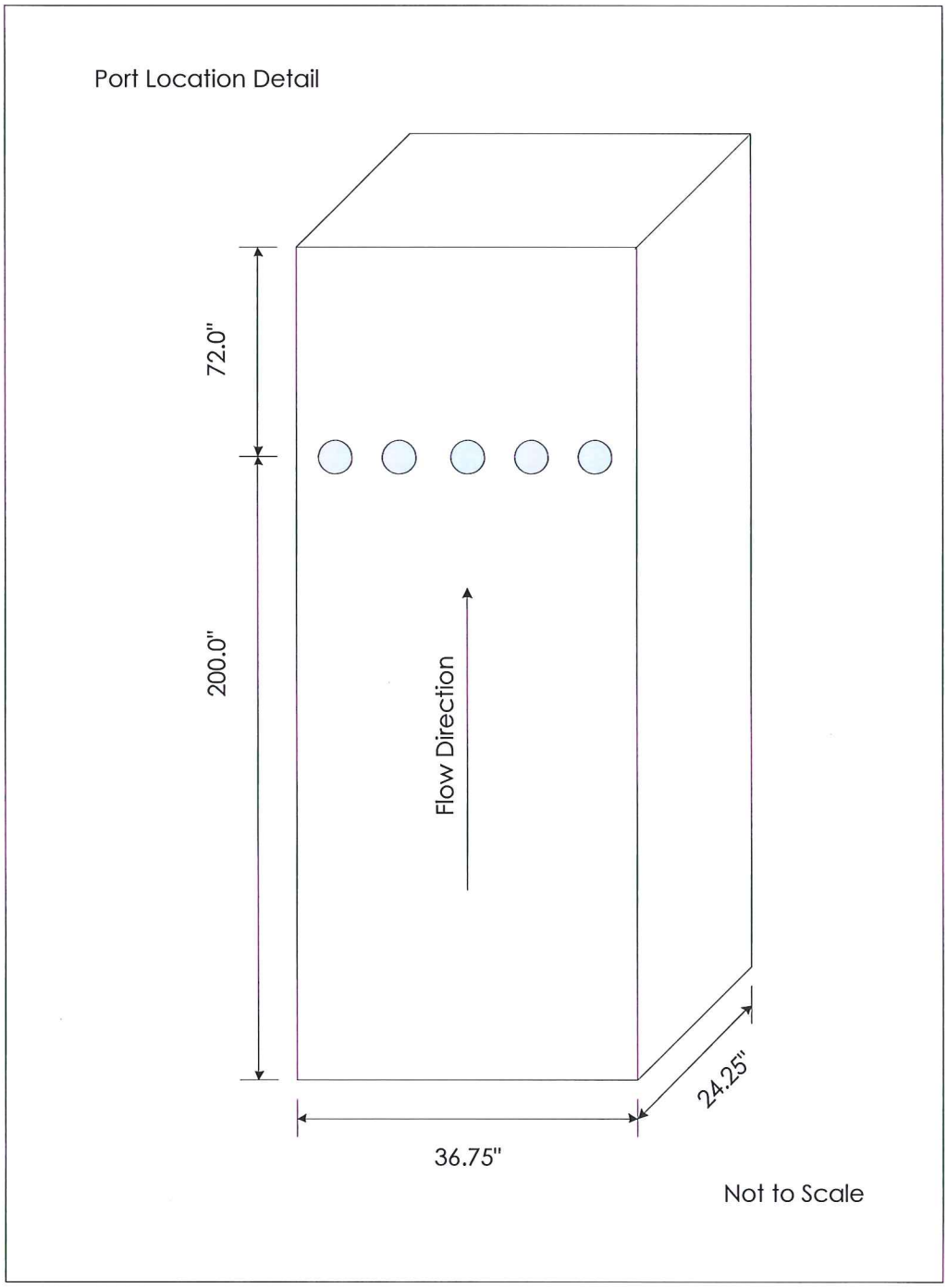


Figure 4 Sample Port Locations – Unit 4

4.0 TESTING METHODS AND PROCEDURES

4.1 TESTING METHODS

The test methods used for each emission unit and emission species are specified in Table 17. Unless deviations are specified in Section 4.4 below, tests conformed to the applicable methodologies specified in the appendices to 40 CFR Parts 51 and 60.

Particulate testing consisted of three reference method test runs performed on each emission unit. Stack emissions were calculated as the average of the three test runs. Each particulate test run was conducted for a minimum of 120 minutes and a minimum sample volume of 60 dry standard cubic feet (dscf) was collected.

Table 17 Test Methods

EMISSION SPECIES	TEST METHODS
Sample Site / Velocity Traverse Points	EPA Method 1
Volumetric Flow Rates	EPA Method 2
O_2 / CO_2	EPA Method 3
Stack Gas Moisture	EPA Method 4
PM_{10}	EPA Method 5 / 202

4.2 SAMPLING EQUIPMENT DESCRIPTION

Sampling trains for total particulate conformed to the guidelines specified in EPA Methods 5 and 202. The Method 5 sampling train employed Teflon® sampling nozzles and quartz probe liners. A diagram of this sampling train is presented in Figure 5.

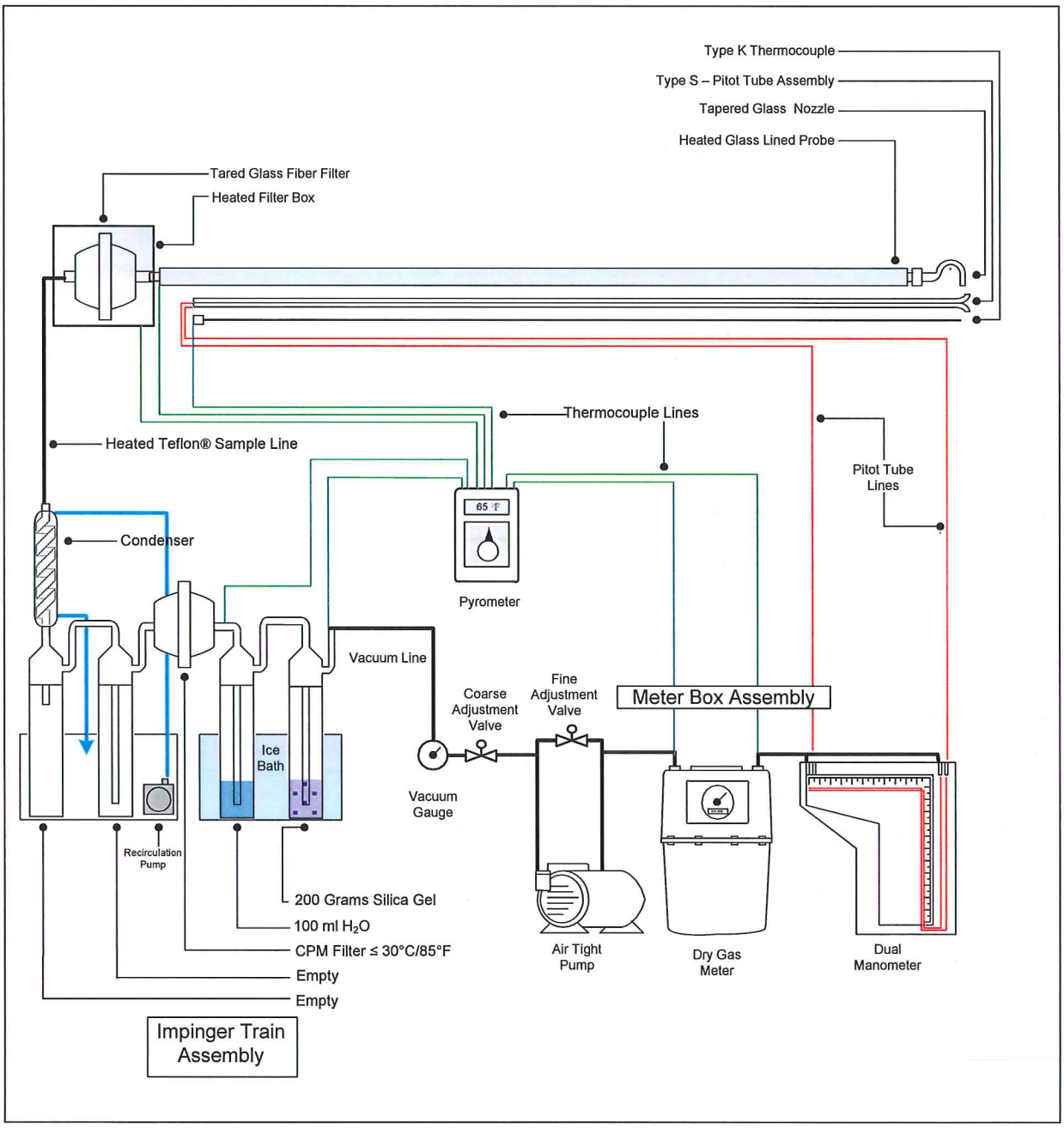


Figure 5 Schematic of EPA Methods 5/202 Sampling System

4.3 METHOD DESCRIPTIONS

This section is intended to provide an overview of the sampling strategy and does not attempt to summarize the sampling procedures, which are described in detail in the appendices to 40 CFR Part 60.

4.3.1 EPA Method 1: Sampling and Velocity Traverses for Stationary Sources

Prior to the source test, a site assessment was performed in order to locate sample points for obtaining the best representative measurements of pollution concentrations and volumetric flow rates. EPA Method 1 takes into account duct area, straight run and cyclonic or stratified flow patterns.

4.3.2 EPA Method 2: Determination of Velocity and Volumetric Flow Rates

Volumetric flow rates for the compliance testing were conducted per EPA Method 2. EPA Method 2 is used to determine stack gas velocity and volumetric flow rates. A calibrated type-S Pitot tube is connected to an inclined manometer and leak checked. Stack gas temperature and manometer displacement (ΔP) is recorded at each traverse point and a duct static pressure is measured and recorded. Stack gas velocity and volumetric flow rate is then calculated in accordance with EPA Method 2.

4.3.3 EPA Method 3: Determination of CO2, O2, and Dry Molecular Weight

Concurrent with each particulate sample run, an integrated gas sample was withdrawn through the sample train and collected into a Tedlar bag. The stack gas sample was analyzed with a Fyrite analyzer for fixed gas composition and determination of stack gas dry molecular weight.

4.3.4 EPA Method 4: Determination of Stack Gas Moisture Content

Stack gas moisture content was determined concurrently with the particulate matter test runs. Impinger weights were determined prior to and following sampling. Stack gas moisture content was determined from the mass of the water collected and the sample gas volume.

4.3.5 EPA Method 5/202: Determination of Total Particulate Emissions

Preliminary measurements were made prior to conducting the particulate test based on EPA Methods 1, 2, and 3. Percent water was based on previous test results. These preliminary results were used to determine an appropriate nozzle size for isokinetic sampling.

Stack gas samples were drawn isokinetically through a heated probe to a heated, tared filter where particulate matter was removed. The sample was drawn through a series of four impingers for collection of condensable particulate matter (CPM) and moisture determination. CPM was collected in the first two impingers of the sampling train, as well as on a CPM filter,

located between the second and third impingers. The contents of the condenser, first two impingers, and the front half of the CPM filter housing was extracted with water, acetone, and hexane and the organic and aqueous fractions were taken to dryness and the residues weighed. The total of both fractions represents the total CPM. The particulate mass collected on the CPM filter was extracted and combined with the organic and aqueous fractions.

4.4 METHOD DEVIATIONS & TEST ANOMALIES

The following deviation from standard methods was employed during testing:

- Stantec performed the post-test meter box calibrations based on the guidelines of EPA Alternative Method 009. The proposed calibration procedure is highly desirable for two reasons: (1) it eliminates questions about the possibility of damage to the metering system occurring during transport and (2) it eliminates travel costs for a retest if the metering system fails the post-test calibration.

5.0 QUALITY ASSURANCE / QUALITY CONTROL

Stantec ensures the quality and validity of its emission measurement and reporting procedures through a rigorous quality assurance program. Stantec utilizes an ISO 9001:2008 registered Quality Management System. Stantec performs, at a minimum, a quality review performed by the Project Manager or 'professional-of-record' and an independent review performed by an appropriately experienced professional who was not primarily responsible for the preparation of the test report.

Quality assurance procedures were performed in accordance with those listed in the appropriate test method and the *Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III*. The quality assurance procedures included, but were not limited to the following:

- Inspection of the type-S Pitot tube prior to and following use to confirm proper design criteria specified in EPA Method 2
- Calibration of the stack temperature sensor against an ASTM thermometer prior to sampling
- Leak checks of the sampling system after each sample run including the sample train, manometers and Pitot tube lines
- Calibration of the dry gas meter prior to and after sampling
- Inspection of the calibrated nozzle prior to and after each sample run to ensure its integrity
- Assurance that the probe and filter holder heaters operated properly
- Inspection of all glassware to ensure cleanliness and lack of contaminants
- Preparation and analysis of a full set of field blanks

APPENDIX A TEST RESULTS

Unit 1 Test Results

TEST DATA SUMMARY
EPA Method 5/202

Client: Gem State
Test Date: 1-Oct-15
Emissions Unit: Unit 1
Project No.: 203705130

RUN DATA

	Run 1	Run 2	Run 3	Averages
Test Date	1-Oct-15	2-Oct-15	2-Oct-15	
Start Time	3:58 PM	7:10 AM	9:03 AM	
Stop Time	5:48 PM	8:58 AM	10:50 AM	
Area of Stack (ft^2)	2.85	2.85	2.85	
Nozzle Diameter (in.)	0.250	0.250	0.250	
Nozzle Area (ft^2)	0.00034	0.00034	0.00034	
Pitot Tube Calibration Coefficient (C_p)	0.84	0.84	0.84	
Dry Gas Meter Calibration Factor (Y)	1.0190	1.0190	1.0190	
Dry Gas Meter Delta H@ ("H_2O)	2.0960	2.0960	2.0960	
Barometric Pressure ("Hg)	25.65	25.65	25.65	
Sampling Time (min)	108	108	108	108
Total Dry Gas Volume (dcf)	89.0	87.5	89.3	89
Corrected Dry Gas Meter Volume (dscf)	74.2	76.9	77.9	76
Dry Gas Meter Temperature (°F)	96.1	68.2	71.9	78.7
Dry Gas Meter Temperature (°R)	556.1	528.2	531.9	538.7
Average ΔH ("H_2O)	2.06	2.05	2.03	2.05
Isokinetic Variation (%)	99.7	104.1	105.5	103.1

STACK GAS VELOCITY AND VOLUMETRIC FLOW RATE (Method 2)

	Run 1	Run 2	Run 3	Averages
Average Stack Temperature (°F)	177	179	180	179
Average Stack Temperature (°R)	637	639	640	639
Stack Static Pressure ("H_2O)	0.50	0.50	0.50	0.50
Stack Gas Pressure ("Hg)	25.69	25.69	25.69	25.69
Average ΔP ("H_2O)	0.55	0.55	0.55	0.55
Average ΔP Square Root	0.74	0.74	0.74	0.74
Stack Gas Velocity (ft/sec)	49.87	49.07	49.31	49.42
Stack Gas Volumetric Flow Rate (acfm)	8,513	8,377	8,418	8,436
Stack Gas Volumetric Flow Rate (scfm)	6,059	5,943	5,958	5,987
Stack Gas Volumetric Flow Rate (dscfm)	5,754	5,710	5,709	5,724
Stack Gas Volumetric Flow Rate (dscfh)	345,225	342,590	342,554	343,456

TEST DATA SUMMARY
EPA Method 5/202

Client: Gem State
Test Date: 1-Oct-15
Emissions Unit: Unit 1
Project No.: 203705130

STACK GAS MOLECULAR WEIGHT (Method 3)

	Run 1	Run 2	Run 3	Averages
Net Volume of O_2 (%)	19.4	19.4	19.4	19.4
Net volume of CO_2 (%)	0.30	0.40	0.30	0.33
Net Volume of N_2 and CO (%)	80.3	80.2	80.3	80.3
Molecular Weight, Dry (lb/lb-mole)	28.82	29.69	29.62	29.38
Molecular Weight, Wet (lb/lb-mole)	28.28	29.23	29.14	28.88

STACK GAS MOISTURE CONTENT (Method 4)

	Run 1	Run 2	Run 3	Averages
Total Water Collected (g)	133.6	116.8	122.1	124.2
Volume of Rinse (ml)	50.1	50.0	50.0	50.0
Net Volume of Water Collected (ml)	83.5	66.8	72.1	74.1
Corrected Volume of Water Collected (scf)	2.527	2.094	1.784	2.135
Water Vapor (B_{WS})	0.0503	0.0393	0.0418	0.0438
Moisture Factor (1- B_{WS})	0.9497	0.9607	0.9582	0.9562
Stack Moisture (%)	5.03	3.93	4.18	4.4

PARTICULATE DATA SUMMARY

Client: Gem State
Test Date: 01-Oct-15
Emissions Unit: Unit 1
Project No.: 203705130

EPA Method 5 Test Results

	Run 1	Run 2	Run 3	Averages
Test Date	1-Oct-15	2-Oct-15	2-Oct-15	
Start Time	3:58 PM	7:10 AM	9:03 AM	
End Time	5:48 PM	8:58 AM	10:50 AM	
Corrected DGM (dscf)	74.193	76.873	77.880	76.316
Stack Flow Rate (dscfm)	5,754	5,710	5,709	5,724

Filterable Particulate Laboratory Results (Method 5)

	Run 1	Run 2	Run 3	Averages
Filter Net Mass Gain (g)	0.0007	0.0007	0.0006	0.0007
Net Mass of Filter Blank (g)	0.0004	0.0004	0.0004	0.0004
Total Filter Mass (g)	0.0007	0.0007	0.0006	0.0007
Probe & Nozzle Acetone Rinse Net Mass (g)	0.0008	0.0007	0.0007	0.0007
Probe & Nozzle Acetone Rinse Volume (ml)	100	100	100	100
Probe & Nozzle Acetone Rinse Blank Net Mass (g)	0.0012	0.0012	0.0012	0.0012
Probe & Nozzle Acetone Rinse Blank Volume (ml)	25	25	25	25
Acetone Density (g/ml)	0.79	0.79	0.79	0.79
Probe & Nozzle Rinse Acetone Blank Concentration (g/g)	6.08E-05	6.08E-05	6.08E-05	0.0000608
Probe & Nozzle Acetone Rinse Blank Mass (g)	0.004800	0.004800	0.004800	0.00480
Maximum Acetone Rinse Blank Mass (g)	0.000790	0.000790	0.000790	0.00079
Probe & Nozzle Acetone Rinse Mass (g)	0.000010	-0.000090	-0.000090	-0.00006
Filter, Probe, & Nozzle Acetone Rinse Mass (g)	0.00071	0.000610	0.000510	0.00061
Filter, Probe, & Nozzle Acetone Rinse Mass (mg)	0.71	0.610	0.510	0.61

Filterable Particulate Concentrations and Emission Rates (Method 5)

	Run 1	Run 2	Run 3	Averages
Total Filterable Particulate Concentration (mg/dscf)	0.0096	0.0079	0.00655	0.008
Total Filterable Particulate Concentration (gr/dscf)	0.000147	0.000122	0.000101	0.00012
Total Filterable Particulate Emission Rate (lb/hr)	0.00727	0.00598	0.00493	0.0061

PARTICULATE DATA SUMMARY

Client: Gem State
Test Date: 01-Oct-15
Emissions Unit: Unit 1
Project No.: 203705130

Field Train Recovery Blank (Method 202)

	Run 1	Run 2	Run 3	Averages
Inorganic Fraction Blank Net Mass (g)	0.0013	0.0013	0.0013	0.0013
Organic Fraction Blank Net Mass (g)	0.0006	0.0006	0.0006	0.0006
Field Train Recovery Blank Net Mass (g)	0.0019	0.0019	0.0019	0.0019
Field Train Recovery Blank Net Mass (mg)	1.9	1.9	1.9	1.9
Maximum Field Train Recovery Blank Net Mass (mg)	2.0	2.0	2.0	2.0
Field Train Recovery Blank Net Mass Used (g)	0.0019	0.0019	0.0019	0.0

Total Condensable Particulate Matter (Method 202)

	Run 1	Run 2	Run 3	Averages
Mass of Dried Sample, Inorganic (g)	0.0005	0.0013	0.0011	0.0010
Mass of Dried Sample, Inorganic (mg)	0.50	1.30	1.10	1.0
Mass of Dried Sample, Organic (g)	0.0097	0.0078	0.0096	0.0090
Mass of Dried Sample, Organic (mg)	9.700	7.80	9.60	9.0
Total Mass of CPM (g)	0.00830	0.00720	0.00880	0.0081
Total Mass of CPM (mg)	8.30	7.20	8.80	8.1

Total Condensable Particulate Matter Concentrations and Emission Rates (Method 202)

	Run 1	Run 2	Run 3	Averages
Total CPM Concentration (mg/dscf)	0.112	0.0937	0.113	0.11
Total CPM Concentration (gr/dscf)	0.00173	0.00145	0.00174	0.0016
Total CPM Concentration (lb/hr)	0.0852	0.0708	0.0854	0.080

Filterable and Condensable Concentrations and Emission Rates

	Run 1	Run 2	Run 3	Averages
Particulate Mass (g)	0.00901	0.00781	0.00931	0.0087
Particulate Mass (mg)	9.01	7.81	9.31	8.7
Particulate Concentration (mg/dscf)	0.121	0.102	0.120	0.11
Particulate Concentration (gr/dscf)	0.00187	0.00157	0.00184	0.0018
Particulate Concentration (lb/hr)	0.0925	0.0768	0.0903	0.087

Unit 2 Test Results

TEST DATA SUMMARY
EPA Method 5/202

Client: Gem State
Test Date: 1-Oct-15
Emissions Unit: Unit 2
Project No.: 203705130

RUN DATA

	Run 1	Run 2	Run 3	Averages
Test Date	1-Oct-15	2-Oct-15	2-Oct-15	
Start Time	4:05 PM	7:11 AM	9:20 AM	
Stop Time	6:10 PM	9:16 AM	11:25 AM	
Area of Stack (ft^2)	5.14	5.14	5.14	
Nozzle Diameter (in.)	0.300	0.300	0.300	
Nozzle Area (ft^2)	0.00049	0.00049	0.00049	
Pitot Tube Calibration Coefficient (C_p)	0.84	0.84	0.84	
Dry Gas Meter Callbration Factor (Y)	0.9760	0.9760	0.9760	
Dry Gas Meter Delta H@ ("H_2O)	1.9650	1.9650	1.9650	
Barometric Pressure ("Hg)	25.40	25.40	25.40	
Sampling Time (min)	125	125	125	125
Total Dry Gas Volume (dcf)	108.9	97.3	100.5	102
Corrected Dry Gas Meter Volume (dscf)	85.3	80.7	82.8	83
Dry Gas Meter Temperature (°F)	102.0	69.9	74.1	82.0
Dry Gas Meter Temperature (°R)	562.0	529.9	534.1	542.0
Average ΔH ("H_2O)	2.22	1.90	1.89	2.00
Isokinetic Variation (%)	99.0	102.1	105.2	102.1

STACK GAS VELOCITY AND VOLUMETRIC FLOW RATE (Method 2)

	Run 1	Run 2	Run 3	Averages
Average Stack Temperature (°F)	168	171	180	173
Average Stack Temperature (°R)	628	631	640	633
Stack Static Pressure ("H_2O)	0.50	0.50	0.50	0.50
Stack Gas Pressure ("Hg)	25.44	25.44	25.44	25.44
Average ΔP ("H_2O)	0.29	0.25	0.24	0.26
Average ΔP Square Root	0.53	0.50	0.49	0.51
Stack Gas Velocity (ft/sec)	35.75	33.20	33.19	34.05
Stack Gas Volumetric Flow Rate (acfm)	11,026	10,240	10,237	10,501
Stack Gas Volumetric Flow Rate (scfm)	7,881	7,280	7,183	7,448
Stack Gas Volumetric Flow Rate (dscfm)	7,215	6,626	6,591	6,811
Stack Gas Volumetric Flow Rate (dscfh)	432,901	397,584	395,431	408,639

TEST DATA SUMMARY
EPA Method 5/202

Client: Gem State
Test Date: 1-Oct-15
Emissions Unit: Unit 2
Project No.: 203705130

STACK GAS MOLECULAR WEIGHT (Method 3)

	Run 1	Run 2	Run 3	Averages
Net Volume of O_2 (%)	19.4	19.4	19.4	19.4
Net volume of CO_2 (%)	0.30	0.30	0.30	0.30
Net Volume of N_2 and CO (%)	80.3	80.3	80.3	80.3
Molecular Weight, Dry (lb/lb-mole)	28.82	29.65	29.62	29.37
Molecular Weight, Wet (lb/lb-mole)	27.91	28.60	28.66	28.39

STACK GAS MOISTURE CONTENT (Method 4)

	Run 1	Run 2	Run 3	Averages
Total Water Collected (g)	216.1	219.3	208.0	214.5
Volume of Rinse (ml)	48.9	50.3	50.1	49.8
Net Volume of Water Collected (ml)	167.2	169.0	157.9	164.7
Corrected Volume of Water Collected (scf)	6.603	6.828	5.548	6.326
Water Vapor (B_{WS})	0.0845	0.0897	0.0824	0.0856
Moisture Factor (1- B_{WS})	0.9155	0.9103	0.9176	0.9144
Stack Moisture (%)	8.45	8.97	8.24	8.6

PARTICULATE DATA SUMMARY

Client: Gem State
Test Date: 01-Oct-15
Emissions Unit: Unit 2
Project No.: 203705130

EPA Method 5 Test Results

	Run 1	Run 2	Run 3	Averages
Test Date	1-Oct-15	2-Oct-15	2-Oct-15	
Start Time	4:05 PM	7:11 AM	9:20 AM	
End Time	6:10 PM	9:16 AM	11:25 AM	
Corrected DGM (dscf)	85.263	80.700	82.754	82.906
Stack Flow Rate (dscfm)	7,215	6,626	6,591	6,811

Filterable Particulate Laboratory Results (Method 5)

	Run 1	Run 2	Run 3	Averages
Filter Net Mass Gain (g)	0.0008	0.0009	0.0010	0.0009
Net Mass of Filter Blank (g)	0.0004	0.0004	0.0004	0.0004
Total Filter Mass (g)	0.0008	0.0009	0.0010	0.0009
Probe & Nozzle Acetone Rinse Net Mass (g)	0.0009	0.0011	0.0006	0.0009
Probe & Nozzle Acetone Rinse Volume (ml)	100	100	100	100
Probe & Nozzle Acetone Rinse Blank Net Mass (g)	0.0012	0.0012	0.0012	0.0012
Probe & Nozzle Acetone Rinse Blank Volume (ml)	25	25	25	25
Acetone Density (g/ml)	0.79	0.79	0.79	0.79
Probe & Nozzle Rinse Acetone Blank Concentration (g/g)	0.0001	0.0001	0.0001	0.0001
Probe & Nozzle Acetone Rinse Blank Mass (g)	0.0048	0.0048	0.0048	0.0048
Maximum Acetone Rinse Blank Mass (g)	0.0008	0.0008	0.0008	0.0008
Probe & Nozzle Acetone Rinse Mass (g)	0.0001	0.0003	-0.0002	0.0001
Filter, Probe, & Nozzle Acetone Rinse Mass (g)	0.0009	0.0012	0.0008	0.0010
Filter, Probe, & Nozzle Acetone Rinse Mass (mg)	0.9	1.2	0.8	1.0

Filterable Particulate Concentrations and Emission Rates (Method 5)

	Run 1	Run 2	Run 3	Averages
Total Filterable Particulate Concentration (mg/dscf)	0.0107	0.0150	0.00979	0.012
Total Filterable Particulate Concentration (gr/dscf)	0.000164	0.000231	0.000151	0.00018
Total Filterable Particulate Emission Rate (lb/hr)	0.0102	0.0131	0.00851	0.011

PARTICULATE DATA SUMMARY

Client: Gem State
Test Date: 01-Oct-15
Emissions Unit: Unit 2
Project No.: 203705130

Field Train Recovery Blank (Method 202)

	Run 1	Run 2	Run 3	Averages
Inorganic Fraction Blank Net Mass (g)	0.0013	0.0013	0.0013	0.0013
Organic Fraction Blank Net Mass (g)	0.0006	0.0006	0.0006	0.0006
Field Train Recovery Blank Net Mass (g)	0.0019	0.0019	0.0019	0.0019
Field Train Recovery Blank Net Mass (mg)	1.9	1.9	1.9	1.9
Maximum Field Train Recovery Blank Net Mass (mg)	2.0	2.0	2.0	2.0
Field Train Recovery Blank Net Mass Used (g)	0.0019	0.0019	0.0019	0.0

Total Condensable Particulate Matter (Method 202)

	Run 1	Run 2	Run 3	Averages
Mass of Dried Sample, Inorganic (g)	0.0031	0.0009	0.0019	0.0020
Mass of Dried Sample, Inorganic (mg)	3.10	0.90	1.90	2.0
Mass of Dried Sample, Organic (g)	0.0090	0.0084	0.0098	0.0091
Mass of Dried Sample, Organic (mg)	9.000	8.40	9.80	9.1
Total Mass of CPM (g)	0.01020	0.00740	0.00980	0.0091
Total Mass of CPM (mg)	10.20	7.40	9.80	9.1

Total Condensable Particulate Matter Concentrations and Emission Rates (Method 202)

	Run 1	Run 2	Run 3	Averages
Total CPM Concentration (mg/dscf)	0.1196	0.0917	0.1184	0.110
Total CPM Concentration (gr/dscf)	0.00185	0.00142	0.00183	0.0017
Total CPM Concentration (lb/hr)	0.114	0.0804	0.103	0.10

Filterable and Condensable Concentrations and Emission Rates

	Run 1	Run 2	Run 3	Averages
Particulate Mass (g)	0.01111	0.00861	0.01061	0.0101
Particulate Mass (mg)	11.11	8.61	10.61	10.1
Particulate Concentration (mg/dscf)	0.130	0.107	0.128	0.12
Particulate Concentration (gr/dscf)	0.00201	0.00165	0.00198	0.0019
Particulate Concentration (lb/hr)	0.124	0.0935	0.112	0.11

Unit 3 Test Results

TEST DATA SUMMARY
EPA Method 5/202

Client: Gem State
Test Date: 1-Oct-15
Emissions Unit: Unit 3
Project No.: 203705130

RUN DATA

	Run 1	Run 2	Run 3	Averages
Test Date	1-Oct-15	2-Oct-15	2-Oct-15	
Start Time	4:25 PM	8:11 AM	10:19 AM	
Stop Time	6:27 PM	10:17 AM	12:24 PM	
Area of Stack (ft^2)	5.14	5.14	5.14	
Nozzle Diameter (in.)	0.275	0.275	0.275	
Nozzle Area (ft^2)	0.00041	0.00041	0.00041	
Pitot Tube Calibration Coefficient (C_p)	0.84	0.84	0.84	
Dry Gas Meter Calibration Factor (Y)	1.0140	1.0140	1.0140	
Dry Gas Meter Delta H@ ("H_2O)	2.0480	2.0480	2.0480	
Barometric Pressure ("Hg)	25.40	25.40	25.40	
Sampling Time (min)	125	125	125	125
Total Dry Gas Volume (dcf)	100.0	95.8	94.9	97
Corrected Dry Gas Meter Volume (dscf)	82.4	83.3	82.1	83
Dry Gas Meter Temperature (°F)	94.3	65.5	68.1	76.0
Dry Gas Meter Temperature (°R)	554.3	525.5	528.1	536.0
Average ΔH ("H_2O)	1.65	1.99	2.05	1.90
Isokinetic Variation (%)	121.0	112.3	112.8	115.4

STACK GAS VELOCITY AND VOLUMETRIC FLOW RATE (Method 2)

	Run 1	Run 2	Run 3	Averages
Average Stack Temperature (°F)	194	209	214	206
Average Stack Temperature (°R)	654	669	674	666
Stack Static Pressure ("H_2O)	1.90	1.90	1.90	1.90
Stack Gas Pressure ("Hg)	25.54	25.54	25.54	25.54
Average ΔP ("H_2O)	0.30	0.37	0.37	0.35
Average ΔP Square Root	0.54	0.61	0.61	0.59
Stack Gas Velocity (ft/sec)	37.84	42.36	42.89	41.03
Stack Gas Volumetric Flow Rate (acfm)	11,670	13,065	13,229	12,655
Stack Gas Volumetric Flow Rate (scfm)	8,046	8,798	8,846	8,563
Stack Gas Volumetric Flow Rate (dscfm)	6,791	7,394	7,262	7,149
Stack Gas Volumetric Flow Rate (dscfh)	407,437	443,625	435,722	428,928

TEST DATA SUMMARY
EPA Method 5/202

Client: Gem State
Test Date: 1-Oct-15
Emissions Unit: Unit 3
Project No.: 203705130

STACK GAS MOLECULAR WEIGHT (Method 3)

	Run 1	Run 2	Run 3	Averages
Net Volume of O_2 (%)	19.4	19.4	19.4	19.4
Net volume of CO_2 (%)	0.30	0.30	0.30	0.30
Net Volume of N_2 and CO (%)	80.3	80.3	80.3	80.3
Molecular Weight, Dry (lb/lb-mole)	28.82	29.65	29.62	29.37
Molecular Weight, Wet (lb/lb-mole)	27.14	27.79	27.54	27.49

STACK GAS MOISTURE CONTENT (Method 4)

	Run 1	Run 2	Run 3	Averages
Total Water Collected (g)	373.2	385.9	431.8	397.0
Volume of Rinse (ml)	49.7	50.0	51.3	50.3
Net Volume of Water Collected (ml)	323.5	335.9	380.5	346.6
Corrected Volume of Water Collected (scf)	14.236	14.847	16.815	15.299
Water Vapor (B_{WS})	0.1560	0.1596	0.1791	0.1649
Moisture Factor (1- B_{WS})	0.8440	0.8404	0.8209	0.8351
Stack Moisture (%)	15.6	16.0	17.9	16

PARTICULATE DATA SUMMARY

Client: Gem State
Test Date: 01-Oct-15
Emissions Unit: Unit 3
Project No.: 203705130

EPA Method 5 Test Results

	Run 1	Run 2	Run 3	Averages
Test Date	1-Oct-15	2-Oct-15	2-Oct-15	
Start Time	4:25 PM	8:11 AM	10:19 AM	
End Time	6:27 PM	10:17 AM	12:24 PM	
Corrected DGM (dscf)	82.389	83.261	82.108	82.586
Stack Flow Rate (dscfm)	6,791	7,394	7,262	7,149

Filterable Particulate Laboratory Results (Method 5)

	Run 1	Run 2	Run 3	Averages
Filter Net Mass Gain (g)	0.0005	0.0005	0.0007	0.0006
Net Mass of Filter Blank (g)	0.0004	0.0004	0.0004	0.0004
Total Filter Mass (g)	0.0005	0.0005	0.0007	0.0006
Probe & Nozzle Acetone Rinse Net Mass (g)	0.0012	0.0011	0.0014	0.0012
Probe & Nozzle Acetone Rinse Volume (ml)	100	100	100	100
Probe & Nozzle Acetone Rinse Blank Net Mass (g)	0.0012	0.0012	0.0012	0.0012
Probe & Nozzle Acetone Rinse Blank Volume (ml)	25	25	25	25
Acetone Density (g/ml)	0.79	0.79	0.79	0.79
Probe & Nozzle Rinse Acetone Blank Concentration (g/g)	0.0001	0.0001	0.0001	0.0001
Probe & Nozzle Acetone Rinse Blank Mass (g)	0.0048	0.0048	0.0048	0.0048
Maximum Acetone Rinse Blank Mass (g)	0.0008	0.0008	0.0008	0.0008
Probe & Nozzle Acetone Rinse Mass (g)	0.0004	0.0003	0.0006	0.0004
Filter, Probe, & Nozzle Acetone Rinse Mass (g)	0.0009	0.0008	0.0013	0.0010
Filter, Probe, & Nozzle Acetone Rinse Mass (mg)	0.9	0.8	1.3	1.0

Filterable Particulate Concentrations and Emission Rates (Method 5)

	Run 1	Run 2	Run 3	Averages
Total Filterable Particulate Concentration (mg/dscf)	0.0110	0.0097	0.01595	0.012
Total Filterable Particulate Concentration (gr/dscf)	0.000170	0.000150	0.000246	0.00019
Total Filterable Particulate Emission Rate (lb/hr)	0.00990	0.00949	0.0153	0.012

PARTICULATE DATA SUMMARY

Client: Gem State
Test Date: 01-Oct-15
Emissions Unit: Unit 3
Project No.: 203705130

Field Train Recovery Blank (Method 202)

	Run 1	Run 2	Run 3	Averages
Inorganic Fraction Blank Net Mass (g)	0.0013	0.0013	0.0013	0.0013
Organic Fraction Blank Net Mass (g)	0.0006	0.0006	0.0006	0.0006
Field Train Recovery Blank Net Mass (g)	0.0019	0.0019	0.0019	0.0019
Field Train Recovery Blank Net Mass (mg)	1.9	1.9	1.9	1.9
Maximum Field Train Recovery Blank Net Mass (mg)	2.0	2.0	2.0	2.0
Field Train Recovery Blank Net Mass Used (g)	0.0019	0.0019	0.0019	0.0

Total Condensable Particulate Matter (Method 202)

	Run 1	Run 2	Run 3	Averages
Mass of Dried Sample, Inorganic (g)	0.0013	0.0014	0.0004	0.0010
Mass of Dried Sample, Inorganic (mg)	1.30	1.40	0.40	1.0
Mass of Dried Sample, Organic (g)	0.0101	0.0089	0.0101	0.0097
Mass of Dried Sample, Organic (mg)	10.100	8.90	10.10	9.7
Total Mass of CPM (g)	0.00950	0.00840	0.00860	0.0088
Total Mass of CPM (mg)	9.50	8.40	8.60	8.8

Total Condensable Particulate Matter Concentrations and Emission Rates (Method 202)

	Run 1	Run 2	Run 3	Averages
Total CPM Concentration (mg/dscf)	0.1153	0.1009	0.1047	0.107
Total CPM Concentration (gr/dscf)	0.00178	0.00156	0.00162	0.0017
Total CPM Concentration (lb/hr)	0.104	0.0987	0.101	0.10

Filterable and Condensable Concentrations and Emission Rates

	Run 1	Run 2	Run 3	Averages
Particulate Mass (g)	0.01041	0.00921	0.00991	0.0098
Particulate Mass (mg)	10.41	9.21	9.91	9.8
Particulate Concentration (mg/dscf)	0.126	0.111	0.121	0.12
Particulate Concentration (gr/dscf)	0.00195	0.00171	0.00186	0.0018
Particulate Concentration (lb/hr)	0.114	0.108	0.116	0.11

Unit 4 Test Results

TEST DATA SUMMARY
EPA Method 5/202

Client: Gem State
Test Date: 1-Oct-15
Emissions Unit: Unit 4
Project No.: 203705130

RUN DATA

	Run 1	Run 2	Run 3	Averages
Test Date	1-Oct-15	2-Oct-15	2-Oct-15	
Start Time	4:25 PM	7:29 AM	9:37 AM	
Stop Time	6:34 PM	9:34 AM	11:42 AM	
Area of Stack (ft^2)	6.19	6.19	6.19	
Nozzle Diameter (in.)	0.250	0.250	0.250	
Nozzle Area (ft^2)	0.00034	0.00034	0.00034	
Pitot Tube Calibration Coefficient (C_p)	0.84	0.84	0.84	
Dry Gas Meter Calibration Factor (Y)	0.9900	0.9900	0.9900	
Dry Gas Meter Delta H@ ("H_2O)	1.7350	1.7350	1.7350	
Barometric Pressure ("Hg)	25.40	25.40	25.40	
Sampling Time (min)	125	125	125	125
Total Dry Gas Volume (dcf)	94.9	90.5	95.7	94
Corrected Dry Gas Meter Volume (dscf)	76.1	76.4	80.4	78
Dry Gas Meter Temperature (°F)	95.7	67.7	70.3	77.9
Dry Gas Meter Temperature (°R)	555.7	527.7	530.3	537.9
Average ΔH ("H_2O)	1.44	1.37	1.41	1.41
Isokinetic Variation (%)	96.4	97.4	103.6	99.1

STACK GAS VELOCITY AND VOLUMETRIC FLOW RATE (Method 2)

	Run 1	Run 2	Run 3	Averages
Average Stack Temperature (°F)	162	155	168	161
Average Stack Temperature (°R)	622	615	628	621
Stack Static Pressure ("H_2O)	1.70	1.70	1.70	1.70
Stack Gas Pressure ("Hg)	25.53	25.53	25.53	25.53
Average ΔP ("H_2O)	0.58	0.55	0.57	0.56
Average ΔP Square Root	0.76	0.74	0.75	0.75
Stack Gas Velocity (ft/sec)	51.87	49.54	50.92	50.78
Stack Gas Volumetric Flow Rate (acfm)	19,259	18,395	18,908	18,854
Stack Gas Volumetric Flow Rate (scfm)	13,952	13,477	13,568	13,666
Stack Gas Volumetric Flow Rate (dscfm)	11,475	11,392	11,270	11,379
Stack Gas Volumetric Flow Rate (dscfh)	688,505	683,545	676,221	682,757

TEST DATA SUMMARY
EPA Method 5/202

Client: Gem State
Test Date: 1-Oct-15
Emissions Unit: Unit 4
Project No.: 203705130

STACK GAS MOLECULAR WEIGHT (Method 3)

	Run 1	Run 2	Run 3	Averages
Net Volume of O_2 (%)	19.4	19.4	19.4	19.4
Net volume of CO_2 (%)	0.30	0.30	0.30	0.30
Net Volume of N_2 and CO (%)	80.3	80.3	80.3	80.3
Molecular Weight, Dry (lb/lb-mole)	28.82	29.65	29.62	29.37
Molecular Weight, Wet (lb/lb-mole)	26.90	27.85	27.65	27.47

STACK GAS MOISTURE CONTENT (Method 4)

	Run 1	Run 2	Run 3	Averages
Total Water Collected (g)	399.0	346.9	398.3	381.4
Volume of Rinse (ml)	50.1	50.1	50.2	50.1
Net Volume of Water Collected (ml)	348.9	296.8	348.1	331.3
Corrected Volume of Water Collected (scf)	15.280	12.970	15.233	14.494
Water Vapor (B_{WS})	0.1775	0.1547	0.1694	0.1672
Moisture Factor (1- B_{WS})	0.8225	0.8453	0.8306	0.8328
Stack Moisture (%)	17.8	15.5	16.9	17

PARTICULATE DATA SUMMARY

Client: Gem State
Test Date: 01-Oct-15
Emissions Unit: Unit 4
Project No.: 203705130

EPA Method 5 Test Results

	Run 1	Run 2	Run 3	Averages
Test Date	1-Oct-15	2-Oct-15	2-Oct-15	
Start Time	4:25 PM	7:29 AM	9:37 AM	
End Time	6:34 PM	9:34 AM	11:42 AM	
Corrected DGM (dscf)	76.090	76.357	80.354	77.600
Stack Flow Rate (dscfm)	11,475	11,392	11,270	11,379

Filterable Particulate Laboratory Results (Method 5)

	Run 1	Run 2	Run 3	Averages
Filter Net Mass Gain (g)	0.0006	0.0004	0.0013	0.0008
Net Mass of Filter Blank (g)	0.0004	0.0004	0.0004	0.0004
Total Filter Mass (g)	0.0006	0.0004	0.0013	0.0008
Probe & Nozzle Acetone Rinse Net Mass (g)	0.0012	0.0009	0.0006	0.0009
Probe & Nozzle Acetone Rinse Volume (ml)	100	100	100	100
Probe & Nozzle Acetone Rinse Blank Net Mass (g)	0.0012	0.0012	0.0012	0.0012
Probe & Nozzle Acetone Rinse Blank Volume (ml)	25	25	25	25
Acetone Density (g/ml)	0.79	0.79	0.79	0.79
Probe & Nozzle Rinse Acetone Blank Concentration (g/g)	0.0001	0.0001	0.0001	0.0001
Probe & Nozzle Acetone Rinse Blank Mass (g)	0.0048	0.0048	0.0048	0.0048
Maximum Acetone Rinse Blank Mass (g)	0.0008	0.0008	0.0008	0.0008
Probe & Nozzle Acetone Rinse Mass (g)	0.0004	0.0001	-0.0002	0.0001
Filter, Probe, & Nozzle Acetone Rinse Mass (g)	0.0010	0.0005	0.0011	0.0009
Filter, Probe, & Nozzle Acetone Rinse Mass (mg)	1.0	0.5	1.1	0.9

Filterable Particulate Concentrations and Emission Rates (Method 5)

	Run 1	Run 2	Run 3	Averages
Total Filterable Particulate Concentration (mg/dscf)	0.0133	0.0067	0.01381	0.011
Total Filterable Particulate Concentration (gr/dscf)	0.000204	0.000103	0.000213	0.00017
Total Filterable Particulate Emission Rate (lb/hr)	0.0201	0.0100	0.0205	0.017

PARTICULATE DATA SUMMARY

Client: Gem State
Test Date: 01-Oct-15
Emissions Unit: Unit 4
Project No.: 203705130

Field Train Recovery Blank (Method 202)

	Run 1	Run 2	Run 3	Averages
Inorganic Fraction Blank Net Mass (g)	0.0013	0.0013	0.0013	0.0013
Organic Fraction Blank Net Mass (g)	0.0006	0.0006	0.0006	0.0006
Field Train Recovery Blank Net Mass (g)	0.0019	0.0019	0.0019	0.0019
Field Train Recovery Blank Net Mass (mg)	1.9	1.9	1.9	1.9
Maximum Field Train Recovery Blank Net Mass (mg)	2.0	2.0	2.0	2.0
Field Train Recovery Blank Net Mass Used (g)	0.0019	0.0019	0.0019	0.0

Total Condensable Particulate Matter (Method 202)

	Run 1	Run 2	Run 3	Averages
Mass of Dried Sample, Inorganic (g)	0.0024	0.0033	0.0035	0.0031
Mass of Dried Sample, Inorganic (mg)	2.40	3.30	3.50	3.1
Mass of Dried Sample, Organic (g)	0.0101	0.0101	0.0077	0.0093
Mass of Dried Sample, Organic (mg)	10.100	10.10	7.70	9.3
Total Mass of CPM (g)	0.01060	0.01150	0.00930	0.0105
Total Mass of CPM (mg)	10.60	11.50	9.30	10.5

Total Condensable Particulate Matter Concentrations and Emission Rates (Method 202)

	Run 1	Run 2	Run 3	Averages
Total CPM Concentration (mg/dscf)	0.1393	0.1506	0.1157	0.135
Total CPM Concentration (gr/dscf)	0.00215	0.00232	0.00179	0.0021
Total CPM Concentration (lb/hr)	0.212	0.227	0.173	0.20

Filterable and Condensable Concentrations and Emission Rates

	Run 1	Run 2	Run 3	Averages
Particulate Mass (g)	0.01161	0.01201	0.01041	0.0113
Particulate Mass (mg)	11.61	12.01	10.41	11.3
Particulate Concentration (mg/dscf)	0.153	0.157	0.130	0.15
Particulate Concentration (gr/dscf)	0.00235	0.00243	0.00200	0.0023
Particulate Concentration (lb/hr)	0.232	0.237	0.193	0.22

APPENDIX B FIELD DATA SHEETS

Unit 1 Field Data Sheets

METHOD 2 - PRELIMINARY STACK GAS VELOCITY TRAVERSE AND CYCLONIC FLOW CHECK

Stack Shape: C=Circular, R=Rectangular	R
Stack Dimensions LxW (in.)	409.7
Number of Traverse Points	9
Stack Cross-Sectional Area (ft^2)	2.8
Barometric Pressure ("Hg)	25.65
Pitot Tube Calibration Coefficient (Cp)	0.84
Stack Static Pressure	0.5

Traverse Point #	ΔP ("H_2O)	√ΔP ("H_2O)	Stack Temp (°F)	Cyclonic Flow Determination		
				ΔP @ 0°	Angle for ΔP=0	Abs. Angle for ΔP=0
1	0.55	0.74	175	5	0	0
2	0.56	0.75	175	10	0	0
3	0.56	0.75	175	10	0	0
4	0.53	0.73	175	0	0	0
5	0.55	0.74	175	5	0	0
6	0.56	0.75	175	5	0	0
7	0.55	0.74	175	5	0	0
8	0.55	0.74	175	10	0	0
9	0.57	0.75	175	5	0	0
Averages	0.55	0.74	175	6	0	0

Combustion/Ambient Source: C=Combustion, A=Ambient	A
Dry Molecular Weight of Stack Gas Estimate (g/g-mol)	29.00
Percent Moisture in Stack Gas (Estimate) (% H_2O)	7.00%
(1-Bws)	0.9300
Wet stack gas molecular weight	28.23
Stack Temperature (°F)	175
Stack Temperature (°R)	635
Stack Static Pressure ("H_2O)	0.5
Stack Gas Pressure ("Hg)	25.69
Avg. Delta P (ΔP)	0.55
Avg. of the Sqrt of Delta P (ΔP)	0.74
Stack Gas Velocity (ft/s)	49.99
Stack Gas Volumetric Flow Rate (dscfm)	5,665

Determination of Moisture by Wet Bulb/Dry Bulb

Dry Stack Temperature (°F)	
Dry Stack Temperature (°C)	
Wet Stack Temperature (°F)	
Wet Stack Temperature (°C)	
Stack Saturated Vapor Pressure (in. Hg)	
Stack Vapor Pressure (in. Hg)	
Stack Gas Moisture Content (%)	

Stantec

INITIAL VELOCITY DATA

Client: Gem State	Stack Diameter (in.): 17¼ x 23¾	Meter Box ID: 5X	Run #:
Unit: 1	Coupling Length (in.) 0	Meter Y_d: 1.019	Type of Stack (C/R): R
Location: Burley, ID	Static Pressure: +0.5	Meter ΔH @: 2.096	No. of Ports: 3
Date: 10/1/15 Time:	Pbar: 25.65 ID: 5782	Pitot Tube C_p: 0.84	Pitot Tube Initial Leak: Pass
Technician: DV, GK	Assumed Moisture: 7%	Pitot Tube #:	Pitot Tube Final Leak: Pass

Traverse Points			Port Selection															
			A				B				C				X			
#	W/O	W	T_s (°F)	ΔP ("H_2O)	ΔP@0°	Angle For ΔP=0	T_s (°F)	ΔP ("H_2O)	ΔP@0°	Angle For ΔP=0	T_s (°F)	ΔP ("H_2O)	ΔP@0°	Angle For ΔP=0	T_s (°F)	ΔP ("H_2O)	ΔP@0°	Angle For ΔP=0
1	3.96	~~2.9~~	175	0.55	5		175	0.53	0		175	0.55	5					
2	11.9	~~8.16~~		0.56	10			0.55	5			0.55	10					
3	19.8	~~14.1~~		0.56	10			0.56	5			0.57	5					

Stack Diagram	Port Location	Additional Information
		Wet Bulb Temp. (°F)
		Dry Bulb Temp. (°F)
		Diameter Upstream (A): ~~17~~ 90"
		Diameter Downstream (B): 200"

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client: Gem State
Start Time: 3:58 PM
Stop Time: 5:48 PM
Run 1

Test Date: 01-Oct-15
Emission Unit: Unit 1
Project No.: 203705130

Point #	Run Time	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temperature (°F)	Dry Gas Meter (dcf)	Meter Temperature (°F)		Corrected DGM $V_{m(std)}$ (dscf)	Stack Gas Velocity V_s (ft/sec)	Intermediate Isokinetic Rate (%)	DGM Flow Rate (dcf/min)
						In	Out				
Initial					737.183						
1	12	0.55	2.06	178	747.104	93	91	8.336	49.91	100.9	0.83
2	24	0.55	2.06	178	757.025	99	93	8.276	49.91	100.2	0.83
3	36	0.55	2.06	178	766.965	101	94	8.269	49.91	100.1	0.83
4	48	0.55	2.06	176	775.850	100	92	7.411	49.83	89.6	0.74
5	60	0.55	2.06	179	786.740	101	93	9.068	49.95	109.9	0.91
6	72	0.55	2.06	177	796.625	102	94	8.216	49.87	99.4	0.82
7	84	0.55	2.06	176	806.480	100	93	8.213	49.83	99.3	0.82
8	96	0.55	2.06	176	816.330	100	92	8.216	49.83	99.3	0.82
9	108	0.55	2.06	174	826.146	100	92	8.188	49.75	98.8	0.82
Max/Avg.	108	0.55	2.06	177	88.963	96		8.244	49.87	99.7	0.82

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client:	Gem State	Test Date:	01-Oct-15
Start Time:	3:58 PM	Emission Unit:	Unit 1
Stop Time:	5:48 PM	Project No.:	203705130
Run	1		

Sampling Time, min	108	Meter Calibration Factor, Y	1.0190	H_2O Collected, ml	133.6
Number of Sample Points	9	Nozzle Area, ft^2	0.00034	Net H_2O Collected, V_{lc}, ml	83.5
O_2, %	19.40	Corrected DGM, $V_{m(std)}$, dscf	74.2	Water Vapor Volume, $V_{wc(std)}$, scf	2.53
CO_2, %	0.30	Average ΔP, "H_2O	0.55	Water Vapor Volume, $V_{wg(std)}$, scf	1.41
N_2 & CO, %	80.30	Average Square Root ΔP	0.74	Water Vapor, B_{ws}	0.0503
Barometric Pressure	25.65	Average ΔH, "H_2O	2.06	Moisture Factor, 1- B_{ws}	0.9497
Static Pressure, P_g, "H_2O	0.50	Stack Temperature, T_s, °R	637	Dry Molecular Weight, M_d, lb/lb-mole	28.82
Stack Pressure, P_s, "Hg	25.69	Meter Temperature, T_m, °R	556	Wet Molecular Weight, M_s, lb/lb-mole	28.28
Pitot Tube Calibration Coefficient, C_p	0.84	Stack Gas Velocity, V_s, ft/sec	49.87	% Isokinetic	99.7

Impinger Data

Impinger Content	Final Weight (g)	Initial Weight (g)	Net Weight (g)
H_2O	607.5	510.7	96.8
H_2O	607.4	603.4	4.0
Empty	701.5	698.5	3.0
Silica Gel	890.5	860.7	29.8
		Sub Total	133.6
		Sample Line Rinse	50.1
		Total	83.5

Mid Test Leak Checks

Time	DGM Start	DGM Final	Difference
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
		Sum	0

Stack Area, A_s, ft^2	2.85
Stack Flow Rate, acf/min	8,513
Stack Flow Rate, acf/hr	510,754
Stack Flow Rate, scf/min	6,059
Stack Flow Rate, scf/hr	363,522
Stack Flow Rate, dscf/min	5,754
Stack Flow Rate, dscf/hr	345,225

Stantec

M5 Field Data

Client: Gem State	Meter Box ID: 3X	Stack Diameter (in.): 17.25x23.75	Test Method: 5/202	Pitot Tube Initial Leak: pass
Unit: Unit 1	Meter Yd: 1.019	Static Pressure:	Train Initial Leak: 0.010@10"	Pitot Tube Final Leak: pass
Location: Burley, ID	Meter ΔH @: 2.096	P_{bar}: 25.65 ID: 5782	Train Final Leak: 0.003@10"	Agency Observer: n/a
Date: 10/1	Probe #: 4-3	Assumed Moisture: 7%	Filter Appearance: clean	Test Anomalies:
Technician: BK	Liner Material: Qtz	ΔH K-Factor: 3.75	Impinger Appearance: clear	
Run #: 1	Pitot Tube C_p: 0.84	Start Time: 1558	Silica Gel Spent (Y/N): N	
Page 1 of 1	Nozzle Diameter (in.):	End Time: 1748	Filter #:	

Traverse Point Number	Sampling Time (min)	Vacuum (in Hg)	Velocity Head ΔP (in H_2O)	Orifice ΔH (in H_2O)	Stack Temp (°F)	Sample Volume (ft^3)	Dry Gas Meter Temp Inlet (°F)	Dry Gas Meter Temp Outlet (°F)	Probe Temp (°F)	Box Temp (°F)	Impinger Exit Temp (°F)
						737.183					
1	12	9.5	0.55	2.06	178	747.104	93	91	257	255	70
2	24	9.5	0.55	2.06	178	756.025	99	93	248	250	68
3	36	9.5	0.55	2.06	178	766.965	101	94	250	250	63
4	48	9.5	0.55	2.06	176	775.85	100	92	249	249	61
5	60	9.5	0.55	2.06	179	786.74	101	93	249	256	62
6	72 (1.12)	9.5	0.55	2.06	177	796.625	102	94	250	249	61
7	84 (1.24)	9.5	0.55	2.06	176	806.48	100	93	250	250	64
8	96 (1.36)	9.5	0.55	2.06	176	816.33	100	92	250	251	64
9	108 (1.48)	9.5	0.55	2.06	174	826.196	100	92	250	250	65

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client: Gem State
Start Time: 7:10 AM
Stop Time: 8:58 AM
Run 2

Test Date: 02-Oct-15
Emission Unit: Unit 1
Project No.: 203705130

Point #	Run Time	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temperature (°F)	Dry Gas Meter (dcf)	Meter Temperature (°F)		Corrected DGM $V_{m(std)}$ (dscf)	Stack Gas Velocity V_s (ft/sec)	Intermediate Isokinetic Rate (%)	DGM Flow Rate (dcf/min)
						In	Out				
Initial					826.700						
1	12	0.55	2.06	179	836.090	69	59	8.311	49.13	101.2	0.78
2	24	0.54	2.02	179	845.575	69	59	8.394	48.68	103.2	0.79
3	36	0.55	2.06	179	855.060	74	62	8.331	49.13	101.4	0.79
4	48	0.54	2.00	179	864.850	75	63	8.582	48.68	105.5	0.82
5	60	0.55	2.06	178	874.725	75	63	8.658	49.09	105.3	0.82
6	72	0.55	2.06	180	884.600	75	64	8.649	49.17	105.4	0.82
7	84	0.56	2.10	177	894.600	75	64	8.760	49.49	105.5	0.83
8	96	0.55	2.06	179	904.370	76	64	8.549	49.13	104.1	0.81
9	108	0.55	2.06	180	914.246	76	65	8.634	49.17	105.2	0.82
Max/Avg.	108	0.55	2.05	179	87.546	68		8.541	49.07	104.1	0.81

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client: Gem State
Start Time: 7:10 AM
Stop Time: 8:58 AM
Run 2

Test Date: 02-Oct-15
Emission Unit: Unit 1
Project No.: 203705130

Sampling Time, min	108	Meter Calibration Factor, Y	1.0190	H_2O Collected, ml	116.8
Number of Sample Points	9	Nozzle Area, ft^2	0.00034	Net H_2O Collected, V_{lc}, ml	66.8
O_2, %	19.40	Corrected DGM, $V_{m(std)}$, dscf	76.9	Water Vapor Volume, $V_{wc(std)}$, scf	2.09
CO_2, %	0.40	Average ΔP, "H_2O	0.55	Water Vapor Volume, $V_{wsg(std)}$, scf	1.05
N_2 & CO, %	83.25	Average Square Root ΔP	0.74	Water Vapor, B_{ws}	0.0393
Barometric Pressure	25.65	Average ΔH, "H_2O	2.05	Moisture Factor, 1- B_{ws}	0.9607
Static Pressure, P_g, "H_2O	0.50	Stack Temperature, T_s, °R	639	Dry Molecular Weight, M_d, lb/lb-mole	29.69
Stack Pressure, P_s, "Hg	25.69	Meter Temperature, T_m, °R	528	Wet Molecular Weight, M_s, lb/lb-mole	29.23
Pitot Tube Calibration Coefficient, C_p	0.84	Stack Gas Velocity, V_s, ft/sec	49.07	% Isokinetic	104.1

Impinger Data

Impinger Content	Final Weight (g)	Initial Weight (g)	Net Weight (g)
H_2O	670.7	580.5	90.2
H_2O	642.7	640.1	2.6
Empty	727.1	725.4	1.7
Silica Gel	901.7	879.4	22.3
		Sub Total	116.8
		Sample Line Rinse	50.0
		Total	66.8

Mid Test Leak Checks

Time	DGM Start	DGM Final	Difference
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
		Sum	0

Stack Area, A_s, ft^2	2.85
Stack Flow Rate, acf/min	8,377
Stack Flow Rate, acf/hr	502,615
Stack Flow Rate, scf/min	5,943
Stack Flow Rate, scf/hr	356,609
Stack Flow Rate, dscf/min	5,710
Stack Flow Rate, dscf/hr	342,590

Stantec

M5 FIELD DATA

Client: Gem State	Meter Box ID: 3X	Stack Diameter (in.): 17.25x23.75	Test Method: 5/202	Pitot Tube Initial Leak: pass
Unit: 1	Meter Yd: 1.019	Static Pressure:	Train Initial Leak: 0.668 @ 12"	Pitot Tube Final Leak: pass
Location: Burley, ID	Meter ΔH @: 2.096	P_{bar}: 25.65 ID:	Train Final Leak: 0.0106 @ 10"	Agency Observer:
Date: 10/2/15	Probe #:	Assumed Moisture: 7%	Filter Appearance:	Test Anomalies:
Technician: GK	Liner Material: Qtz	ΔH K-Factor: 3.75	Impinger Appearance:	
Run #: 2	Pitot Tube C_p: 0.84	Start Time: 0710	Silica Gel Spent (Y/N):	
Page 1 of 1	Nozzle Diameter (in.):	End Time: 0858	Filter #:	

Traverse Point Number	Sampling Time (min)	Vacuum (in Hg)	Velocity Head ΔP (in H_2O)	Orifice ΔH (in H_2O)	Stack Temp (°F)	Sample Volume (ft^3)	Dry Gas Meter Temp Inlet (°F)	Dry Gas Meter Temp Outlet (°F)	Probe Temp (°F)	Box Temp (°F)	Impinger Exit Temp (°F)
						826.700					
1	12	8	0.55	2.06	179	836.09	69	59	249	256	56
2	24	8	0.54	2.02	179	845.575	69	59	252	253	56
3	36	8	0.55	2.06	179	855.06	74	62	251	247	63
4	48	8	0.54	2.0	179	864.55	75	63	252	250	63
5	60	8	0.55	2.06	178	874.725	75	63	249	251	60
6	72 (1.17)	8	0.55	2.06	180	884.6	75	64	248	248	58
7	84 (1.24)	8	0.56	2.1	177	894.6	75	64	248	249	57
8	96 (1.36)	8	0.55	2.06	179	904.37	76	64	248	251	58
9	108 (1.48)	8	0.55	2.06	180	914.246	76	65	250	247	59

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client: Gem State
Start Time: 9:03 AM
Stop Time: 10:50 AM
Run 3

Test Date: 02-Oct-15
Emission Unit: Unit 1
Project No.: 203705130

Point #	Run Time	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temperature (°F)	Dry Gas Meter (dcf)	Meter Temperature (°F)		Corrected DGM $V_{m(std)}$ (dscf)	Stack Gas Velocity V_s (ft/sec)	Intermediate Isokinetic Rate (%)	DGM Flow Rate (dcf/min)
						In	Out				
Initial					915.982						
1	12	0.56	2.10	180	926.445	76	76	9.054	49.69	109.4	0.87
2	24	0.56	2.10	180	936.335	76	65	8.647	49.69	104.5	0.82
3	36	0.55	2.00	180	946.225	78	66	8.620	49.25	105.1	0.82
4	48	0.56	2.10	180	956.025	78	66	8.544	49.69	103.3	0.82
5	60	0.55	2.00	181	965.800	78	67	8.512	49.29	103.9	0.81
6	72	0.54	2.00	180	975.575	78	67	8.512	48.80	104.8	0.81
7	84	0.54	2.00	183	985.330	78	67	8.495	48.91	104.8	0.81
8	96	0.55	2.00	179	995.090	74	65	8.547	49.21	104.2	0.81
9	108	0.55	2.00	181	1005.305	74	65	8.946	49.29	109.2	0.85
Max/Avg.	108	0.55	2.03	180	89.323	72		8.653	49.31	105.5	0.83

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client:	Gem State	Test Date:	02-Oct-15
Start Time:	9:03 AM	Emission Unit:	Unit 1
Stop Time:	10:50 AM	Project No.:	203705130
Run	3		

Sampling Time, min	108	Meter Calibration Factor, Y	1.0190	H_2O Collected, ml	122.1
Number of Sample Points	9	Nozzle Area, ft^2	0.00034	Net H_2O Collected, V_{lc}, ml	72.1
O_2, %	19.40	Corrected DGM, $V_{m(std)}$, dscf	77.9	Water Vapor Volume, $V_{wc(std)}$, scf	1.78
CO_2, %	0.30	Average ΔP, "H_2O	0.55	Water Vapor Volume, $V_{wsg(std)}$, scf	1.61
N_2 & CO, %	83.15	Average Square Root ΔP	0.74	Water Vapor, B_{ws}	0.0418
Barometric Pressure	25.65	Average ΔH, "H_2O	2.03	Moisture Factor, 1- B_{ws}	0.9582
Static Pressure, P_g, "H_2O	0.50	Stack Temperature, T_s, °R	640	Dry Molecular Weight, M_d, lb/lb-mole	29.62
Stack Pressure, P_s, "Hg	25.69	Meter Temperature, T_m, °R	532	Wet Molecular Weight, M_s, lb/lb-mole	29.14
Pitot Tube Calibration Coefficient, C_p	0.84	Stack Gas Velocity, V_s, ft/sec	49.31	% Isokinetic	105.5

Impinger Data

Impinger Content	Final Weight (g)	Initial Weight (g)	Net Weight (g)
H_2O	590.7	510.1	80.6
H_2O	603.5	599.3	4.2
Empty	704.5	701.4	3.1
Silica Gel	924.7	890.5	34.2
		Sub Total	122.1
		Sample Line Rinse	50.0
		Total	72.1

Mid Test Leak Checks

Time	DGM Start	DGM Final	Difference
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
		Sum	0

Stack Area, A_s, ft^2	2.85
Stack Flow Rate, acf/min	8,418
Stack Flow Rate, acf/hr	505,086
Stack Flow Rate, scf/min	5,958
Stack Flow Rate, scf/hr	357,491
Stack Flow Rate, dscf/min	5,709
Stack Flow Rate, dscf/hr	342,554

Stantec

FIELD DATA

Client: GemState	Meter Box ID: 3X	Stack Diameter (in.): 17½x23¾	Test Method: 5/202	Pitot Tube Initial Leak: pass
Unit: 1	Meter Yd: 1.019	Static Pressure:	Train Initial Leak: 0.010@10"	Pitot Tube Final Leak: pass
Location: Burley	Meter ΔH @: 2.096	P_{bar}: 25.65 ID: 5782	Train Final Leak: 0.010@10"	Agency Observer: n/a
Date: 10/2/15	Probe #: 4-3	Assumed Moisture: 7%	Filter Appearance: clean	Test Anomalies:
Technician: EK	Liner Material: Qtz	ΔH K-Factor: 3.75	Impinger Appearance: clear	
Run #: 3	Pitot Tube C_p: 0.84	Start Time: 0903	Silica Gel Spent (Y/N): N	
Page: 1 of 1	Nozzle Diameter (in.):	End Time: 1050	Filter #:	

Traverse Point Number	Sampling Time (min)	Vacuum (in Hg)	Velocity Head ΔP (in H_2O)	Orifice ΔH (in H_2O)	Stack Temp (°F)	Sample Volume 915.982	Dry Gas Meter Temp Inlet (°F)	Dry Gas Meter Temp Outlet (°F)	Probe Temp (°F)	Box Temp (°F)	Impinger Exit Temp (°F)
1	12	9	0.56	2.1	180	926.445	76	76	252	247	59
2	24	9	0.56	2.1	180	936.335	76	65	250	248	60
3	36	9	0.55	2.0	180	946.225	78	66	249	250	61
4	48	9	0.56	2.1	180	956.025	78	66	250	254	61
5	60	9	0.55	2.0	181	965.800	78	67	251	249	59
6	1.12	9	0.54	2.0	180	975.575	78	67	248	246	58
7	1.24	9	0.54	2.0	183	985.33	76	67	251	249	57
8	1.36	9	0.55	2.0	179	995.09	74	65	249	251	57
9	1.48	9	0.55	2.0	181	~~999.205~~ 1005.305	74	65	250	249	59

Stantec

RECOVERY DATA

Client: Iowa State	Test Method: M5/202
Unit: Unit 1	Date: 10-1-15
Location: Burley ID	Project Number:

	RUN 1			RUN 2			RUN 3		
Filter Number:									
Impinger Contents:	Final	Initial	Net	Final	Initial	Net	Final	Initial	Net
Blank	607.5	510.7		670.7	580.5		540.7	490.1	
Blank	607.4	603.4		642.7	640.1		603.5	599.3	
H_2O	701.5	698.5		727.1	725.4		704.5	701.4	
Silica	890.5	860.7		901.7	879.4		924.7	890.5	
Line Rinse, g			50.1			50.0			50.0
Total Weight, g									

Comments

Unit 2 Field Data Sheets

METHOD 2 - PRELIMINARY STACK GAS VELOCITY TRAVERSE AND CYCLONIC FLOW CHECK

Stack Shape: C=Circular, R=Rectangular	R
Stack Dimensions LxW (in.)	740.3
Number of Traverse Points	25
Stack Cross-Sectional Area (ft^2)	5.1
Barometric Pressure ("Hg)	25.40
Pitot Tube Calibration Coefficient (Cp)	0.84
Stack Static Pressure	0.5

Traverse Point #	ΔP ("H_2O)	√ΔP ("H_2O)	Stack Temp (°F)	Cyclonic Flow Determination ΔP @ 0°	Angle for ΔP=0	Abs. Angle for ΔP=0
1	0.25	0.50	170	5	0	0
2	0.25	0.50	170	10	0	0
3	0.23	0.48	170	10	0	0
4	0.24	0.49	170	0	0	0
5	0.23	0.48	170	5	0	0
6	0.25	0.50	170	5	0	0
7	0.26	0.51	170	5	0	0
8	0.25	0.50	170	10	0	0
9	0.25	0.50	170	5	0	0
10	0.23	0.48	170	5	0	0
11	0.26	0.51	170	0	0	0
12	0.26	0.51	170	10	0	0
13	0.25	0.50	170	5	0	0
14	0.23	0.48	170	5	0	0
15	0.23	0.48	170	10	0	0
16	0.27	0.51	170	0	0	0
17	0.25	0.51	170	0	0	0
18	0.25	0.50	170	5	0	0
19	0.25	0.48	170	10	0	0
20	0.23	0.48	170	10	0	0
21	0.25	0.50	170	0	0	0
22	0.25	0.50	170	0	0	0
23	0.26	0.51	170	5	0	0
24	0.25	0.50	170	5	0	0
25	0.25	0.50	170	0	0	0
Averages	0.25	0.50	170	5	0	0

Combustion/Ambient Source: C=Combustion, A=Ambient	A
Dry Molecular Weight of Stack Gas Estimate (g/g-mol)	29.00
Percent Moisture in Stack Gas (Estimate) (% H_2O)	7.00%
(1-Bws)	0.9300
Wet stack gas molecular weight	28.23
Stack Temperature (°F)	170
Stack Temperature (°R)	630
Stack Static Pressure ("H_2O)	0.5
Stack Gas Pressure ("Hg)	25.44
Avg. Delta P (ΔP)	0.25
Avg. of the Sqrt of Delta P (ΔP)	0.50
Stack Gas Velocity (ft/s)	33.37
Stack Gas Volumetric Flow Rate (dscfm)	6,820

Determination of Moisture by Wet Bulb/Dry Bulb

Dry Stack Temperature (°F)	
Dry Stack Temperature (°C)	
Wet Stack Temperature (°F)	
Wet Stack Temperature (°C)	
Stack Saturated Vapor Pressure (in. Hg)	
Stack Vapor Pressure (in. Hg)	
Stack Gas Moisture Content (%)	

Stantec

INITIAL VELOCITY DATA

Client: GemState	Stack Diameter (in.): 31.5 x 23.5	Meter Box ID: 3V	Run #:
Unit: 2	Coupling Length (in.) 0	Meter Y_d: 0.976	Type of Stack (C/R): R
Location: Burley, ID	Static Pressure: +0.5	Meter ΔH @: 1.965	No. of Ports: 5
Date: 10/1/15 Time:	Pbar: 25.65 ID: 5782	Pitot Tube C_p: 0.84	Pitot Tube Initial Leak: pass
Technician: DV, GK	Assumed Moisture: 7%	Pitot Tube #:	Pitot Tube Final Leak: pass

Traverse Points			Port Selection															
			A				B				C				D			
#	W/O	W	T_s (°F)	ΔP ("H_2O)	ΔP@0°	Angle For ΔP=0	T_s (°F)	ΔP ("H_2O)	ΔP@0°	Angle For ΔP=0	T_s (°F)	ΔP ("H_2O)	ΔP@0°	Angle For ΔP=0	T_s (°F)	ΔP ("H_2O)	ΔP@0°	Angle For ΔP=0
1		2.4	170	0.25			170	0.25			170	0.24			170	0.27		
2		7.0		0.25				0.26				0.26				0.25		
3		11.8		0.23				0.25				0.25				0.25		
4		16.5		0.24				0.25				0.23				0.25		
5		21.2		0.23				0.23				0.23				0.25		
				EE														
1		2.4	170	0.25														
2		7.0		0.25														
3		11.8		0.26														
4		16.5		0.25														
5		21.2		0.25														

Stack Diagram	Port Location	Additional Information
		Wet Bulb Temp. (°F)
		Dry Bulb Temp. (°F)
		Diameter Upstream (A): 72"
		Diameter Downstream (B): 200"

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client: Gem State
Start Time: 4:05 PM
Stop Time: 6:10 PM
Run 1

Test Date: 01-Oct-15
Emission Unit: Unit 2
Project No.: 203705130

Point #	Run Time	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temperature (°F)	Dry Gas Meter (dcf)	Meter Temperature (°F)		Corrected DGM $V_{m(std)}$ (dscf)	Stack Gas Velocity V_s (ft/sec)	Intermediate Isokinetic Rate (%)	DGM Flow Rate (dcf/min)
						In	Out				
Initial					588.276						
1	5	0.75	5.85	167	595.020	98	100	5.365	58.45	95.2	1.35
2	10	0.75	5.85	166	601.390	99	105	5.041	58.40	89.3	1.27
3	15	0.25	1.90	166	605.520	99	105	3.231	33.72	99.2	0.83
4	20	0.25	1.90	168	609.655	100	106	3.229	33.77	99.3	0.83
5	25	0.25	1.90	169	613.815	100	106	3.249	33.80	100.0	0.83
6	30	0.25	1.90	167	618.000	100	105	3.271	33.74	100.5	0.84
7	35	0.25	1.90	166	622.200	99	105	3.286	33.72	100.9	0.84
8	40	0.25	1.90	166	626.400	100	106	3.280	33.72	100.7	0.84
9	45	0.25	1.90	168	630.605	100	107	3.281	33.77	100.9	0.84
10	50	0.25	1.90	167	634.790	100	107	3.266	33.74	100.3	0.84
11	55	0.25	1.90	168	638.985	100	107	3.273	33.77	100.6	0.84
12	60	0.25	1.90	167	643.175	101	108	3.264	33.74	100.3	0.84
13	65	0.25	1.90	168	647.400	100	106	3.300	33.77	101.5	0.85
14	70	0.25	1.90	168	651.530	100	107	3.223	33.77	99.1	0.83
15	75	0.25	1.90	167	655.720	100	106	3.272	33.74	100.5	0.84
16	80	0.25	1.90	167	659.960	99	106	3.314	33.74	101.8	0.85
17	85	0.25	1.90	169	664.050	99	105	3.200	33.80	98.5	0.82
18	90	0.25	1.90	168	668.220	99	106	3.260	33.77	100.2	0.83
19	95	0.25	1.90	169	672.395	99	106	3.264	33.80	100.4	0.83
20	100	0.25	1.90	170	676.520	99	106	3.225	33.82	99.3	0.83
21	105	0.25	1.90	172	680.640	98	104	3.229	33.88	99.6	0.82
22	110	0.25	1.90	171	684.795	97	103	3.262	33.85	100.5	0.83
23	115	0.25	1.90	167	688.890	96	102	3.221	33.74	99.0	0.82
24	120	0.25	1.90	170	693.020	95	102	3.252	33.82	100.1	0.83
25	125	0.25	1.90	170	697.150	95	101	3.254	33.82	100.2	0.83
Max/Avg.	125	0.29	2.22	168	108.874	102		3.413	35.75	99.5	0.87

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client:	Gem State	Test Date:	01-Oct-15
Start Time:	4:05 PM	Emission Unit:	Unit 2
Stop Time:	6:10 PM	Project No.:	203705130
Run	1		

Sampling Time, min	125	Meter Calibration Factor, Y	0.9760	H_2O Collected, ml	216.1
Number of Sample Points	25	Nozzle Area, ft^2	0.00049	Net H_2O Collected, V_{lc}, ml	167.2
O_2, %	19.40	Corrected DGM, $V_{m(std)}$, dscf	85.3	Water Vapor Volume, $V_{wc(std)}$, scf	6.60
CO_2, %	0.30	Average ΔP, "H_2O	0.29	Water Vapor Volume, $V_{wsg(std)}$, scf	1.27
N_2 & CO, %	80.30	Average Square Root ΔP	0.53	Water Vapor, B_{ws}	0.0845
Barometric Pressure	25.40	Average ΔH, "H_2O	2.22	Moisture Factor, 1- B_{ws}	0.9155
Static Pressure, P_g, "H_2O	0.50	Stack Temperature, T_s, °R	628	Dry Molecular Weight, M_d, lb/lb-mole	28.82
Stack Pressure, P_s, "Hg	25.44	Meter Temperature, T_m, °R	562	Wet Molecular Weight, M_s, lb/lb-mole	27.91
Pitot Tube Calibration Coefficient, C_p	0.84	Stack Gas Velocity, V_s, ft/sec	35.75	% Isokinetic	99.0

Impinger Data

Impinger Content	Final Weight (g)	Initial Weight (g)	Net Weight (g)
H_2O	713.5	526.7	186.8
H_2O	601.7	601.4	0.3
Empty	729.4	727.3	2.1
Silica Gel	831.4	804.5	26.9
		Sub Total	216.1
		Sample Line Rinse	48.9
		Total	167.2

Mid Test Leak Checks

Time	DGM Start	DGM Final	Difference
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
		Sum	0

Stack Area, A_s, ft^2	5.14
Stack Flow Rate, acf/min	11,026
Stack Flow Rate, acf/hr	661,590
Stack Flow Rate, scf/min	7,881
Stack Flow Rate, scf/hr	472,863
Stack Flow Rate, dscf/min	7,215
Stack Flow Rate, dscf/hr	432,901

Stantec

M5 Field Data

Client: GemStateC	Meter Box ID: 3U	Stack Diameter (in.): 23.5x31.5	Test Method: 5/202	Pitot Tube Initial Leak: Pass
Unit: Unit 2	Meter Yd: 0.976	Static Pressure: 0.5	Train Initial Leak: 0.015@6"	Pitot Tube Final Leak: pass
Location: Burley, ID	Meter ΔH@: 1.965	P_{bar}: 25.65 ID: 5782	Train Final Leak: 0.014@9"	Agency Observer: n/a
Date: 10/1/15	Probe #: 6-3	Assumed Moisture: 7%	Filter Appearance: clean	Test Anomalies:
Technician: GK	Liner Material: Qtz	ΔH K-Factor: 7.8	Impinger Appearance: clear	
Run #: 1	Pitot Tube C_p: 0.84	Start Time: 1605	Silica Gel Spent (Y/N): N	
Page 1 of 1	Nozzle Diameter (in.): 0.3	End Time: 1810	Filter #:	

Traverse Point Number	Sampling Time (min)	Vacuum (in Hg)	Velocity Head ΔP (in H_2O)	Orifice ΔH (in H_2O)	Stack Temp (°F)	Sample Volume (ft^3)	Dry Gas Meter Temp Inlet (°F)	Dry Gas Meter Temp Outlet (°F)	Probe Temp (°F)	Box Temp (°F)	Impinger Exit Temp (°F)
			0.75	5.85		588.276					
1	5	8	~~0.49~~	~~5.8~~	167	595.02	98	100	272	240	60
2	10	8	0.75	5.85	166	601.39	99	105	255	256	61
3	15	4	0.25	1.9	166	605.52	99	105	235	256	61
4	20	4	0.25	1.9	168	609.655	100	106	250	256	61
5	25	4	0.25	1.9	169	613.815	100	106	253	249	61
6	30	4	0.25	1.9	167	618.000	100	105	253	252	61
7	35	4	0.25	1.9	166	622.200	99	105	251	253	64
8	40	4	0.25	1.9	166	626.400	100	106	251	250	63
9	45	4	0.25	1.9	168	630.605	100	107	250	249	64
10	50	4	0.25	1.9	167	634.79	100	107	249	249	65
11	55	4	0.25	1.9	168	638.985	100	107	249	252	65
12	60	4	0.25	1.9	167	643.175	101	108	250	248	65
13	65	4	0.25	1.9	168	647.4	100	106	250	251	67
14	70	4	0.25	1.9	168	651.53	100	107	250	250	67
15	75	4	0.25	1.9	167	655.72	100	106	251	251	67
16	80	4	0.25	1.9	167	659.96	99	106	251	248	68
17	85	4	0.25	1.9	169	664.05	99	105	251	252	68
18	90	4	0.25	1.9	168	668.270	99	106	250	250	68
19	95	4	0.25	1.9	169	672.395	99	106	248	253	68
20	100	4	0.25	1.9	170	676.52	99	106	248	250	67
21	105	4	0.25	1.9	172	680.64	98	104	249	249	68
22	110	4	0.25	1.9	171	684.795	97	103	250	250	68
23	115	4	0.25	1.9	167	688.89	96	102	251	252	68
24	120	4	0.25	1.9	176	693.02	95	102	250	250	67
25	125	4	0.25	1.9	170	697.15	95	101	249	249	67

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client: Gem State
Start Time: 7:11 AM
Stop Time: 9:16 AM
Run 2

Test Date: 02-Oct-15
Emission Unit: Unit 2
Project No.: 203705130

Point #	Run Time	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temperature (°F)	Dry Gas Meter (dcf)	Meter Temperature (°F)		Corrected DGM $V_{m(std)}$ (dscf)	Stack Gas Velocity V_s (ft/sec)	Intermediate Isokinetic Rate (%)	DGM Flow Rate (dcf/min)
						In	Out				
Initial					699.723						
1	5	0.25	1.9	170	703.625	58	62	3.300	33.41	103.5	0.78
2	10	0.24	1.9	170	707.450	59	66	3.219	32.74	103.0	0.77
3	15	0.26	2.03	170	711.270	60	69	3.204	34.07	98.5	0.76
4	20	0.25	1.9	171	715.075	62	73	3.172	33.44	99.5	0.76
5	25	0.25	1.9	170	718.890	62	74	3.177	33.41	99.6	0.76
6	30	0.23	1.8	170	722.720	63	74	3.186	32.05	104.1	0.77
7	35	0.25	1.9	171	726.550	65	75	3.178	33.44	99.7	0.77
8	40	0.26	2.0	171	730.400	65	75	3.195	34.10	98.3	0.77
9	45	0.25	1.9	169	734.270	65	76	3.208	33.38	100.5	0.77
10	50	0.24	1.9	168	738.145	66	76	3.209	32.68	102.5	0.78
11	55	0.23	1.8	167	742.020	66	76	3.208	31.97	104.6	0.78
12	60	0.23	1.8	170	745.900	66	75	3.215	32.05	105.1	0.78
13	65	0.25	1.9	173	749.790	66	76	3.221	33.49	101.2	0.78
14	70	0.25	1.9	173	753.690	67	76	3.226	33.49	101.4	0.78
15	75	0.27	2.1	173	757.620	67	76	3.253	34.80	98.4	0.79
16	80	0.23	1.8	175	761.515	67	76	3.221	32.17	105.7	0.78
17	85	0.24	1.9	171	765.400	67	76	3.214	32.76	102.9	0.78
18	90	0.24	1.9	171	769.305	67	76	3.230	32.76	103.5	0.78
19	95	0.25	1.9	171	773.220	67	76	3.239	33.44	101.6	0.78
20	100	0.25	1.9	171	777.140	67	76	3.243	33.44	101.8	0.78
21	105	0.23	1.8	171	781.040	68	77	3.219	32.07	105.3	0.78
22	110	0.24	1.9	172	784.970	68	77	3.245	32.79	104.0	0.79
23	115	0.25	1.9	173	788.890	68	77	3.237	33.49	101.7	0.78
24	120	0.26	2.0	176	792.915	68	77	3.325	34.23	102.7	0.80
25	125	0.26	2.0	178	796.983	69	77	3.357	34.29	103.9	0.81
Max/Avg.	125	0.25	1.90	171	97.260	70		3.228	33.20	102.1	0.78

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client:	Gem State	Test Date:	02-Oct-15
Start Time:	7:11 AM	Emission Unit:	Unit 2
Stop Time:	9:16 AM	Project No.:	203705130
Run	2		

Sampling Time, min	125	Meter Calibration Factor, Y	0.9760	H_2O Collected, ml	219.3
Number of Sample Points	25	Nozzle Area, ft^2	0.00049	Net H_2O Collected, V_{lc}, ml	169.0
O_2, %	19.40	Corrected DGM, $V_{m(std)}$, dscf	80.7	Water Vapor Volume, $V_{wc(std)}$, scf	6.83
CO_2, %	0.30	Average ΔP, "H_2O	0.25	Water Vapor Volume, $V_{wsg(std)}$, scf	1.13
N_2 & CO, %	83.25	Average Square Root ΔP	0.50	Water Vapor, B_{ws}	0.0897
Barometric Pressure	25.40	Average ΔH, "H_2O	1.90	Moisture Factor, 1- B_{ws}	0.9103
Static Pressure, P_g, "H_2O	0.50	Stack Temperature, T_s, °R	631	Dry Molecular Weight, M_d, lb/lb-mole	29.65
Stack Pressure, P_s, "Hg	25.44	Meter Temperature, T_m, °R	530	Wet Molecular Weight, M_s, lb/lb-mole	28.60
Pitot Tube Calibration Coefficient, C_p	0.84	Stack Gas Velocity, V_s, ft/sec	33.20	% Isokinetic	102.1

Impinger Data

Impinger Content	Final Weight (g)	Initial Weight (g)	Net Weight (g)
H_2O	727.3	532.7	194.6
H_2O	586.7	585.6	1.1
Empty	753.1	753.4	-0.3
Silica Gel	831.7	807.8	23.9
		Sub Total	219.3
		Sample Line Rinse	50.3
		Total	169.0

Mid Test Leak Checks

Time	DGM Start	DGM Final	Difference
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
		Sum	0

Stack Area, A_s, ft^2	5.14
Stack Flow Rate, acf/min	10,240
Stack Flow Rate, acf/hr	614,370
Stack Flow Rate, scf/min	7,280
Stack Flow Rate, scf/hr	436,777
Stack Flow Rate, dscf/min	6,626
Stack Flow Rate, dscf/hr	397,584

Stantec

PM Field Data

Client: Gem State	Meter Box ID: 3U	Stack Diameter (in.): 31.5x23.5	Test Method: 5/202	Pitot Tube Initial Leak: pass
Unit: 2	Meter Yd: 0.976	Static Pressure: 0.5	Train Initial Leak: 0.015@10	Pitot Tube Final Leak: pass
Location: Burley	Meter ΔH @: 1.965	P_{bar}: 25.65 ID: 5782	Train Final Leak: 0.010@6"	Agency Observer:
Date: 10/2/15	Probe #: 6-3	Assumed Moisture: 7%	Filter Appearance:	Test Anomalies:
Technician: GK	Liner Material: Qtz	ΔH K-Factor: 7.8	Impinger Appearance:	
Run #: 2	Pitot Tube C_p: 0.84	Start Time: 0711	Silica Gel Spent (Y/N):	
Page 1 of 1	Nozzle Diameter (in.): 0.3	End Time: 0916	Filter #:	

Traverse Point Number	Sampling Time (min)	Vacuum (in Hg)	Velocity Head ΔP (in H_2O)	Orifice ΔH (in H_2O)	Stack Temp (°F)	Sample Volume 699.1923	Dry Gas Meter Temp Inlet (°F)	Dry Gas Meter Temp Outlet (°F)	Probe Temp (°F)	Box Temp (°F)	Impinger Exit Temp (°F)
1	5	3.5	0.25	1.9	170	703.625	58	62	243	254	58
2	10	3.5	0.24	1.9	170	707.45	59	66	255	247	59
3	15	3.5	0.26	2.03	170	711.27	60	69	254	251	61
4	20	3.5	0.25	1.9	171	715.075	62	73	250	255	65
5	25	3.5	0.25	1.9	170	718.89	62	74	240	248	65
1	30	3.5	0.23	1.8	170	722.72	63	74	249	251	65
2	35	3.5	0.25	1.9	171	726.55	65	75	248	250	64
3	40	3.5	0.26	2.0	171	730.4	65	75	249	246	63
4	45	3.5	0.25	1.9	169	737.27	65	76	249	247	61
5	50	3.5	0.24	1.9	168	738.145	66	76	249	243	60
1	55	3.5	0.23	1.8	167	742.02	66	76	250	250	59
2	60	3.5	0.23	1.8	170	745.9	66	75	250	238	59
3	65	3.5	0.25	1.9	173	749.79	66	76	249	256	59
4	70	3.5	0.25	1.9	173	753.69	67	76	250	257	59
5	75	3.5	0.27	2.1	173	757.62	67	76	251	254	59
1	80	3.5	0.23	1.8	175	761.515	67	76	251	247	59
2	85	3.5	0.24	1.9	171	765.4	67	76	251	246	58
3	90	3.5	0.24	1.9	171	769.305	67	76	249	247	56
4	95	3.5	0.25	1.9	171	773.22	67	76	249	255	57
5	100	3.5	0.25	1.9	171	778.14	67	76	250	245	57
1	105	3.5	0.23	1.8	171	781.04	68	77	250	243	58
2	110	3.5	0.24	1.9	172	784.97	68	77	250	253	58
3	115	3.5	0.25	1.9	173	788.89	68	77	250	249	58
4	120	3.5	0.26	2.0	176	792.915	68	77	251	249	58
5	125	3.5	0.26	2.0	178	796.983	69	77	250	253	58
	1-										

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client: Gem State
Start Time: 9:20 AM
Stop Time: 11:25 AM
Run 3

Test Date: 02-Oct-15
Emission Unit: Unit 2
Project No.: 203705130

Point #	Run Time	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temperature (°F)	Dry Gas Meter (dcf)	Meter Temperature (°F)		Corrected DGM $V_{m(std)}$ (dscf)	Stack Gas Velocity V_s (ft/sec)	Intermediate Isokinetic Rate (%)	DGM Flow Rate (dcf/min)
						In	Out				
Initial					798.588						
1	5	0.26	2.0	176	802.620	68	76	3.334	34.20	102.3	0.81
2	10	0.24	1.9	172	806.615	69	77	3.295	32.75	104.9	0.80
3	15	0.24	1.9	169	810.600	69	77	3.287	32.68	104.4	0.80
4	20	0.25	1.9	169	814.600	69	77	3.300	33.35	102.7	0.80
5	25	0.25	1.9	169	818.606	69	77	3.305	33.35	102.8	0.80
6	30	0.23	1.8	171	822.595	69	78	3.287	32.04	106.8	0.80
7	35	0.22	1.7	175	826.600	69	78	3.299	31.43	109.9	0.80
8	40	0.24	1.9	176	830.615	69	78	3.309	32.86	105.7	0.80
9	45	0.25	1.9	177	834.635	69	78	3.313	33.56	103.7	0.80
10	50	0.25	1.9	183	838.680	70	78	3.331	33.72	104.8	0.81
11	55	0.23	1.8	184	842.680	70	78	3.293	32.37	108.1	0.80
12	60	0.23	1.8	184	846.755	70	78	3.354	32.37	110.1	0.82
13	65	0.24	1.9	186	850.790	70	77	3.325	33.11	107.0	0.81
14	70	0.25	1.9	185	854.830	70	77	3.330	33.77	104.9	0.81
15	75	0.26	2.0	185	858.860	70	76	3.326	34.44	102.8	0.81
16	80	0.23	1.8	185	862.880	69	77	3.315	32.39	108.9	0.80
17	85	0.22	1.7	185	866.895	69	77	3.310	31.68	111.2	0.80
18	90	0.24	1.9	185	870.925	69	78	3.321	33.09	106.8	0.81
19	95	0.26	2.0	185	874.930	70	79	3.296	34.44	101.8	0.80
20	100	0.27	2.1	185	878.955	70	80	3.310	35.07	100.3	0.81
21	105	0.24	1.9	184	882.985	71	81	3.306	33.06	106.2	0.81
22	110	0.24	1.9	184	887.030	72	82	3.312	33.06	106.4	0.81
23	115	0.24	1.9	182	891.210	73	81	3.422	33.01	109.8	0.84
24	120	0.25	1.9	182	895.075	73	81	3.165	33.69	99.5	0.77
25	125	0.26	2.0	176	899.114	73	81	3.308	34.20	101.5	0.81
Max/Avg.	125	0.24	1.89	180	100.526	74		3.310	33.19	105.3	0.80

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client:	Gem State	Test Date:	02-Oct-15
Start Time:	9:20 AM	Emission Unit:	Unit 2
Stop Time:	11:25 AM	Project No.:	203705130
Run	3		

Sampling Time, min	125	Meter Calibration Factor, Y	0.9760	H_2O Collected, ml	208.0
Number of Sample Points	25	Nozzle Area, ft^2	0.00049	Net H_2O Collected, V_{lc}, ml	157.9
O_2, %	19.40	Corrected DGM, $V_{m(std)}$, dscf	82.8	Water Vapor Volume, $V_{wc(std)}$, scf	5.55
CO_2, %	0.30	Average ΔP, "H_2O	0.24	Water Vapor Volume, $V_{wsg(std)}$, scf	1.89
N_2 & CO, %	83.15	Average Square Root ΔP	0.49	Water Vapor, B_{ws}	0.0824
Barometric Pressure	25.40	Average ΔH, "H_2O	1.89	Moisture Factor, 1- B_{ws}	0.9176
Static Pressure, P_g, "H_2O	0.50	Stack Temperature, T_s, °R	640	Dry Molecular Weight, M_d, lb/lb-mole	29.62
Stack Pressure, P_s, "Hg	25.44	Meter Temperature, T_m, °R	534	Wet Molecular Weight, M_s, lb/lb-mole	28.66
Pitot Tube Calibration Coefficient, C_p	0.84	Stack Gas Velocity, V_s, ft/sec	33.19	% Isokinetic	105.2

Impinger Data

Impinger Content	Final Weight (g)	Initial Weight (g)	Net Weight (g)
H_2O	690.4	527.3	163.1
H_2O	603.5	602.7	0.8
Empty	733.5	729.4	4.1
Silica Gel	871.4	831.4	40.0
		Sub Total	208.0
		Sample Line Rinse	50.1
		Total	157.9

Mid Test Leak Checks

Time	DGM Start	DGM Final	Difference
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
		Sum	0

Stack Area, A_s, ft^2	5.14
Stack Flow Rate, acf/min	10,237
Stack Flow Rate, acf/hr	614,208
Stack Flow Rate, scf/min	7,183
Stack Flow Rate, scf/hr	430,955
Stack Flow Rate, dscf/min	6,591
Stack Flow Rate, dscf/hr	395,431

Stantec

FIELD DATA

Client: Gem State	Meter Box ID: 30	Stack Diameter (in.): 31.5x23.5	Test Method: 5/202	Pitot Tube Initial Leak: Pass
Unit: 2	Meter Yd: 0.976	Static Pressure: 0.5	Train Initial Leak: 0.001 @ 10	Pitot Tube Final Leak: Pass
Location: Burley, ID	Meter ΔH @: 1.965	P_{bar}: 25.65 ID: 5782	Train Final Leak: 0.005 @ 6"	Agency Observer:
Date: 10/2/15	Probe #: 6-3	Assumed Moisture: 7%	Filter Appearance: Clean	Test Anomalies: n/a
Technician: GK	Liner Material: Qtz	ΔH K-Factor: 7.8	Impinger Appearance: Clear	
Run #: 3	Pitot Tube C_p: 0.84	Start Time: 0920	Silica Gel Spent (Y/N): N	
Page 1 of 2	Nozzle Diameter (in.): 0.3	End Time: 1125	Filter #:	

Traverse Point Number	Sampling Time (min)	Vacuum (in Hg)	Velocity Head ΔP (in H_2O)	Orifice ΔH (in H_2O)	Stack Temp (°F)	Sample Volume 798.5588	Dry Gas Meter Temp Inlet (°F)	Dry Gas Meter Temp Outlet (°F)	Probe Temp (°F)	Box Temp (°F)	Impinger Exit Temp (°F)
1	5	3.5	0.26	2.0	176	802.62	68	76	251	258	57
2	10	3.5	0.24	1.9	172	806.615	69	77	251	250	57
3	15	3.5	0.24	1.9	169	810.600	69	77	250	251	57
4	20	3.5	0.25	1.9	169	814.600	69	77	250	244	58
5	25	3.5	0.25	1.9	169	818.606	69	77	250	252	57
1	30	3.5	0.23	1.8	171	822.595	69	78	250	250	57
2	35	3.5	0.22	1.7	175	826.600	69	78	249	254	57
3	40	3.5	0.24	1.9	176	830.615	69	78	250	245	57
4	45	3.5	0.25	1.9	177	834.635	69	78	250	243	57
5	50	3.5	0.25	1.9	183	838.68	70	78	256	253	57
1	55	3.5	0.23	1.8	184	842.68	70	78	250	242	57
2	60	3.5	0.23	1.8	184	846.755	70	78	249	251	57
3	65	3.5	0.24	1.9	186	850.79	70	77	248	255	57
4	70	3.5	0.25	1.9	185	854.83	70	77	252	247	58
5	75	3.5	0.26	2.0	185	858.86	70	76	251	244	58
1	80	3.5	0.23	1.8	185	862.88	69	77	251	253	59
2	85	3.5	0.22	1.7	185	866.895	69	77	251	244	60
3	90	3.5	0.24	1.9	185	870.925	69	78	251	253	61
4	95	3.5	0.26	2.0	185	874.93	70	79	251	253	61
5	100	3.5	0.27	2.1	185	878.955	70	80	251	255	61
1	105	3.5	0.24	1.9	184	882.985	71	81	250	254	61
2	110	3.5	0.24	1.9	184	887.03	72	82	249	256	61
3	115	3.5	0.24	1.9	182	891.21	73	81	249	254	62
4	120	3.5	0.25	1.9	182	895.075	73	81	250	245	62
5	125	3.5	0.26	2.0	176	899.114	73	81	250	250	62

Stantec

RECOVERY DATA

Client: Battle Born State	Test Method: M5/202
Unit: Unit 2	Date: 10-1-15
Location: Burley, ID	Project Number:

	RUN 1			RUN 2 F-2			RUN 3		
Filter Number:									
Impinger Contents:	Final	Initial	Net	Final	Initial	Net	Final	Initial	Net
	743.5	526.7		727.3	532.7		690.4	527.3	
				727.3					
	601.7	601.4		596.7	585.6		603.5	602.7	
	721.4	722.3		753.1	753.4		733.5	729.4	
	831.4	804.5		651.7	802.8		871.4	831.4	
Line Rinse, g			48.8			50.3			50.1
Total Weight, g									

Comments

Unit 3 Field Data Sheets

METHOD 2 - PRELIMINARY STACK GAS VELOCITY TRAVERSE AND CYCLONIC FLOW CHECK

Stack Shape: C=Circular, R=Rectangular	R
Stack Dimensions LxW (in.)	740.3
Number of Traverse Points	25
Stack Cross-Sectional Area (ft^2)	5.1
Barometric Pressure ("Hg)	25.40
Pitot Tube Calibration Coefficient (Cp)	0.84
Stack Static Pressure	1.9

Traverse Point #	ΔP ("H_2O)	√ΔP ("H_2O)	Stack Temp (°F)	Cyclonic Flow Determination ΔP @ 0°	Angle for ΔP=0	Abs. Angle for ΔP=0
1	0.39	0.62	198	5	0	0
2	0.39	0.62	198	10	0	0
3	0.35	0.59	198	10	0	0
4	0.35	0.59	198	0	0	0
5	0.36	0.60	198	5	0	0
6	0.37	0.61	198	5	0	0
7	0.35	0.59	198	5	0	0
8	0.37	0.61	198	10	0	0
9	0.38	0.62	198	5	0	0
10	0.35	0.59	198	5	0	0
11	0.33	0.57	198	0	0	0
12	0.37	0.61	198	10	0	0
13	0.35	0.59	198	5	0	0
14	0.36	0.60	198	5	0	0
15	0.36	0.60	198	10	0	0
16	0.38	0.62	198	0	0	0
17	0.38	0.62	198	0	0	0
18	0.38	0.62	198	5	0	0
19	0.35	0.59	198	10	0	0
20	0.33	0.57	198	10	0	0
21	0.38	0.62	198	0	0	0
22	0.36	0.60	198	0	0	0
23	0.37	0.61	198	5	0	0
24	0.37	0.61	198	5	0	0
25	0.38	0.62	198	0	0	0
Averages	0.36	0.60	198	5	0	0

Combustion/Ambient Source: C=Combustion, A=Ambient	A
Dry Molecular Weight of Stack Gas Estimate (g/g-mol)	29.00
Percent Moisture in Stack Gas (Estimate) (% H_2O)	7.00%
(1-Bws)	0.9300
Wet stack gas molecular weight	28.23
Stack Temperature (°F)	198
Stack Temperature (°R)	658
Stack Static Pressure ("H_2O)	1.9
Stack Gas Pressure ("Hg)	25.54
Avg. Delta P (ΔP)	0.36
Avg. of the Sqrt of Delta P (ΔP)	0.60
Stack Gas Velocity (ft/s)	41.37
Stack Gas Volumetric Flow Rate (dscfm)	8,127

Determination of Moisture by Wet Bulb/Dry Bulb

Dry Stack Temperature (°F)	
Dry Stack Temperature (°C)	
Wet Stack Temperature (°F)	
Wet Stack Temperature (°C)	
Stack Saturated Vapor Pressure (in. Hg)	
Stack Vapor Pressure (in. Hg)	
Stack Gas Moisture Content (%)	

Stantec

Initial Velocity Data

Client: ConocoPhillips	Stack Diameter (in.): 31½ x 23½	Meter Box ID: 2X	Run #:
Unit: 3	Coupling Length (in.)	Meter Y_d: 0.987	Type of Stack (C/R): R
Location: Bartlesville, OK	Static Pressure: +1.9	Meter ΔH @: 1.820	No. of Ports: 5
Date: 10/1/15 Time:	Pbar: 25.40 ID: 5702	Pitot Tube C_p: 0.84	Pitot Tube Initial Leak: Pass
Technician: DV, GK	Assumed Moisture: 7%	Pitot Tube #: 4-1	Pitot Tube Final Leak: Pass

Traverse Points			Port Selection															
			A				B				C				D			
#	W/O	W	T_s (°F)	ΔP ("H_2O)	ΔP@0°	Angle For ΔP=0	T_s (°F)	ΔP ("H_2O)	ΔP@0°	Angle For ΔP=0	T_s	ΔP ("H_2O)	ΔP@0°	Angle For ΔP=0	T_s (°F)	ΔP ("H_2O)	ΔP@0°	Angle For ΔP=0
1		2.4	198	0.39			198	0.57			198	0.33			198	0.36		
2		7.0		0.39				0.35				0.37				0.38		
3		11.8		0.35				0.37				0.35				0.38		
4		16.5		0.35				0.38				0.36				0.35		
5		21.2		0.36				0.35				0.36				0.33		
				Error														
1			198	0.38														
2				0.36														
3				0.37														
4				0.37														
5				0.38														

Stack Diagram	Port Location	Additional Information
		Wet Bulb Temp. (°F)
		Dry Bulb Temp. (°F)
		Diameter Upstream (A): 72
		Diameter Downstream (B): 200

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client: Gem State
Start Time: 4:25 PM
Stop Time: 6:27 PM
Run 1

Test Date: 01-Oct-15
Emission Unit: Unit 3
Project No.: 203705130

Point #	Run Time	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temperature (°F)	Dry Gas Meter (dcf)	Meter Temperature (°F)		Corrected DGM $V_{m(std)}$ (dscf)	Stack Gas Velocity V_s (ft/sec)	Intermediate Isokinetic Rate (%)	DGM Flow Rate (dcf/min)
						In	Out				
Initial					10.175						
1	5	0.40	2.20	190	14.785	92	98	3.798	43.98	119.3	0.92
2	10	0.42	2.31	190	19.435	92	99	3.829	45.07	117.4	0.93
3	15	0.35	1.92	191	23.865	93	97	3.647	41.18	122.6	0.89
4	20	0.36	1.98	191	28.130	92	96	3.518	41.76	116.6	0.85
5	25	0.25	1.37	191	31.750	93	95	2.980	34.80	118.5	0.72
6	30	0.21	1.15	191	35.225	94	97	2.852	31.89	123.7	0.70
7	35	0.23	1.26	189	38.475	92	96	2.675	33.33	110.7	0.65
8	40	0.13	0.71	190	41.680	93	98	2.627	25.08	144.7	0.64
9	45	0.27	1.48	191	45.635	93	99	3.246	36.17	124.2	0.79
10	50	0.31	1.70	192	49.660	93	99	3.305	38.78	118.1	0.81
11	55	0.26	1.43	192	53.800	93	98	3.400	35.52	132.7	0.83
12	60	0.37	2.03	193	58.330	92	98	3.730	42.40	122.1	0.91
13	65	0.36	1.98	194	62.725	92	97	3.622	41.86	120.3	0.88
14	70	0.32	1.76	195	66.355	92	96	2.992	39.49	105.5	0.73
15	75	0.15	0.82	194	69.235	93	97	2.363	27.02	121.6	0.58
16	80	0.14	0.77	194	72.725	93	97	2.863	26.10	152.5	0.70
17	85	0.36	1.98	195	77.125	93	97	3.623	41.89	120.4	0.88
18	90	0.37	2.03	197	81.715	93	97	3.780	42.53	124.1	0.92
19	95	0.44	2.42	197	86.265	92	94	3.764	46.38	113.4	0.91
20	100	0.33	1.81	198	90.605	92	94	3.584	40.20	124.7	0.87
21	105	0.38	2.09	198	95.025	91	92	3.663	43.13	118.8	0.88
22	110	0.36	1.98	197	99.240	92	93	3.486	41.95	116.0	0.84
23	115	0.29	1.59	198	102.970	92	93	3.081	37.68	114.4	0.75
24	120	0.22	1.21	198	106.520	92	93	2.929	32.82	124.8	0.71
25	125	0.25	1.37	198	110.210	92	93	3.046	34.99	121.8	0.74
Max/Avg.	125	0.30	1.65	194	100.035	94		3.296	37.84	122.0	0.80

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client:	Gem State	Test Date:	01-Oct-15
Start Time:	4:25 PM	Emission Unit:	Unit 3
Stop Time:	6:27 PM	Project No.:	203705130
Run	1		

Sampling Time, min	125	Meter Calibration Factor, Y	1.0140	H_2O Collected, ml	373.2
Number of Sample Points	25	Nozzle Area, ft^2	0.00041	Net H_2O Collected, V_{lc}, ml	323.5
O_2, %	19.40	Corrected DGM, $V_{m(std)}$, dscf	82.4	Water Vapor Volume, $V_{wc(std)}$, scf	14.24
CO_2, %	0.30	Average ΔP, "H_2O	0.30	Water Vapor Volume, $V_{wsg(std)}$, scf	0.99
N_2 & CO, %	80.30	Average Square Root ΔP	0.54	Water Vapor, B_{ws}	0.1560
Barometric Pressure	25.40	Average ΔH, "H_2O	1.65	Moisture Factor, 1- B_{ws}	0.8440
Static Pressure, P_g, "H_2O	1.90	Stack Temperature, T_s, °R	654	Dry Molecular Weight, M_d, lb/lb-mole	28.82
Stack Pressure, P_s, "Hg	25.54	Meter Temperature, T_m, °R	554	Wet Molecular Weight, M_s, lb/lb-mole	27.14
Pitot Tube Calibration Coefficient, C_p	0.84	Stack Gas Velocity, V_s, ft/sec	37.84	% Isokinetic	121.0

Impinger Data

Impinger Content	Final Weight (g)	Initial Weight (g)	Net Weight (g)
H_2O	795.7	521.4	274.3
H_2O	647.5	570.4	77.1
Empty	732.3	731.5	0.8
Silica Gel	922.5	901.5	21.0
		Sub Total	373.2
		Sample Line Rinse	49.7
		Total	323.5

Mid Test Leak Checks

Time	DGM Start	DGM Final	Difference
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
		Sum	0

Stack Area, A_s, ft^2	5.14
Stack Flow Rate, acf/min	11,670
Stack Flow Rate, acf/hr	700,225
Stack Flow Rate, scf/min	8,046
Stack Flow Rate, scf/hr	482,733
Stack Flow Rate, dscf/min	6,791
Stack Flow Rate, dscf/hr	407,437

Stantec

M5 Field Data

Client: Lemstar	Meter Box ID: 2x	Stack Diameter (in.): 23.5x 23.5	Test Method: 5-202	Pitot Tube Initial Leak: PASS
Unit: 3	Meter Yd: 0.987	Static Pressure: +1.9	Train Initial Leak: 0.000@10"Hg	Pitot Tube Final Leak: Pass
Location: IDAHO, BORLEY	Meter ΔH @: 1.820	P_{bar}: 25.4 ID: 5782	Train Final Leak: 0.000@10"Hg	Agency Observer: N/A
Date: 10/1/15	Probe #: 4-1	Assumed Moisture: >16	Filter Appearance: clean	Test Anomalies:
Technician: JA	Liner Material: QTZ	ΔH K-Factor: 5.5	Impinger Appearance: clear	
Run #: 1	Pitot Tube C_p: 0.84	Start Time: 1625	Silica Gel Spent (Y/N): N	
Page 1 of 1	Nozzle Diameter (in.): .275	End Time: 6:27 PM	Filter #:	

Traverse Point Number	Sampling Time (min)	Vacuum (in Hg)	Velocity Head ΔP (in H_2O)	Orifice ΔH (in H_2O)	Stack Temp (°F)	Sample Volume (ft^3)	Dry Gas Meter Temp Inlet (°F)	Dry Gas Meter Temp Outlet (°F)	Probe Temp (°F)	Box Temp (°F)	Impinger Exit Temp (°F)
						10.175					
1	5	7	.40	2.2	190	14.785	92	98	254	250	54
2	10	7	.42	2.31	190	19.435	92	99	255	251	54
3	15	6	.35	1.92	191	23.865	93	97	249	253	55
4	20	6	.36	1.98	191	28.130	92	96	250	252	55
5	25	6	.25	1.37	191	31.750	93	95	251	249	55
6	30	4.5	.21	1.15	191	35.225	94	97	253	251	56
7	35	4.5	.23	1.26	189	38.475	92	96	253	251	56
8	40	4	.13	0.71	190	41.680	93	98	251	252	57
9	45	5	.27	1.48	191	45.635	93	99	249	251	57
10	50	4.5	.31	1.70	192	49.660	93	99	251	250	57
11	55	5	.26	1.43	192	53.800	93	98	251	251	57
12	60	6.5	.37	2.03	193	58.330	92	98	250	250	55
13	65	7	.36	1.98	194	62.725	92	97	250	251	55
14	70	6	.32	1.76	195	66.355	92	96	249	249	55
15	75	3	.15	0.82	194	69.235	93	97	250	249	55
16	80	3	.14	0.77	194	72.725	93	97	251	250	56
17	85	6	.36	1.98	195	77.125	93	97	251	250	56
18	90	6	.37	2.03	197	81.715	93	97	251	251	57
19	95	7	.44	2.42	197	86.265	92	94	250	252	57
20	100	6	.33	1.81	198	90.605	92	94	250	251	57
21	105	6.5	.38	2.09	198	95.025	91	92	249	249	54
22	110	6	.36	1.98	197	99.240	92	93	250	251	54
23	115	5	.29	1.59	198	102.970	92	93	251	249	55
24	120	4.5	.22	1.21	198	106.520	92	93	250	250	55
25	125	4.5	.25	1.37	198	110.210	92	93	250	249	56

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client: Gem State
Start Time: 8:11 AM
Stop Time: 10:17 AM
Run 2

Test Date: 02-Oct-15
Emission Unit: Unit 3
Project No.: 203705130

Point #	Run Time	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temperature (°F)	Dry Gas Meter (dcf)	Meter Temperature (°F) In	Meter Temperature (°F) Out	Corrected DGM $V_{m(std)}$ (dscf)	Stack Gas Velocity V_s (ft/sec)	Intermediat Isokinetic Rate (%)	DGM Flow Rate (dcf/min)
Initial					322.655						
1	5	0.37	2.03	213	326.540	62	62	3.401	42.53	114.9	0.78
2	10	0.36	1.98	212	330.395	62	61	3.378	41.92	115.6	0.77
3	15	0.36	1.98	213	334.250	65	62	3.365	41.96	115.2	0.77
4	20	0.36	1.98	213	338.600	65	62	3.797	41.96	130.0	0.87
5	25	0.30	0.75	212	341.030	65	62	2.113	38.27	79.2	0.49
6	30	0.37	2.03	207	344.790	65	62	3.282	42.34	110.4	0.75
7	35	0.37	2.03	205	348.815	68	62	3.504	42.28	117.6	0.80
8	40	0.36	1.98	208	352.790	67	62	3.463	41.80	118.1	0.80
9	45	0.38	2.09	209	356.795	67	62	3.490	42.98	116.0	0.80
10	50	0.40	2.20	208	360.800	70	62	3.481	44.06	112.7	0.80
11	55	0.39	2.14	209	364.720	70	63	3.404	43.54	111.6	0.78
12	60	0.38	2.09	209	368.640	70	63	3.403	42.98	113.1	0.78
13	65	0.37	2.03	208	372.525	70	63	3.372	42.38	113.5	0.78
14	70	0.36	1.98	208	376.315	70	63	3.289	41.80	112.2	0.76
15	75	0.36	1.98	209	380.100	71	63	3.282	41.83	112.0	0.76
16	80	0.36	1.98	209	383.900	71	63	3.295	41.83	112.5	0.76
17	85	0.36	1.98	209	387.690	71	63	3.286	41.83	112.2	0.76
18	90	0.37	2.03	209	391.500	71	63	3.304	42.41	111.3	0.76
19	95	0.37	2.10	209	395.330	71	62	3.325	42.41	112.0	0.77
20	100	0.38	2.09	209	399.165	71	63	3.326	42.98	110.5	0.77
21	105	0.39	2.14	209	403.030	71	63	3.353	43.54	110.0	0.77
22	110	0.39	2.14	209	406.890	71	62	3.352	43.54	109.9	0.77
23	115	0.37	2.03	209	410.735	71	62	3.337	42.41	112.4	0.77
24	120	0.37	2.03	209	414.560	71	62	3.320	42.41	111.8	0.76
25	125	0.38	2.09	209	418.410	71	62	3.342	42.98	111.1	0.77
Max/Avg.	125	0.37	2.00	209	95.755	66		3.331	42.36	112.2	0.77

Stantec Consulting Service

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client:	Gem State	Test Date:	02-Oct-15
Start Time:	8:11 AM	Emission Unit:	Unit 3
Stop Time:	10:17 AM	Project No.:	203705130
Run	2		

Sampling Time, min	125	Meter Calibration Factor, Y	1.0140	H_2O Collected, ml	385.9
Number of Sample Points	25	Nozzle Area, ft^2	0.00041	Net H_2O Collected, V_{lc}, ml	335.9
O_2, %	19.40	Corrected DGM, $V_{m(std)}$, dscf	83.3	Water Vapor Volume, $V_{wc(std)}$, scf	14.85
CO_2, %	0.30	Average ΔP, "H_2O	0.37	Water Vapor Volume, $V_{wsg(std)}$, scf	0.96
N_2 & CO, %	83.25	Average Square Root ΔP	0.61	Water Vapor, B_{ws}	0.1596
Barometric Pressure	25.40	Average ΔH, "H_2O	2.00	Moisture Factor, 1- B_{ws}	0.8404
Static Pressure, P_g, "H_2O	1.90	Stack Temperature, T_s, °R	669	Dry Molecular Weight, M_d, lb/lb-mole	29.65
Stack Pressure, P_s, "Hg	25.54	Meter Temperature, T_m, °R	526	Wet Molecular Weight, M_s, lb/lb-mole	27.79
Pitot Tube Calibration Coefficient, C_p	0.84	Stack Gas Velocity, V_s, ft/sec	42.36	% Isokinetic	112.3

Impinger Data

Impinger Content	Final Weight (g)	Initial Weight (g)	Net Weight (g)
H_2O	892.4	602.7	289.7
H_2O	725.3	649.1	76.2
Empty	646.3	646.7	-0.4
Silica Gel	903.4	883.0	20.4
		Sub Total	385.9
		Sample Line Rinse	50.0
		Total	335.9

Mid Test Leak Checks

Time	DGM Start	DGM Final	Difference
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
		Sum	0

Stack Area, A_s, ft^2	5.14
Stack Flow Rate, acf/min	13,065
Stack Flow Rate, acf/hr	783,906
Stack Flow Rate, scf/min	8,798
Stack Flow Rate, scf/hr	527,859
Stack Flow Rate, dscf/min	7,394
Stack Flow Rate, dscf/hr	443,626

Stantec

M5 Field Data

Client: GEM STATE	Meter Box ID: ~~2x~~ 4X	Stack Diameter (in.): 31½ x 23½	Test Method: 5-202	Pitot Tube Initial Leak: PASS
Unit: UNIT 3	Meter Yd: ~~0.987~~ 1.014	Static Pressure: -1.9	Train Initial Leak: 0.000 @ 10" HG	Pitot Tube Final Leak: PASS
Location: IDAHO	Meter ΔH @: ~~1.820~~ 2.049	P_{bar}: 25.4 ID: 5782	Train Final Leak: 0.000 @ 10" HG	Agency Observer: N/A
Date: 10/2/15	Probe #: 4-1	Assumed Moisture:	Filter Appearance: GOOD	Test Anomalies:
Technician: JA	Liner Material: QTZ	ΔH K-Factor: 5.5	Impinger Appearance: GOOD	
Run #: 2	Pitot Tube C_p:	Start Time: ~~8:11 AM~~	Silica Gel Spent (Y/N): N	
Page 1 of 1	Nozzle Diameter (in.): .275	End Time: 10:17 AM	Filter #:	

SAMPLE VOL START – 322.655

Traverse Point Number	Sampling Time (min)	Vacuum (in Hg)	Velocity Head ΔP (in H_2O)	Orifice ΔH (in H_2O)	Stack Temp (°F)	Sample Volume	Dry Gas Meter Temp Inlet (°F)	Dry Gas Meter Temp Outlet (°F)	Probe Temp (°F)	Box Temp (°F)	Impinger Exit - Temp (°F)
1	5	6	.37	2.63	213	326.540	62	62	253	250	55
2	10	6	.36	1.98	212		62	61	253	221	55
3	15	6	.36	1.98	213	334.25	65	62	241	250	55
4	20	6	.36	1.98	213	338.6	65	63	250	250	56
5	25	6	.30	0.75	212	341.03	65	62	250	251	55
6	30	6	0.37	2.03	207	344.740	65	62	250	251	54
7	35	6	0.37	2.03	205	348.815	68	62	250	251	54
8	40	6	.36 ~~1.98~~	1.98	208	352.790	67	62	250	249	54
9	45	6	.38	~~2.08~~	2.09		67	62	250	250	55
10	50	6	.40	2.20	208	360.800	70	62	249	250	56
11	55	6	.39	2.14	209	364.720	70	63	250	250	56
12	60	6	.38	2.09	209	368.640	70	63	251	253	56
13	65	6	.37	2.03	208	372.525	70	63	250	251	57
14	70	6	.36	1.98	208	376.315	70	63	250	250	57
15	75	6	.36	1.98	209	380.100	71	63	250	252	57
16	80	6	.36	1.98	209	383.900	71	63	251	250	57
17	85	6	.36	1.98	209	387.690	71	63	251	252	55
18	90	6	.37	2.03	209	391.500	71	62	251	251	55
19	95	6	.37	2.03	209	395.330	71	62	250	249	55
20	100	6	.38	2.09	209	399.165	71	63	249	249	56
21	105	6	.39	2.14	209	403.030	71	63	250	250	56
22	110	6	.39	2.14	209	406.890	71	62	251	249	56
23	115	6	.37	2.03	209	410.735	71	62	251	251	56
	120	6	.37	2.03	209	414.560	71	62	251	251	57
	125	6	.38	2.09	209	418.410	71	62	249	250	57

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client: Gem State
Start Time: 10:19 AM
Stop Time: 12:24 PM
Run 3

Test Date: 02-Oct-15
Emission Unit: Unit 3
Project No.: 203705130

Point #	Run Time	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temperature (°F)	Dry Gas Meter (dcf)	Meter Temperature (°F) In	Meter Temperature (°F) Out	Corrected DGM $V_{m(std)}$ (dscf)	Stack Gas Velocity V_s (ft/sec)	Intermediat Isokinetic Rate (%)	DGM Flow Rate (dcf/min)
Initial					419.700						
1	5	0.39	2.14	214	423.600	71	66	3.373	43.90	113.2	0.78
2	10	0.38	2.09	214	427.505	71	66	3.377	43.33	114.8	0.78
3	15	0.37	2.03	214	431.305	71	66	3.286	42.76	113.2	0.76
4	20	0.39	2.14	214	435.165	71	66	3.339	43.90	112.0	0.77
5	25	0.38	2.09	214	439.040	71	65	3.354	43.33	114.0	0.78
6	30	0.36	1.98	214	442.900	71	65	3.340	42.18	116.7	0.77
7	35	0.35	1.92	214	446.750	71	65	3.331	41.59	118.0	0.77
8	40	0.35	1.92	214	450.615	71	65	3.344	41.59	118.4	0.77
9	45	0.37	2.03	214	454.460	71	65	3.328	42.76	114.6	0.77
10	50	0.39	2.14	214	458.300	71	65	3.325	43.90	111.6	0.77
11	55	0.38	2.09	214	462.120	71	65	3.307	43.33	112.4	0.76
12	60	0.37	2.03	214	465.910	71	65	3.280	42.76	113.0	0.76
13	65	0.37	2.03	214	470.110	71	65	3.635	42.76	125.2	0.84
14	70	0.36	1.98	214	473.410	71	65	2.856	42.18	99.7	0.66
15	75	0.36	1.98	214	477.150	71	65	3.237	42.18	113.0	0.75
16	80	0.38	2.09	214	480.865	71	65	3.216	43.33	109.3	0.74
17	85	0.35	1.92	214	484.575	71	65	3.210	41.59	113.7	0.74
18	90	0.35	1.92	214	488.335	71	65	3.253	41.59	115.2	0.75
19	95	0.35	1.92	214	492.085	71	65	3.245	41.59	114.9	0.75
20	100	0.39	2.14	214	495.865	71	65	3.273	43.90	109.8	0.76
21	105	0.39	2.14	214	499.640	71	65	3.268	43.90	109.7	0.75
22	110	0.38	2.09	214	503.370	71	65	3.229	43.33	109.8	0.75
23	115	0.38	2.09	214	507.105	71	65	3.233	43.33	109.9	0.75
24	120	0.38	2.09	214	510.835	71	65	3.229	43.33	109.8	0.75
25	125	0.39	2.14	214	514.575	71	65	3.238	43.90	108.7	0.75
Max/Avg.	125	0.37	2.05	214	94.875	68		3.284	42.89	112.8	0.76

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client:	Gem State	Test Date:	02-Oct-15
Start Time:	10:19 AM	Emission Unit:	Unit 3
Stop Time:	12:24 PM	Project No.:	203705130
Run	3		

Sampling Time, min	125	Meter Calibration Factor, Y	1.0140	H_2O Collected, ml	431.8
Number of Sample Points	25	Nozzle Area, ft^2	0.00041	Net H_2O Collected, V_{lc}, ml	380.5
O_2, %	19.40	Corrected DGM, $V_{m(std)}$, dscf	82.1	Water Vapor Volume, $V_{wc(std)}$, scf	16.81
CO_2, %	0.30	Average ΔP, "H_2O	0.37	Water Vapor Volume, $V_{wsg(std)}$, scf	1.09
N_2 & CO, %	83.15	Average Square Root ΔP	0.61	Water Vapor, B_{ws}	0.1791
Barometric Pressure	25.40	Average ΔH, "H_2O	2.05	Moisture Factor, 1- B_{ws}	0.8209
Static Pressure, P_g, "H_2O	1.90	Stack Temperature, T_s, °R	674	Dry Molecular Weight, M_d, lb/lb-mole	29.62
Stack Pressure, P_s, "Hg	25.54	Meter Temperature, T_m, °R	528	Wet Molecular Weight, M_s, lb/lb-mole	27.54
Pitot Tube Calibration Coefficient, C_p	0.84	Stack Gas Velocity, V_s, ft/sec	42.89	% Isokinetic	112.8

Impinger Data

Impinger Content	Final Weight (g)	Initial Weight (g)	Net Weight (g)
H_2O	848.3	522.3	326.0
H_2O	653.7	571.4	82.3
Empty	732.7	732.4	0.3
Silica Gel	945.7	922.5	23.2
		Sub Total	431.8
		Sample Line Rinse	51.3
		Total	380.5

Mid Test Leak Checks

Time	DGM Start	DGM Final	Difference
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
		Sum	0

Stack Area, A_s, ft^2	5.14
Stack Flow Rate, acf/min	13,229
Stack Flow Rate, acf/hr	793,719
Stack Flow Rate, scf/min	8,846
Stack Flow Rate, scf/hr	530,756
Stack Flow Rate, dscf/min	7,262
Stack Flow Rate, dscf/hr	435,722

Stantec

M5 Field Data

Client: GEM STATE	Meter Box ID: 4x	Stack Diameter (in.): 31½ x 23½	Test Method: 5 - 202	Pitot Tube Initial Leak: PASS	
Unit: UNIT 3	Meter Yd: 1.014	Static Pressure: +1.9	Train Initial Leak: 0.060 @ 10"Hg	Pitot Tube Final Leak: PASS	
Location: BURLEY, IDAHO	Meter ΔH @: 2.048	P_{bar}: 25.4 ID: 5782	Train Final Leak: 0.000 @ 10"Hg	Agency Observer: N/A	
Date: 10/2/15	Probe #: 4-1	Assumed Moisture: 7%	Filter Appearance: GOOD	Test Anomalies:	
Technician: JA	Liner Material: QTZ	ΔH K-Factor: 5.5	Impinger Appearance: GOOD		
Run #: 3	Pitot Tube C_p: 0.84	Start Time: 10:19 AM	Silica Gel Spent (Y/N): N		
Page 1 of 1	Nozzle Diameter (in.): .275	End Time: 12:24 PM	Filter #:		

Traverse Point Number	Sampling Time (min)	Vacuum (in Hg)	Velocity Head ΔP (in H_2O)	Orifice ΔH (in H_2O)	Stack Temp (°F)	Sample Volume (419 ft³ 700)	Dry Gas Meter Temp Inlet (°F)	Dry Gas Meter Temp Outlet (°F)	Probe Temp (°F)	Box Temp (°F)	Impinger Exit Temp (°F)
1	5	5	.39	2.14	214	423.600	71	66	249	246	55
2	10	5	.38	2.09	214	427.505	71	66	251	251	55
3	15	5	.37	2.03	214	431.305	71	66	250	252	55
4	20	5	.39	2.14	214	435.165	71	66	251	252	56
5	25	5	.38	2.09	214	439.040	71	65	251	253	56
6	30	5	.36	1.98	214	442.900	71	65	249	249	56
7	35	5	.35	1.92	214	446.760	71	65	251	251	57
8	40	5	.35	1.92	214	450.615	71	65	251	251	57
9	45	5	.37	2.03	214	454.460	71	65	250	249	57
10	50	5	.39	2.14	214	458.300	71	65	249	248	55
11	55	5	.38	2.09	214	462.120	71	65	250	249	55
12	60	5	.37	2.03	214	465.910	71	65	252	253	55
13	65	5	.37	2.03	214	470.110	71	65	249	250	56
14	70	5	.36	1.98	214	473.410	71	65	250	250	56
15	75	5	.36	1.98	214	477.150	71	65	250	252	57
16	80	5	.38	2.09	214	480.865	71	65	250	252	57
17	85	5	.35	1.92	214	484.575	71	65	250	249	58
18	90	5	.35	1.92	214	488.335	71	65	250	249	58
19	95	5	.35	1.92	214	492.085	71	65	250	249	58
20	100	5	.39	2.14	214	495.865	71	65	250	248	58
21	105	5	.39	2.14	214	499.640	71	65	250	248	58
22	110	5	.38	2.09	214	503.370	71	65	250	248	58
23	115	5	.38	2.09	214	507.105	71	65	250	246	55
24	120	5	.38	2.09	214	510.835	71	65	250	251	55
25	125	5	.39	2.14	214	514.575	71	65	249	250	55

Stantec

RECOVERY DATA

Client: Gem State	Test Method: M202
Unit: Unit 3	Date: 10-1-15
Location: Burley, ID	Project Number:

	RUN 1			RUN 2			RUN 3		
Filter Number:									
Impinger Contents:	Final	Initial	Net	Final	Initial	Net	Final	Initial	Net
Blank	785.7	521.4		892.4	502.7		848.7	522.3	
Blank	647.5	570.4		725.3	648.1		653.7	571.4	
H2O	732.3	731.5		646.3	646.7		732.7	732.4	
Silica	922.5	401.5		903.4	883.0		945.7	922.5	
Line Rinse, g			49.7			50.0			51.3
Total Weight, g									

Comments

Unit 4 Field Data Sheets

METHOD 2 - PRELIMINARY STACK GAS VELOCITY TRAVERSE AND CYCLONIC FLOW CHECK

Stack Shape: C=Circular, R=Rectangular	R
Stack Dimensions LxW (in.)	891.2
Number of Traverse Points	25
Stack Cross-Sectional Area (ft^2)	6.2
Barometric Pressure ("Hg)	25.40
Pitot Tube Calibration Coefficient (Cp)	0.84
Stack Static Pressure	1.7

Traverse Point #	ΔP ("H_2O)	√ΔP ("H_2O)	Stack Temp (°F)	Cyclonic Flow Determination		
				ΔP @ 0°	Angle for ΔP=0	Abs. Angle for ΔP=0
1	0.59	0.77	165	5	0	0
2	0.59	0.77	165	10	0	0
3	0.55	0.74	165	10	0	0
4	0.56	0.75	165	0	0	0
5	0.57	0.75	165	5	0	0
6	0.55	0.74	165	5	0	0
7	0.57	0.75	165	5	0	0
8	0.58	0.76	165	10	0	0
9	0.55	0.74	165	5	0	0
10	0.53	0.73	165	5	0	0
11	0.57	0.75	165	0	0	0
12	0.55	0.74	165	10	0	0
13	0.56	0.75	165	5	0	0
14	0.56	0.75	165	5	0	0
15	0.58	0.76	165	10	0	0
16	0.58	0.76	165	0	0	0
17	0.58	0.76	165	0	0	0
18	0.58	0.76	165	5	0	0
19	0.55	0.74	165	10	0	0
20	0.53	0.73	165	10	0	0
21	0.58	0.76	165	0	0	0
22	0.56	0.75	165	0	0	0
23	0.57	0.75	165	5	0	0
24	0.57	0.75	165	5	0	0
25	0.58	0.76	165	0	0	0
Averages	0.57	0.75	165	5	0	0

Combustion/Ambient Source: C=Combustion, A=Ambient	A
Dry Molecular Weight of Stack Gas Estimate (g/g-mol)	29.00
Percent Moisture in Stack Gas (Estimate) (% H_2O)	7.00%
(1-Bws)	0.9300
Wet stack gas molecular weight	28.23
Stack Temperature (°F)	165
Stack Temperature (°R)	625
Stack Static Pressure ("H_2O)	1.7
Stack Gas Pressure ("Hg)	25.53
Avg. Delta P (ΔP)	0.57
Avg. of the Sqrt of Delta P (ΔP)	0.75
Stack Gas Velocity (ft/s)	50.27
Stack Gas Volumetric Flow Rate (dscfm)	12,510

Determination of Moisture by Wet Bulb/Dry Bulb

Dry Stack Temperature (°F)	
Dry Stack Temperature (°C)	
Wet Stack Temperature (°F)	
Wet Stack Temperature (°C)	
Stack Saturated Vapor Pressure (in. Hg)	
Stack Vapor Pressure (in. Hg)	
Stack Gas Moisture Content (%)	

Stantec

INITIAL VELOCITY DATA

Client: GemStafe	Stack Diameter (in.): 36 3/4 x 24 1/4	Meter Box ID: 5X	Run #:
Unit: 4	Coupling Length (in.) 0	Meter Y_d: 0.990	Type of Stack (C/R): R
Location: Burley, ID	Static Pressure: +1.7	Meter ΔH @: 1.735	No. of Ports: 5
Date: 10/1 Time:	Pbar: 25.40 ID: 5702	Pitot Tube C_p: 0.84	Pitot Tube Initial Leak: Pass
Technician: GK, DV	Assumed Moisture: 7%	Pitot Tube #: 6-2	Pitot Tube Final Leak: Pass

Traverse Points			Port Selection															
			A				B				C				D			
#	W/O	W	T_s (°F)	ΔP ("H_2O)	ΔP@0°	Angle For ΔP=0	T_s (°F)	ΔP ("H_2O)	ΔP@0°	Angle For ΔP=0	T_s	ΔP ("H_2O)	ΔP@0°	Angle For ΔP=0	T_s (°F)	ΔP ("H_2O)	ΔP@0°	Angle For ΔP=0
1		2.4	165	0.59				0.55				0.57			0	0.56		
2		7.3		0.59				0.57				0.55				0.56		
3		12.1		0.55				0.58				0.56				0.58		
4		17.0		0.56				0.55				0.56				0.55		
5		21.8		0.57				0.53				0.56				0.53		
				E														
1				0.58														
2				0.56														
3				0.57														
4				0.57														
5				0.58														

Stack Diagram	Port Location	Additional Information
		Wet Bulb Temp. (°F)
		Dry Bulb Temp. (°F)
		Diameter Upstream (A): 72
		Diameter Downstream (B): 200

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client: Gem State
Start Time: 4:25 PM
Stop Time: 6:34 PM
Run 1

Test Date: 01-Oct-15
Emission Unit: Unit 4
Project No.: 203705130

Point #	Run Time	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temperature (°F)	Dry Gas Meter (dcf)	Meter Temperature (°F)		Corrected DGM $V_{m(std)}$ (dscf)	Stack Gas Velocity V_s (ft/sec)	Intermediate Isokinetic Rate (%)	DGM Flow Rate (dcf/min)
						In	Out				
Initial					248.640						
1	5	0.50	1.25	154	251.935	91	91	2.662	48.02	89.9	0.66
2	10	0.55	1.37	190	255.145	94	91	2.587	51.81	85.7	0.64
3	15	0.56	1.40	191	258.765	95	92	2.913	52.32	95.7	0.72
4	20	0.57	1.42	191	262.515	96	93	3.012	52.79	98.1	0.75
5	25	0.57	1.42	182	266.245	98	92	2.993	52.42	96.8	0.75
6	30	0.60	1.50	154	270.160	99	93	3.137	52.60	96.7	0.78
7	35	0.58	1.45	155	274.060	100	93	3.122	51.76	98.0	0.78
8	40	0.59	1.47	154	277.965	100	94	3.123	52.16	97.1	0.78
9	45	0.56	1.40	155	281.835	100	94	3.094	50.86	98.8	0.77
10	50	0.56	1.40	156	285.700	100	94	3.090	50.90	98.8	0.77
11	55	0.58	1.45	158	289.595	99	94	3.118	51.88	98.1	0.78
12	60	0.59	1.47	158	293.465	99	94	3.098	52.33	96.6	0.77
13	65	0.55	1.37	156	297.300	99	95	3.066	50.44	98.9	0.77
14	70	0.57	1.42	156	301.200	99	95	3.119	51.35	98.8	0.78
15	75	0.61	1.52	157	304.985	99	94	3.030	53.16	92.9	0.76
16	80	0.56	1.40	157	308.860	99	95	3.098	50.94	99.1	0.78
17	85	0.62	1.55	158	312.770	99	93	3.133	53.64	95.3	0.78
18	90	0.61	1.52	158	316.790	99	93	3.221	53.21	98.8	0.80
19	95	0.63	1.57	158	320.660	99	92	3.104	54.07	93.7	0.77
20	100	0.59	1.47	157	324.560	99	93	3.125	52.29	97.4	0.78
21	105	0.55	1.37	158	328.315	99	93	3.008	50.52	97.2	0.75
22	110	0.56	1.40	158	332.100	99	92	3.035	50.98	97.2	0.76
23	115	0.56	1.40	158	335.900	99	93	3.044	50.98	97.4	0.76
24	120	0.60	1.50	158	339.730	99	93	3.069	52.77	94.9	0.77
25	125	0.59	1.47	158	343.575	99	93	3.081	52.33	96.1	0.77
Max/Avg.	125	0.58	1.44	162	94.935	96		3.043	51.86	96.3	0.76

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client:	Gem State	Test Date:	01-Oct-15
Start Time:	4:25 PM	Emission Unit:	Unit 4
Stop Time:	6:34 PM	Project No.:	203705130
Run	1		

Sampling Time, min	125	Meter Calibration Factor, Y	0.9900	H_2O Collected, ml	399.0
Number of Sample Points	25	Nozzle Area, ft^2	0.00034	Net H_2O Collected, V_{lc}, ml	348.9
O_2, %	19.40	Corrected DGM, $V_{m(std)}$, dscf	76.1	Water Vapor Volume, $V_{wc(std)}$, scf	15.28
CO_2, %	0.30	Average ΔP, "H_2O	0.58	Water Vapor Volume, $V_{wsg(std)}$, scf	1.14
N_2 & CO, %	80.30	Average Square Root ΔP	0.76	Water Vapor, B_{ws}	0.1775
Barometric Pressure	25.40	Average ΔH, "H_2O	1.44	Moisture Factor, 1- B_{ws}	0.8225
Static Pressure, P_g, "H_2O	1.70	Stack Temperature, T_s, °R	622	Dry Molecular Weight, M_d, lb/lb-mole	28.82
Stack Pressure, P_s, "Hg	25.53	Meter Temperature, T_m, °R	556	Wet Molecular Weight, M_s, lb/lb-mole	26.90
Pitot Tube Calibration Coefficient, C_p	0.84	Stack Gas Velocity, V_s, ft/sec	51.87	% Isokinetic	96.4

Impinger Data

Impinger Content	Final Weight (g)	Initial Weight (g)	Net Weight (g)
H_2O	871.7	554.7	317.0
H_2O	655.7	605.7	50.0
Empty	755.6	747.8	7.8
Silica Gel	835.7	811.5	24.2
		Sub Total	399.0
		Sample Line Rinse	50.1
		Total	348.9

Mid Test Leak Checks

Time	DGM Start	DGM Final	Difference
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
		Sum	0

Stack Area, A_s, ft^2	6.19
Stack Flow Rate, acf/min	19,259
Stack Flow Rate, acf/hr	1,155,547
Stack Flow Rate, scf/min	13,952
Stack Flow Rate, scf/hr	837,096
Stack Flow Rate, dscf/min	11,475
Stack Flow Rate, dscf/hr	688,505

Stantec

M5 Field Data

Client: Gem State	Meter Box ID: 5X	Stack Diameter (in.): 36.75x24.25	Test Method: M2/M5	Pitot Tube Initial Leak: Pass
Unit: Unit 4	Meter Yd: 0.990	Static Pressure: +1.7	Train Initial Leak: 0.001@15"Hg	Pitot Tube Final Leak: Pass
Location: Burley ID	Meter ΔH @: 1.73	P_{bar}: 25.4 ID: 57.62	Train Final Leak: 0.000@15"Hg	Agency Observer: N/A
Date: 10-1	Probe #: G-2	Assumed Moisture: 7%	Filter Appearance: clean	Test Anomalies:
Technician: MV	Liner Material: Qtz	ΔH K-Factor: 2.5	Impinger Appearance: clear	
Run #: R1	Pitot Tube C_p: 0.84	Start Time: 6:16	Silica Gel Spent (Y/N): N	
Page 1 of 1	Nozzle Diameter (in.): 0.25	End Time: 6:34 PM	Filter #:	

Traverse Point Number	Sampling Time (min)	Vacuum (in Hg)	Velocity Head ΔP (in H_2O)	Orifice ΔH (in H_2O)	Stack Temp (°F)	Sample Volume (ft^3)	Dry Gas Meter Temp Inlet (°F)	Dry Gas Meter Temp Outlet (°F)	Probe Temp (°F)	Box Temp (°F)	Impinger Exit Temp (°F)
						254.64					
1	5	4	.50	1.25	154	254.935	91	91	245	225	65
2	10	4	.55	1.37	190	255.145	94	91	251	250	55
3	15	4	.56	1.40	191	258.765	95	92	252	250	55
4	20	4.5	.57	1.42	191	262.515	96	93	251	249	55
5	25	4.5	.57	1.42	182	266.245	98	92	251	249	56
6	30	5	.60	1.50	154	270.160	99	93	251	249	56
7	35	5	.58	1.45	155	274.060	100	93	250	250	57
8	40	5	.59	1.47	154	277.965	100	94	250	250	57
9	45	5	.56	1.40	155	281.835	100	94	251	250	58
10	50	5	.56	1.40	156	285.700	100	94	250	250	59
11	55	5	.58	1.45	158	289.595	99	94	250	251	55
12	60	5	.59	1.47	158	293.465	99	94	251	251	55
13	65	5	.55	1.37	156	297.300	99	95	252	251	55
14	70	5	.57	1.42	156	301.200	99	95	250	249	56
15	75	5	.61	1.52	157	304.985	99	94	251	249	56
16	80	5	.56	1.40	157	308.860	99	95	250	249	56
17	85	5	.62	1.55	158	312.770	99	93	251	250	57
18	90	5	.61	1.52	158	316.740	99	93	251	249	57
19	95	5	.63	1.57	158	320.660	99	92	249	250	54
20	100	5	.59	1.47	157	324.560	99	93	250	250	54
21	105	5	.55	1.37	158	328.315	99	93	250	249	55
22	110	5	.56	1.40	158	332.100	99	92	251	250	55
23	115	5	.56	1.40	158	335.900	99	93	249	250	56
24	120	5	.60	1.50	158	339.730	99	93	251	249	56
24	124	5	.59	1.47	158	343.575	99	93	251	250	56

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client: Gem State
Start Time: 7:29 AM
Stop Time: 9:34 AM
Run 2

Test Date: 02-Oct-15
Emission Unit: Unit 4
Project No.: 203705130

Point #	Run Time	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temperature (°F)	Dry Gas Meter (dcf)	Meter Temperature (°F)		Corrected DGM $V_{m(std)}$ (dscf)	Stack Gas Velocity V_s (ft/sec)	Intermediate Isokinetic Rate (%)	DGM Flow Rate (dcf/min)
						In	Out				
Initial					356.290						
1	5	0.54	1.35	155	360.330	71	62	3.417	49.08	110.0	0.81
2	10	0.55	1.37	155	363.950	71	62	3.062	49.54	97.7	0.72
3	15	0.53	1.32	153	367.665	71	62	3.142	48.55	101.9	0.74
4	20	0.57	1.42	154	371.335	72	63	3.099	50.39	97.0	0.73
5	25	0.54	1.35	154	374.965	72	63	3.064	49.04	98.6	0.73
6	30	0.54	1.35	154	378.855	72	63	3.284	49.04	105.6	0.78
7	35	0.58	1.45	154	382.400	72	63	2.994	50.83	92.9	0.71
8	40	0.60	1.50	155	386.205	72	64	3.210	51.74	98.1	0.76
9	45	0.61	1.52	155	390.005	72	64	3.206	52.17	97.1	0.76
10	50	0.54	1.35	154	393.660	72	64	3.083	49.04	99.2	0.73
11	55	0.55	1.37	154	397.350	72	64	3.112	49.50	99.2	0.74
12	60	0.55	1.37	154	401.000	72	64	3.079	49.50	98.1	0.73
13	65	0.57	1.42	155	404.480	72	64	2.936	50.43	92.0	0.70
14	70	0.53	1.32	156	407.940	72	64	2.918	48.67	94.9	0.69
15	75	0.54	1.35	156	411.400	71	64	2.921	49.12	94.1	0.69
16	80	0.55	1.37	158	414.850	71	64	2.913	49.66	93.1	0.69
17	85	0.53	1.32	158	418.410	71	64	3.005	48.75	97.9	0.71
18	90	0.54	1.35	158	421.955	71	64	2.993	49.20	96.6	0.71
19	95	0.57	1.42	156	425.600	71	64	3.078	50.47	96.5	0.73
20	100	0.56	1.40	153	429.070	71	66	2.924	49.90	92.3	0.69
21	105	0.54	1.35	153	432.625	71	66	2.995	49.00	96.3	0.71
22	110	0.54	1.35	153	436.200	71	66	3.012	49.00	96.8	0.71
23	115	0.55	1.37	153	439.700	71	66	2.949	49.46	93.9	0.70
24	120	0.52	1.30	155	443.235	71	66	2.978	48.17	97.7	0.71
25	125	0.52	1.30	156	446.775	71	65	2.985	48.21	98.0	0.71
Max/Avg.	125	0.55	1.37	155	90.485	68		3.054	49.54	97.4	0.72

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client: Gem State
Start Time: 7:29 AM
Stop Time: 9:34 AM
Run 2

Test Date: 02-Oct-15
Emission Unit: Unit 4
Project No.: 203705130

Sampling Time, min	125	Meter Calibration Factor, Y	0.9900	H_2O Collected, ml	346.9
Number of Sample Points	25	Nozzle Area, ft^2	0.00034	Net H_2O Collected, Vlc, ml	296.8
O_2, %	19.40	Corrected DGM, $V_{m(std)}$, dscf	76.4	Water Vapor Volume, $V_{wc(std)}$, scf	12.97
CO_2, %	0.30	Average ΔP, "H_2O	0.55	Water Vapor Volume, $V_{wsg(std)}$, scf	1.00
N_2 & CO, %	83.25	Average Square Root ΔP	0.74	Water Vapor, B_{ws}	0.1547
Barometric Pressure	25.40	Average ΔH, "H_2O	1.37	Moisture Factor, 1- B_{ws}	0.8453
Static Pressure, P_g, "H_2O	1.70	Stack Temperature, T_s, °R	615	Dry Molecular Weight, M_d, lb/lb-mole	29.65
Stack Pressure, P_s, "Hg	25.53	Meter Temperature, T_m, °R	528	Wet Molecular Weight, M_s, lb/lb-mole	27.85
Pitot Tube Calibration Coefficient, C_p	0.84	Stack Gas Velocity, V_s, ft/sec	49.54	% Isokinetic	97.4

Impinger Data

Impinger Content	Final Weight (g)	Initial Weight (g)	Net Weight (g)
H_2O	807.8	529.1	278.7
H_2O	683.2	641.7	41.5
Empty	711.4	705.9	5.5
Silica Gel	778.4	757.2	21.2
		Sub Total	346.9
		Sample Line Rinse	50.1
		Total	296.8

Mid Test Leak Checks

Time	DGM Start	DGM Final	Difference
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
		Sum	0

Stack Area, A_s, ft^2	6.19
Stack Flow Rate, acf/min	18,395
Stack Flow Rate, acf/hr	1,103,715
Stack Flow Rate, scf/min	13,477
Stack Flow Rate, scf/hr	808,598
Stack Flow Rate, dscf/min	11,392
Stack Flow Rate, dscf/hr	683,545

Stantec

M5 Field Data

Client: GEM STATE	Meter Box ID: 5X	Stack Diameter (in.): 36.75x24¼	Test Method: 5-202	Pitot Tube Initial Leak: PASS	
Unit: UNIT 4	Meter Yd: 0.990	Static Pressure: -1.7	Train Initial Leak: 0.000 @ 10" Hg	Pitot Tube Final Leak: PASS	
Location: IDAHO, BURLEY	Meter ΔH @: 1.735	P_{bar}: 25.40 ID: 5782	Train Final Leak: 0.000 @ 10" Hg	Agency Observer: N/A	
Date: 10/2/15	Probe #: C-2	Assumed Moisture:	Filter Appearance: GOOD	Test Anomalies:	
Technician: JA	Liner Material: QT2	ΔH K-Factor: .25	Impinger Appearance: GOOD		
Run #: 2	Pitot Tube C_p: 0.84	Start Time: 7:29 AM	Silica Gel Spent (Y/N): N		
Page 1 of 1	Nozzle Diameter (in.): .25	End Time: 9:34 AM	Filter #:		

Traverse Point Number	Sampling Time (min)	Vacuum (in Hg)	Velocity Head ΔP (in H_2O)	Orifice ΔH (in H_2O)	Stack Temp (°F)	Sample Volume (ft^3)	Dry Gas Meter Temp Inlet (°F)	Dry Gas Meter Temp Outlet (°F)	Probe Temp (°F)	Box Temp (°F)	Impinger Exit Temp (°F)
						356.240					
1	5	5	.54	1.35	155	360.330	71	62	247	249	55
2	10	5	.55	1.37	155	363.950	71	62	248	250	55
3	15	5	.53	1.32	153	367.665	71	62	252	253	55
4	20	4.5	.57	1.42	154	371.335	72	63	250	250	56
5	25	4.5	.54	1.35	154	374.965	72	63	251	250	56
6	30	4.5	.54	1.35	154	378.855	72	63	251	249	56
7	35	4.5	.58	1.45	154	382.400	72	63	250	248	56
8	40	4.5	.60	1.5	155	386.205	72	64	250	250	57
9	45	4.5	.61	1.52	155	390.005	72	64	251	252	57
10	50	4.5	.54	1.35	154	393.660	72	64	251	249	57
11	55	4.5	.55	1.37	154	397.350	72	64	250	250	57
12	60	4.5	.55	1.37	154	401 —	72	64	250	249	57
13	65	4.5	.57	1.42	155	404.480	72	64	250	250	55
14	70	4.5	.53	1.32	156	411.400	72	64	250	250	55
15	75	4.5	.54	1.35	156	~~414.~~ ↓	71	64	249	250	55
16	80	4.5	.55	1.37	158	414.850	71	64	250	249	55
17	85	4.5	.53	1.32	158	418.410	71	64	250	250	56
18	90	4.5	.54	1.35	158	421.955	71	64	250	251	56
19	95	4.5	.57	1.42	156	425.600	71	64	250	251	56
20	100	4.5	.56	1.40	153	429.070	71	66	251	251	56
21	105	4.5	.54	1.35	153	432.625	71	66	251	251	56
22	110	4.5	.54	1.35	153	436.200	71	66	251	251	56
23	115	4.5	.55	1.37	153	439.700	71	66	251	251	57
24	120	4.5	.52	1.30	155	493.235	71	66	251	251	57
25	125	4.5	.52	1.30	156	446.775	71	65	250	251	56

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client: Gem State
Start Time: 9:37 AM
Stop Time: 11:42 AM
Run 3

Test Date: 02-Oct-15
Emission Unit: Unit 4
Project No.: 203705130

Point #	Run Time	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temperature (°F)	Dry Gas Meter (dcf)	Meter Temperature (°F)		Corrected DGM $V_{m(std)}$ (dscf)	Stack Gas Velocity V_s (ft/sec)	Intermediate Isokinetic Rate (%)	DGM Flow Rate (dcf/min)
						In	Out				
Initial					447.500						
1	5	0.55	1.37	159	451.540	71	65	3.407	49.87	110.6	0.81
2	10	0.56	1.40	159	455.565	74	65	3.386	50.32	108.9	0.80
3	15	0.60	1.50	167	459.395	74	66	3.219	52.43	100.7	0.77
4	20	0.58	1.45	168	463.205	74	66	3.202	51.59	101.9	0.76
5	25	0.57	1.42	168	467.055	74	66	3.235	51.14	103.9	0.77
6	30	0.59	1.47	171	470.885	74	66	3.219	52.15	101.9	0.77
7	35	0.58	1.45	171	474.730	75	66	3.228	51.71	103.0	0.77
8	40	0.61	1.52	171	478.570	75	66	3.225	53.03	100.3	0.77
9	45	0.57	1.42	171	482.420	75	66	3.232	51.26	104.1	0.77
10	50	0.57	1.42	171	486.255	75	66	3.220	51.26	103.6	0.77
11	55	0.58	1.45	171	490.100	75	66	3.228	51.71	103.0	0.77
12	60	0.56	1.40	159	493.915	75	66	3.203	50.32	103.0	0.76
13	65	0.57	1.42	171	497.725	75	66	3.199	51.26	103.0	0.76
14	70	0.60	1.50	168	501.545	75	66	3.208	52.47	100.4	0.76
15	75	0.59	1.47	168	505.340	75	66	3.187	52.03	100.6	0.76
16	80	0.55	1.37	168	509.150	75	66	3.198	50.23	104.6	0.76
17	85	0.57	1.42	168	512.950	75	66	3.190	51.14	102.5	0.76
18	90	0.54	1.35	168	516.855	75	66	3.278	49.78	108.1	0.78
19	95	0.54	1.35	168	520.540	75	66	3.093	49.78	102.1	0.74
20	100	0.53	1.32	168	524.335	75	66	3.185	49.31	106.1	0.76
21	105	0.54	1.35	168	528.105	75	66	3.165	49.78	104.4	0.75
22	110	0.54	1.35	168	532.005	75	66	3.274	49.78	108.0	0.78
23	115	0.55	1.37	168	535.670	75	66	3.077	50.23	100.6	0.73
24	120	0.55	1.37	168	539.420	75	66	3.148	50.23	102.9	0.75
25	125	0.55	1.37	168	543.170	75	66	3.148	50.23	102.9	0.75
Max/Avg.	125	0.57	1.41	168	95.670	70		3.214	50.92	103.6	0.77

METHOD 5 PARTICULATE EMISSION CALCULATIONS

Client: Gem State
Start Time: 9:37 AM
Stop Time: 11:42 AM
Run 3

Test Date: 02-Oct-15
Emission Unit: Unit 4
Project No.: 203705130

Sampling Time, min	125	Meter Calibration Factor, Y	0.9900	H_2O Collected, ml	398.3
Number of Sample Points	25	Nozzle Area, ft^2	0.00034	Net H_2O Collected, Vlc, ml	348.1
O_2, %	19.40	Corrected DGM, $V_{m(std)}$, dscf	80.4	Water Vapor Volume, $V_{wc(std)}$, scf	15.23
CO_2, %	0.30	Average ΔP, "H_2O	0.57	Water Vapor Volume, $V_{wsg(std)}$, scf	1.15
N_2 & CO, %	83.15	Average Square Root ΔP	0.75	Water Vapor, B_{ws}	0.1694
Barometric Pressure	25.40	Average ΔH, "H_2O	1.41	Moisture Factor, 1- B_{ws}	0.8306
Static Pressure, P_g, "H_2O	1.70	Stack Temperature, T_s, °R	628	Dry Molecular Weight, M_d, lb/lb-mole	29.62
Stack Pressure, P_s, "Hg	25.53	Meter Temperature, T_m, °R	530	Wet Molecular Weight, M_s, lb/lb-mole	27.65
Pitot Tube Calibration Coefficient, C_p	0.84	Stack Gas Velocity, V_s, ft/sec	50.92	% Isokinetic	103.6

Impinger Data

Impinger Content	Final Weight (g)	Initial Weight (g)	Net Weight (g)
H_2O	865.7	554.8	310.9
H_2O	658.6	606.4	52.2
Empty	766.4	755.6	10.8
Silica Gel	860.1	835.7	24.4
		Sub Total	398.3
		Sample Line Rinse	50.2
		Total	348.1

Mid Test Leak Checks

Time	DGM Start	DGM Final	Difference
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
0:00	0	0	0
		Sum	0

Stack Area, A_s, ft^2	6.19
Stack Flow Rate, acf/min	18,908
Stack Flow Rate, acf/hr	1,134,501
Stack Flow Rate, scf/min	13,568
Stack Flow Rate, scf/hr	814,099
Stack Flow Rate, dscf/min	11,270
Stack Flow Rate, dscf/hr	676,221

Stantec

M5 Field Data

Client: GEM STATE	Meter Box ID: 5x	Stack Diameter (in.): 36 3/4 x 24 1/4	Test Method: 5-202	Pitot Tube Initial Leak: PASS
Unit: UNIT 4	Meter Yd: 0.990	Static Pressure: +1.7	Train Initial Leak: 0.000 @ 10" Hg	Pitot Tube Final Leak: PASS
Location: BURLEY, IDAHO	Meter ΔH @: 1.735	P_{bar}: 25.40 ID: 5782	Train Final Leak: 0.000 @ 10" Hg	Agency Observer: NA
Date: 10/2/25	Probe #: 6-2	Assumed Moisture: 7%	Filter Appearance: GOOD	Test Anomalies:
Technician: JA	Liner Material: QTZ	ΔH K-Factor: 2.5	Impinger Appearance: GOOD	
Run #: 3	Pitot Tube C_p: 0.84	Start Time: 9:37 AM	Silica Gel Spent (Y/N): N	
Page ___ of 1	Nozzle Diameter (in.): .25	End Time: 11:42 AM	Filter #:	

Traverse Point Number	Sampling Time (min)	Vacuum (in Hg)	Velocity Head ΔP (in H_2O)	Orifice ΔH (in H_2O)	Stack Temp (°F)	Sample Volume 447[ft³]500	Dry Gas Meter Temp Inlet (°F)	Dry Gas Meter Temp Outlet (°F)	Probe Temp (°F)	Box Temp (°F)	Impinger Exit Temp (°F)
1	5	4.5	.55	1.37	159	451.540	71	65	247	249	55
2	10	4.5	.56	1.40	159	455.565	74	65	252	251	55
3	15	4.5	.60	1.5	167	459.395	74	66	249	248	56
4	20	4.5	.58	1.45	168	463.265	74	66	249	250	56
5	25	4.5	.57	1.42	168	467.055	74	66	250	249	56
6	30	4.5	.59	1.47	171	470.885	74	66	250	249	56
7	35	4.5	.58	1.45	171	474.720	75	66	250	249	57
8	40	4.5	.61	1.52	171	478.570	75	66	249	249	57
9	45	4.5	.57	1.42	171	482.420	75	66	249	249	55
10	50	4.5	.57	1.42	171	486.255	75	66	250	251	55
11	55	4.5	.58	1.45	171	490.100	75	66	250	251	55
12	60	4.5	.56	1.40	159	493.915	75	66	251	250	56
13	65	4.5	.57	1.42	171	497.725	75	66	250	251	56
14	70	4.5	.60	1.5	168	501.545	75	66	249	249	56
15	75	4.5	.59	1.47	168	505.340	75	66	251	251	57
16	80	4.5	.55	1.37	168	509.150	75	66	251	251	57
17	85	4.5	.57	1.42	168	512.950	75	66	250	249	57
18	90	4.5	.54	1.35	168	516.855	75	66	250	249	56
19	95	4.5	.54	1.35	168	520.540	75	66	250	249	56
20	100	4.5	.53	1.32	168	524.335	75	66	251	251	56
21	105	4.5	.54	1.35	168	528.105	75	66	250	249	56
22	110	4.5	.54	1.35	168	532.005	75	66	250	250	57
23	115	4.5	.55	1.37	168	535.670	75	66	251	250	57
24	120	4.5	.55	1.37	168	539.420	75	66	251	250	57
25	125	4.5	.55	1.37	168	543.170	75	66	249	249	58

Stantec

RECOVERY DATA

Client: Gem State	Test Method: M5/202
Unit: Unit 4	Date: 10-1-15
Location: Burley, ID	Project Number:

	RUN 1			RUN 2			RUN 3		
Filter Number:									
Impinger Contents:	Final	Initial	Net	Final	Initial	Net	Final	Initial	Net
	891.7	554.7		807.8	528.1		885.7	554.8	
	655.7	605.7		683.2	641.7		658.6	606.4	
	755.6	747.8		711.4	705.8		766.4	755.6	
	835.7	811.5		778.4	757.3		860.1	835.7	
Line Rinse, g			50.1			50.1			50.2
Total Weight, g									

Comments

APPENDIX C LABORATORY RESULTS

STANTEC
Laboratory Analysis Results

Client: Gemstate
Unit ID: Blanks
Method: 5/202

Project: 203705130
Report Date: 10/9/2015

Sample ID	Tin/Filter ID	Run #	Sample Description	Sample Media	Sample Date	Samples Received	Sample Volume (ml)	Final Gross Mass (g)	Final Tare Mass (g)	Net Mass (g)
15-0312	4796	Blank	Filter Blank	Filter	9/30/2015	10/5/2015	—	0.3659	0.3655	0.0004
15-0313	313	Blank	P/N Rinse	Acetone	9/30/2015	10/5/2015	25	2.2211	2.2199	0.0012
15-0314	314	Blank	Hexane Blank	Hexane	9/30/2015	10/5/2015	50	2.2239	2.2232	0.0007
15-0315	315	Blank	H2O Blank	H2O	9/30/2015	10/5/2015	50	2.2343	2.2280	0.0063
15-0316	316	Blank	FTB Organic	Hexane	10/1/2015	10/5/2015	250	2.2432	2.2426	0.0006
15-0317	317	Blank	FTB Inorganic	H2O	10/1/2015	10/5/2015	250	2.7136	2.7123	0.0013

Unit 1 Laboratory Results

Stantec

EPA METHOD 3 GAS ANALYSIS DATA FORM

Client/Facility: Penn State Unit 1	Location: Hepburn IP
Date: 10/1/15	Run Number: R1
Sampling Time: (24-hr Clock) 1500	Sample Type: (Bag, Integrated, Continuous)
Analytical Method: M3 Fyrite	Ambient Temperature: 72°
Technicians: DV	

RUN	1		2		3		Average Net Volume	Multiplier	Molecular Weight of Stack Gas (Dry Basis) M_d
GAS	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net			
CO_2	1.4		1.3		1.3	.03		0.44	
O_2 (net is actual O_2 reading minus actual CO_2 reading)	19.4		19.4		19.4	19.4		0.32	
CO (net is actual CO reading minus actual O_2 reading)								0.28	
N_2 (net is 100 minus actual CO reading)								0.28	
☐ Initial Leak Check ☐ Final Leak Check								**Total**	

Stantec

EPA METHOD 3 GAS ANALYSIS DATA FORM

Client/Facility: GemState Unit 1	Location: Heyburn ID
Date: 10/2/15	Run Number: R2
Sampling Time: R07 (24-hr Clock)	Sample Type: (Bag, Integrated, Continuous)
Analytical Method: M3 Fyrite	Ambient Temperature: 51°
Technicians: DV	

RUN	1		2		3		Average Net Volume	Multiplier	Molecular Weight of Stack Gas (Dry Basis) M_d
GAS	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net			
CO_2	.4		.4		.4		.4	0.44	
O_2 (net is actual O_2 reading minus actual CO_2 reading)	19.4		19.4		19.4		19.4	0.32	
CO (net is actual CO reading minus actual O_2 reading)								0.28	
N_2 (net is 100 minus actual CO reading)								0.28	
Initial Leak Check		Final Leak Check						**Total**	

Stantec

EPA Method 3 Gas Analysis Data Form

Client/Facility: Gem State	Location: Heyburn ID
Date: 10/2/15	Run Number: R3
Sampling Time: 1215 (24-hr Clock)	Sample Type: (Bag, Integrated, Continuous)
Analytical Method: M3 Fyrite	Ambient Temperature: 51°
Technicians: AV	

RUN	1		2		3		Average Net Volume	Multiplier	Molecular Weight of Stack Gas (Dry Basis) M_d
GAS	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net			
CO_2	.4		.3		.3		.3	0.44	
O_2 (net is actual O_2 reading minus actual CO_2 reading)	19.4		19.5		19.4		19.4	0.32	
CO (net is actual CO reading minus actual O_2 reading)								0.28	
N_2 (net is 100 minus actual CO reading)								0.28	
Initial Leak Check			Final Leak Check					**Total**	

STANTEC
Laboratory Analysis Results

Client: Gemstate
Unit ID: 1
Method: 5/202

Project: 203705130
Report Date: 10/9/2015

Sample ID	Tin/Filter ID	Run #	Sample Description	Sample Media	Sample Date	Samples Received	Sample Volume (ml)	Final Gross Mass (g)	Final Tare Mass (g)	Net Mass (g)
15-0264	264	1	P/N Rinse	Acetone	10/1/2015	10/5/2015	100	2.2420	2.2412	0.0008
15-0265	265	2	P/N Rinse	Acetone	10/1/2015	10/5/2015	100	2.2474	2.2467	0.0007
15-0266	266	3	P/N Rinse	Acetone	10/1/2015	10/5/2015	100	2.2259	2.2252	0.0007
15-0267	4810	1	Filter	Filter	10/1/2015	10/5/2015	—	0.4057	0.4050	0.0007
15-0268	4802	2	Filter	Filter	10/1/2015	10/5/2015	—	0.4065	0.4058	0.0007
15-0269	4700	3	Filter	Filter	10/1/2015	10/5/2015	—	0.3990	0.3984	0.0006
15-0270	270	1	Organic Fraction	Hexane	10/1/2015	10/5/2015	220	2.2675	2.2578	0.0097
15-0271	271	2	Organic Fraction	Hexane	10/1/2015	10/5/2015	195	2.2738	2.2660	0.0078
15-0272	272	3	Organic Fraction	Hexane	10/1/2015	10/5/2015	265	2.2593	2.2497	0.0096
15-0273	273	1	Inorganic Fraction	H2O	10/1/2015	10/5/2015	350	2.2643	2.2638	0.0005
15-0274	274	2	Inorganic Fraction	H2O	10/1/2015	10/5/2015	350	2.2741	2.2728	0.0013
15-0275	275	3	Inorganic Fraction	H2O	10/1/2015	10/5/2015	250	2.2429	2.2418	0.0011

Unit 2 Laboratory Results

Stantec

EPA Method 3 Gas Analysis Data Form

Client/Facility: Gemstate Unit 2	Location: Hagerman ID
Date: 10/1/15	Run Number: R1
Sampling Time: 1805 (24-hr Clock)	Sample Type: (Bag, Integrated, Continuous)
Analytical Method: M3 Fyrite	Ambient Temperature: 77
Technicians: DV	

RUN	1		2		3		Average Net Volume	Multiplier	Molecular Weight of Stack Gas (Dry Basis) M_d
GAS	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net			
CO_2	0.2		0.3		0.3		0.3	0.44	
O_2 (net is actual O_2 reading minus actual CO_2 reading)	19.2		19.5		19.5		19.4	0.32	
CO (net is actual CO reading minus actual O_2 reading)								0.28	
N_2 (net is 100 minus actual CO reading)								0.28	
Initial Leak Check		Final Leak Check						**Total**	

Stantec

EPA Method 3 Gas Analysis Data Form

Client/Facility: Gem State	Location: Heyburn ID
Date: 10/2/15	Run Number: R2
Sampling Time: 1210 (24-hr Clock)	Sample Type: (Bag, Integrated, Continuous)
Analytical Method: M3 Fyrite	Ambient Temperature: 52
Technicians: MV	

RUN	1		2		3		Average Net Volume	Multiplier	Molecular Weight of Stack Gas (Dry Basis) M_d
GAS	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net			
CO_2	0.3		0.3		0.4		0.3	0.44	
O_2 (net is actual O_2 reading minus actual CO_2 reading)	19.4		19.4		19.5		19.4	0.32	
CO (net is actual CO reading minus actual O_2 reading)								0.28	
N_2 (net is 100 minus actual CO reading)								0.28	
Initial Leak Check ✓ Final Leak Check ✓								**Total**	

STANTEC
Laboratory Analysis Results

Client: Gemstate
Unit ID: 2
Method: 5/202

Project: 203705130
Report Date: 10/9/2015

Sample ID	Tin/Filter ID	Run #	Sample Description	Sample Media	Sample Date	Samples Received	Sample Volume (ml)	Final Gross Mass (g)	Final Tare Mass (g)	Net Mass (g)
15-0276	276	1	P/N Rinse	Acetone	10/2/2015	10/5/2015	100	2.2289	2.2280	0.0009
15-0277	277	2	P/N Rinse	Acetone	10/2/2015	10/5/2015	100	2.2492	2.2481	0.0011
15-0278	278	3	P/N Rinse	Acetone	10/2/2015	10/5/2015	100	2.2526	2.2520	0.0006
15-0279	4771	1	Filter	Filter	10/2/2015	10/5/2015	—	0.3740	0.3732	0.0008
15-0280	4725	2	Filter	Filter	10/2/2015	10/5/2015	—	0.3692	0.3683	0.0009
15-0281	4775	3	Filter	Filter	10/2/2015	10/5/2015	—	0.3747	0.3737	0.0010
15-0282	282	1	Organic Fraction	Hexane	10/2/2015	10/5/2015	185	2.2447	2.2357	0.0090
15-0283	283	2	Organic Fraction	Hexane	10/2/2015	10/5/2015	170	2.2504	2.2420	0.0084
15-0284	284	3	Organic Fraction	Hexane	10/2/2015	10/5/2015	155	2.2682	2.2584	0.0098
15-0285	285	1	Inorganic Fraction	H2O	10/2/2015	10/5/2015	405	2.2568	2.2537	0.0031
15-0286	286	2	Inorganic Fraction	H2O	10/2/2015	10/5/2015	340	2.2560	2.2551	0.0009
15-0287	287	3	Inorganic Fraction	H2O	10/2/2015	10/5/2015	360	2.2550	2.2531	0.0019

Unit 3 Laboratory Results

Stantec

EPA Method 3 Gas Analysis Data Form

Client/Facility: GemState unit 3	Location: Heyburn ID
Date: 10/1/15	Run Number: R1
Sampling Time: (24-hr Clock) 1807	Sample Type: (Bag, Integrated, Continuous) C
Analytical Method: M3 fyrite	Ambient Temperature: 77
Technicians: DJ	

RUN	1		2		3		Average Net Volume	Multiplier	Molecular Weight of Stack Gas (Dry Basis) M_d
GAS	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net			
CO_2	0.3		0.2		0.3		0.3	0.44	
O_2 (net is actual O_2 reading minus actual CO_2 reading)	19.4		19.4		19.3		19.4	0.32	
CO (net is actual CO reading minus actual O_2 reading)								0.28	
N_2 (net is 100 minus actual CO reading)								0.28	
☐ Initial Leak Check ☐ Final Leak Check								**Total**	

Stantec

EPA Method 3 Gas Analysis Data Form

Client/Facility: Cimstate unit 3	Location: Heyburn ID
Date: 10/2/15	Run Number: R 2
Sampling Time: (24-hr Clock) 1221	Sample Type: (Bag, Integrated, Continuous)
Analytical Method: M3 fyrite	Ambient Temperature: 52°
Technicians: AV	

RUN	1		2		3		Average Net Volume	Multiplier	Molecular Weight of Stack Gas (Dry Basis) Md
GAS	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net			
CO_2	0.2		0.3		0.3		0.3	0.44	
O_2 (net is actual O_2 reading minus actual CO_2 reading)	19.4		19.4		19.5		19.4	0.32	
CO (net is actual CO reading minus actual O_2 reading)								0.28	
N_2 (net is 100 minus actual CO reading)								0.28	
☐ Initial Leak Check ☐ Final Leak Check								**Total**	

Stantec

EPA METHOD 3 GAS ANALYSIS DATA FORM

Client/Facility: Comstate	Location: Hepburn IP
Date: R3	Run Number: R3
Sampling Time: 1225 (24-hr Clock)	Sample Type: (Bag, Integrated, Continuous)
Analytical Method: M3 Fyrite	Ambient Temperature: 52
Technicians: DV	

RUN	1		2		3		Average Net Volume	Multiplier	Molecular Weight of Stack Gas (Dry Basis) M_d
GAS	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net			
CO_2	0.3		0.3		0.3	0.3		0.44	
O_2 (net is actual O_2 reading minus actual CO_2 reading)	19.4		19.5		19.4	19.4		0.32	
CO (net is actual CO reading minus actual O_2 reading)								0.28	
N_2 (net is 100 minus actual CO reading)								0.28	
☐ Initial Leak Check ☐ Final Leak Check								**Total**	

STANTEC
Laboratory Analysis Results

Client: Gemstate
Unit ID: 3
Method: 5/202

Project: 203705130
Report Date: 10/9/2015

Sample ID	Tin/Filter ID	Run #	Sample Description	Sample Media	Sample Date	Samples Received	Sample Volume (ml)	Final Gross Mass (g)	Final Tare Mass (g)	Net Mass (g)
15-0288	288	1	P/N Rinse	Acetone	10/2/2015	10/5/2015	100	2.2759	2.2747	0.0012
15-0289	289	2	P/N Rinse	Acetone	10/2/2015	10/5/2015	100	2.2287	2.2276	0.0011
15-0290	290	3	P/N Rinse	Acetone	10/2/2015	10/5/2015	100	2.2276	2.2262	0.0014
15-0291	4724	1	Filter	Filter	10/2/2015	10/5/2015	—	0.3664	0.3659	0.0005
15-0292	4731	2	Filter	Filter	10/2/2015	10/5/2015	—	0.3625	0.3620	0.0005
15-0293	4730	3	Filter	Filter	10/2/2015	10/5/2015	—	0.3659	0.3652	0.0007
15-0294	294	1	Organic Fraction	Hexane	10/2/2015	10/5/2015	225	2.2600	2.2499	0.0101
15-0295	295	2	Organic Fraction	Hexane	10/2/2015	10/5/2015	200	2.2593	2.2504	0.0089
15-0296	296	3	Organic Fraction	Hexane	10/2/2015	10/5/2015	250	2.2557	2.2456	0.0101
15-0297	297	1	Inorganic Fraction	H2O	10/2/2015	10/5/2015	750	2.2366	2.2353	0.0013
15-0298	298	2	Inorganic Fraction	H2O	10/2/2015	10/5/2015	450	2.2532	2.2518	0.0014
15-0299	299	3	Inorganic Fraction	H2O	10/2/2015	10/5/2015	500	2.2409	2.2405	0.0004

Unit 4 Laboratory Results

Stantec

EPA Method 3 Gas Analysis Data Form

Client/Facility: GemState Unit 4	Location: Heyburn ID
Date: 10/1/15	Run Number: R1
Sampling Time: 1811 (24-hr Clock)	Sample Type: (Bag, Integrated, Continuous)
Analytical Method: M3 fyrite	Ambient Temperature: 78°
Technicians: DV	

RUN	1		2		3		Average Net Volume	Multiplier	Molecular Weight of Stack Gas (Dry Basis) M_d
GAS	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net			
CO_2	0.4		0.3		0.3		0.3	0.44	
O_2 (net is actual O_2 reading minus actual CO_2 reading)	19.3		19.4		19.5		19.4	0.32	
CO (net is actual CO reading minus actual O_2 reading)								0.28	
N_2 (net is 100 minus actual CO reading)								0.28	
☒ Initial Leak Check ☒ Final Leak Check								**Total**	

Stantec

EPA METHOD 3 GAS ANALYSIS DATA FORM

Client/Facility: Gem State Unit 4	Location: Heyburn ID
Date: 10/2/15	Run Number: R2
Sampling Time: 1227 (24-hr Clock)	Sample Type: (Bag, Integrated, Continuous)
Analytical Method: M3 Fyrite	Ambient Temperature: 52°
Technicians: MV	

RUN	1		2		3		Average Net Volume	Multiplier	Molecular Weight of Stack Gas (Dry Basis) M_d
GAS	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net			
CO_2	0.4		0.3		0.3	0	0.3	0.44	
O_2 (net is actual O_2 reading minus actual CO_2 reading)	19.4		19.4		19.4		19.4	0.32	
CO (net is actual CO reading minus actual O_2 reading)								0.28	
N_2 (net is 100 minus actual CO reading)								0.28	
☐ Initial Leak Check ☐ Final Leak Check								**Total**	

Stantec

EPA METHOD 3 GAS ANALYSIS DATA FORM

Client/Facility: Genstar	Location: Hepburn ID
Date: 10/2/15	Run Number: R3
Sampling Time: (24-hr Clock) 1233	Sample Type: (Bag, Integrated, Continuous)
Analytical Method: M3 fyr,7e	Ambient Temperature: 53°
Technicians: DV	

RUN	1		2		3		Average Net Volume	Multiplier	Molecular Weight of Stack Gas (Dry Basis) M_d
GAS	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net			
CO_2	.3		.4		0.2		0.3	0.44	
O_2 (net is actual O_2 reading minus actual CO_2 reading)	19.5		19.4		19.4		19.4	0.32	
CO (net is actual CO reading minus actual O_2 reading)								0.28	
N_2 (net is 100 minus actual CO reading)								0.28	
☐ Initial Leak Check ☐ Final Leak Check								**Total**	

STANTEC
Laboratory Analysis Results

Client: Gemstate
Unit ID: 4
Method: 5/202

Project: 203705130
Report Date: 10/9/2015

Sample ID	Tin/Filter ID	Run #	Sample Description	Sample Media	Sample Date	Samples Received	Sample Volume (ml)	Final Gross Mass (g)	Final Tare Mass (g)	Net Mass (g)
15-0300	300	1	P/N Rinse	Acetone	10/2/2015	10/5/2015	100	2.2515	2.2503	0.0012
15-0301	301	2	P/N Rinse	Acetone	10/2/2015	10/5/2015	100	2.2394	2.2385	0.0009
15-0302	302	3	P/N Rinse	Acetone	10/2/2015	10/5/2015	100	2.2361	2.2355	0.0006
15-0303	4735	1	Filter	Filter	10/2/2015	10/5/2015	—	0.3716	0.3710	0.0006
15-0304	4726	2	Filter	Filter	10/2/2015	10/5/2015	—	0.3651	0.3647	0.0004
15-0305	4774	3	Filter	Filter	10/2/2015	10/5/2015	—	0.3716	0.3703	0.0013
15-0306	306	1	Organic Fraction	Hexane	10/2/2015	10/5/2015	200	2.2496	2.2395	0.0101
15-0307	307	2	Organic Fraction	Hexane	10/2/2015	10/5/2015	225	2.2651	2.2550	0.0101
15-0308	308	3	Organic Fraction	Hexane	10/2/2015	10/5/2015	200	2.2552	2.2475	0.0077
15-0309	309	1	Inorganic Fraction	H2O	10/2/2015	10/5/2015	450	2.2205	2.2181	0.0024
15-0310	310	2	Inorganic Fraction	H2O	10/2/2015	10/5/2015	500	2.2510	2.2477	0.0033
15-0311	311	3	Inorganic Fraction	H2O	10/2/2015	10/5/2015	450	2.2364	2.2329	0.0035

APPENDIX D PROCESS EQUIPMENT DATA

Houed, Kathy

From: Bill Schow <bschow@gemstateprocessing.com>
Sent: Friday, October 30, 2015 5:03 AM
To: Houed, Kathy
Cc: Heiser, Dan; Wilkin, Andrew; Carpenter, Mannie; Nockleby, Jason; Clark, Eric; Miguel Rementeria
Subject: RE: Gem State Processing Draft Test Report

Kathy,

Miguel Rementeria prepared the following data for you.
If you have any questions his contact information is below.

Thanks,
Bill

Dayshift 10/1/15
Weightbelt setting was 14000 lbs
Total output was 21600 lbs
Wet Cattlefeed lbs was 336 lbs
Petfood lbs was 5929 lbs
Overall total lbs was 27865 lbs
Average moisture for the day was 7.0 %
Gas usage was 171.4 (24 hr period)

Graveyard 10/1/15
Weightbelt setting was 14000 lbs
Total output was 16752 lbs
Wet Cattlefeed lbs was 1597
Petfood lbs was 8269 lbs
Overall total lbs was 26,618 lbs
Average moisture for the day was 7.1 %
Gas usage was 171.4 (24 hr period)

Dayshift 10/2/15
Weightbelt setting was 14000 lbs
Total output was 12800 lbs
Wet Cattlefeed lbs was 1047 lbs
Petfood lbs was 2991 lbs
Overall total lbs was 16838 lbs Shut down early after source test, line was down at 5:30pm
Average moisture for the day was 6.6 %
Gas usage was 59.1 (24 hr period)

Thanks

Miguel Rementeria

APPENDIX E QUALITY ASSURANCE AND CALIBRATION DATA

SEMIANNUAL METER BOX FULL TEST CALIBRATION
CRITICAL ORIFICES 5-POINT CALIBRATION (English Units)

Meter Box ID #	3X	Meter Box Yd:	1.019
Date of Calibration	27-Jul-15	Meter Box ΔH@:	2.096
Calibration Technician	K. Anderson	Due Date of Next Calibration:	23-Jan-16
Barometric Pressure (in "Hg)	28.58	PASS/FAIL Calibration:	PASS
Theoretical Critical Vacuum[1] (in "Hg)	13.5		
Critical Orifice Set I.D. #	IA	[IA, HZ or NL]	

[1]For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.
[2]The Critical Orifice Coefficient, K', must be entered in English units, $(ft^3 x\ °R^{1/2})/(in.Hg*min)$.

Calibration Data										
Run Time	Metering Console					Critical Orifice				
Elapsed	DGM Orifice ΔH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Serial Number	Coefficient	Amb Temp Initial	Amb Temp Final	Actual Vacuum
Q min	P_m in H_2O	Vm_i cubic feet (ft^3)	Vm_f cubic feet (ft^3)	Tm_i °F	Tm_f °F		K'	Tm_{amb} °F	Tm_{amb} °F	In "Hg
5.0	0.33	410.005	411.495	90	90	IA-40	0.2303	90	90	15
5.0	0.64	411.567	413.728	90	90	IA-48	0.3358	90	90	15
5.0	1.20	413.770	416.720	90	90	IA-55	0.4504	90	89	15
5.0	2.50	417.000	420.810	90	90	IA-63	0.5884	89	89	15
5.0	3.20	421.096	426.400	90	90	IA-73	0.8079	89	89	15

Results								
Standardized Data				Dry Gas Meter				
				Calibration Factor		Flowrate	ΔH@	
Dry Gas Meter		Critical Orifice		Value	Variation	Std & Corr	0.75 SCFM	Variation
Vm_{std} cubic feet (ft^3)	Qm_{std} ft^3/min	Vcr_{std} cubic feet (ft^3)	Qcr_{std} ft^3/min	Y	ΔY	$Qm_{std(corr)}$ cfm	ΔH@ In H_2O	ΔΔH@
1.367	0.273	1.403	0.281	1.026	0.007	0.281	2.166	0.070
1.985	0.397	2.046	0.409	1.031	0.012	0.409	1.979	-0.117
2.714	0.543	2.746	0.549	1.012	-0.007	0.549	2.067	-0.029
3.516	0.703	3.589	0.718	1.021	0.002	0.718	2.538	0.442
4.904	0.981	4.927	0.985	1.005	-0.014	0.985	1.729	-0.367
				1.019	Y Average		2.096	ΔH@ Average

Corrected Flow Rate	Orifice Calibration Factor	Minimum Allowable Calibration Factor	Overall Average Calibration Factor	Maximum Allowable Calibration Factor	Meter Pressure	Individual Orifice Calibration Factor (Pass/Fail)
Q_m ft^3/min	Y	Y_{min}	Y_{avg}	Y_{max}	P_m in H_2O	
0.281	1.026	0.999	1.019	1.039	0.33	Pass
0.409	1.031	0.999	1.019	1.039	0.64	Pass
0.549	1.012	0.999	1.019	1.039	1.20	Pass
0.718	1.021	0.999	1.019	1.039	2.50	Pass
0.985	1.005	0.999	1.019	1.039	3.20	Pass

$$V_{m(std)} = \frac{K_1 V_m (P_{bar} + \frac{\Delta H}{13.6})}{T_m}$$

$$ENGLISHK' = \frac{17.64 V_m Y (P_{bar} + \frac{\Delta H}{13.6}) \sqrt{T_{amb} + 460}}{P_{bar}(T_m + 460)\theta}$$

$$DELTA\ H_@' = \frac{0.0319\ \Delta H\ T_m\ \theta^2}{P_{bar}\ Y^2\ V_m^{\ 2}}$$

$$V_{cr(std)} = \frac{K' P_{bar} \theta}{T_{amb}}$$

$$Y = \frac{V_{cr(std)}}{V_{m(std)}}$$

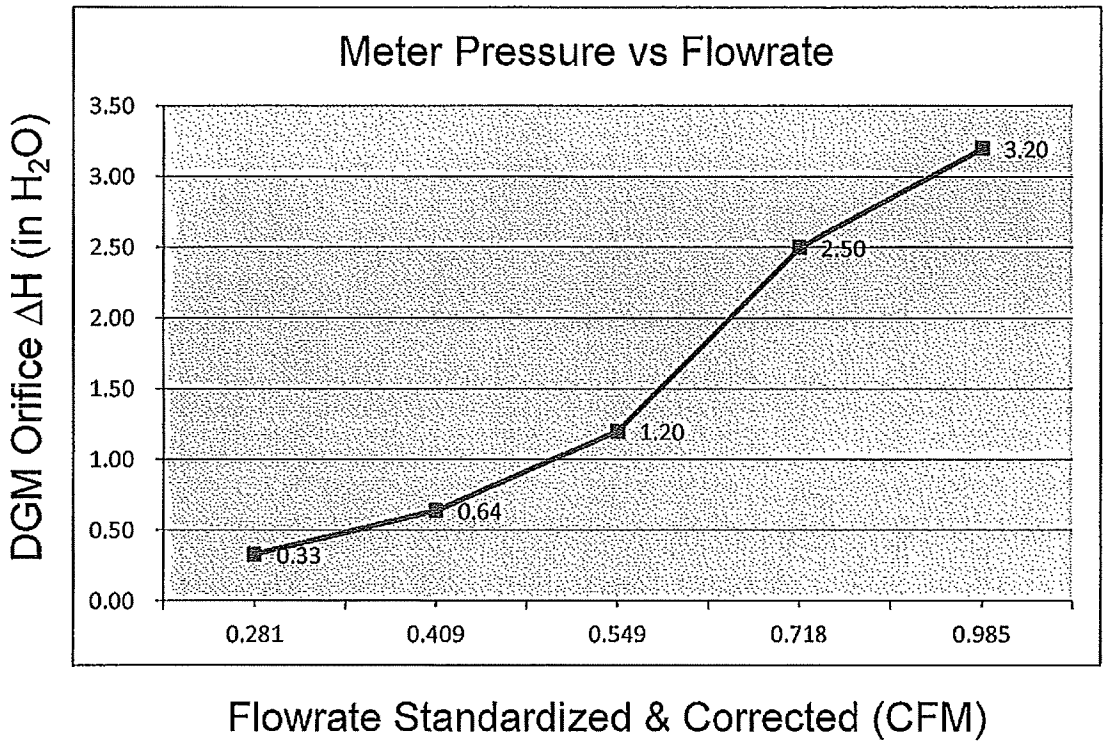
I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR 40 Part 60, Appendix A, Method 5, Item 7.2.2 using a set of calibrated critical orifice.

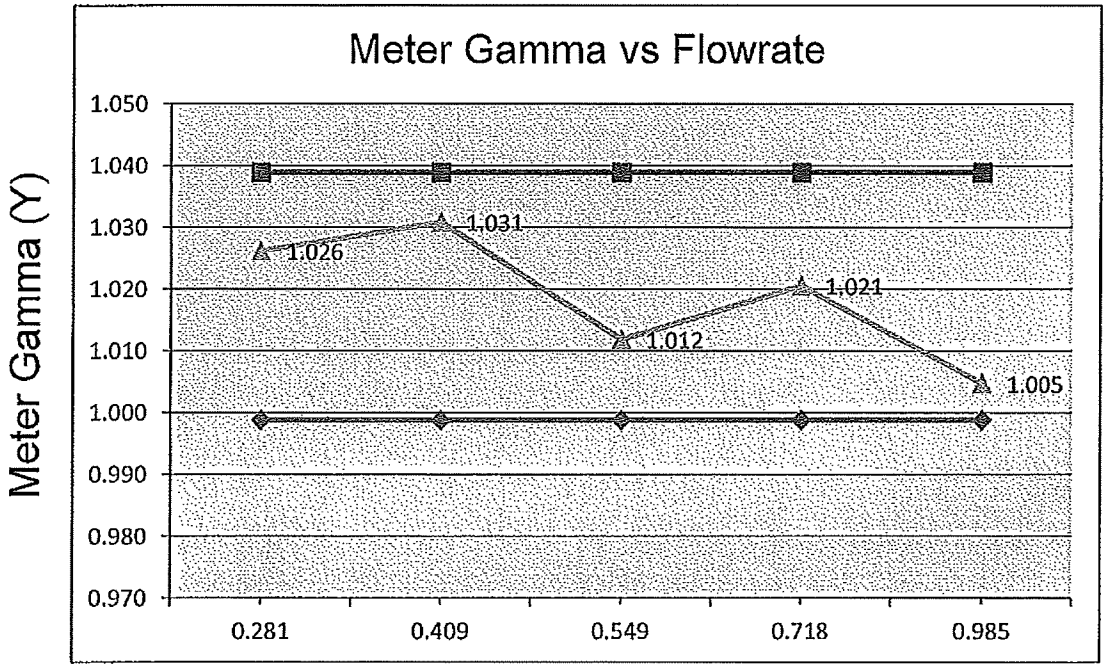
Signature Kip Anderson Date 27-Jul-15

SEMIANNUAL METER BOX FULL TEST CALIBRATION
PYROMETER CALIBRATION TEST REPORT

Meter Box ID #	3X	Reference Used:	Altek Model 222A
Date	27-Jul-15	Serial #:	1104072
Calibration Technician	K. Anderson	Calibrated By:	Davis Instruments

Calibration Reference Setting for Fahrenheit Scale	Pyrometer Reading							
	Stack	Probe	Filter	Impinger Exit	Dry Gas Meter In	Dry Gas Meter Out	Aux I	Aux II
50	50	49	49	50	51	51	50	n/a
100	100	99	99	100	101	101	100	n/a
150	150	149	149	150	151	151	150	n/a
200	200	199	199	201	200	200	201	n/a
250	250	250	249	251	250	250	251	n/a
300	300	300	299	301	300	300	301	n/a
350	350	350	349	350	351	351	351	n/a
400	400	399	399	400	401	401	401	n/a
450	450	449	449	450	451	451	450	n/a
500	500	499	499	500	502	501	500	n/a
550	550	550	549	551	552	551	550	n/a
600	600	600	599	601	602	301	600	n/a


Meter Pressure vs Flowrate
DGM Orifice ΔH (in H2O)
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.33
0.64
1.20
2.50
3.20
0.281
0.409
0.549
0.718
0.985
Flowrate Standardized & Corrected (CFM)


Meter Gamma vs Flowrate
Meter Gamma (Y)
1.050
1.040
1.030
1.020
1.010
1.000
0.990
0.980
0.970
1.026
1.031
1.012
1.021
1.005
0.281
0.409
0.549
0.718
0.985
Flowrate Standardized & Corrected (CFM)

SEMIANNUAL METER BOX FULL TEST CALIBRATION
CRITICAL ORIFICES 5-POINT CALIBRATION (English Units)

Meter Box ID #	3U	Meter Box Yd:	0.976
Date of Calibration	27-Jul-15	Meter Box ΔH@:	1.965
Calibration Technician	K. Anderson	Due Date of Next Calibration:	23-Jan-16
Barometric Pressure (in "Hg)	28.58	PASS/FAIL Calibration:	PASS
Theoretical Critical Vacuum[1] (in "Hg)	13.5		
Critical Orifice Set I.D. #	IA	[IA, HZ or NL]	

[1]For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.
[2]The Critical Orifice Coefficient, K', must be entered in English units, $(ft^3 \times °R^{1/2})/(in.Hg \cdot min)$.

Calibration Data										
Run Time	Metering Console					Critical Orifice				
Elapsed	DGM Orifice ΔH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Serial Number	Coefficient	Amb Temp Initial	Amb Temp Final	Actual Vacuum
Q cfm	P_m in H_2O	Vm_i cubic feet (ft^3)	Vm_f cubic feet (ft^3)	Tm_i °F	Tm_f °F		K'	Tm_{a-b} °F	Tm_{a-b} °F	in "Hg
5.0	0.30	180.182	181.745	88	88	IA-40	0.2303	93	93	15
5.0	0.63	181.855	184.116	88	89	IA-48	0.3358	93	93	15
5.0	1.10	184.250	187.280	89	89	IA-55	0.4504	93	93	15
5.0	1.90	187.510	191.470	89	88	IA-63	0.5884	93	94	15
5.0	3.70	192.455	197.910	90	91	IA-73	0.8079	94	94	15

Results								
Standardized Data				Dry Gas Meter				
				Calibration Factor		Flowrate	ΔH@	
Dry Gas Meter		Critical Orifice		Value	Variation	Std & Corr	0.75 SCFM	Variation
Vm_{std} cubic feet (ft^3)	Qm_{std} ft^3/min	Vcr_{std} cubic feet (ft^3)	Qcr_{std} ft^3/min	Y	ΔY	$Qm_{std(corr)}$ cfm	ΔH@ in H_2O	ΔΔH@
1.440	0.288	1.399	0.280	0.972	-0.004	0.280	1.987	0.022
2.082	0.416	2.041	0.408	0.980	0.004	0.408	1.964	-0.001
2.791	0.558	2.737	0.547	0.980	0.004	0.547	1.909	-0.056
3.659	0.732	3.574	0.715	0.977	0.000	0.715	1.944	-0.021
5.045	1.009	4.905	0.981	0.972	-0.004	0.981	2.021	0.056
				0.976	Y Average		1.965	ΔH@ Average

Corrected Flow Rate	Orifice Calibration Factor	Minimum Allowable Calibration Factor	Overall Average Calibration Factor	Maximum Allowable Calibration Factor	Meter Pressure	Individual Orifice Calibration Factor (Pass/Fail)
Q_m ft^3/min	Y	Y_{min}	Y_{a-g}	Y_{max}	P_m in H_2O	
0.280	0.972	0.956	0.976	0.996	0.30	Pass
0.408	0.980	0.956	0.976	0.996	0.63	Pass
0.547	0.980	0.956	0.976	0.996	1.10	Pass
0.715	0.977	0.956	0.976	0.996	1.90	Pass
0.981	0.972	0.956	0.976	0.996	3.70	Pass

$$V_{m\,(std)} = \frac{K_1 V_m \left(P_{bar} + \frac{\Delta H}{13.6}\right)}{T_m}$$

$$ENGLISHK' = \frac{17.64 V_m Y \left(P_{bar} + \frac{\Delta H}{13.6}\right)\sqrt{T_{amb} + 460}}{P_{bar}(T_m + 460)\theta}$$

$$DELTA\ H_@{}' = \frac{0.0319\ \Delta H\ T_m\ \theta^2}{P_{bar}\ Y^2\ V_m{}^2}$$

$$V_{cr\,(std)} = \frac{K' P_{bar} \theta}{T_{amb}}$$

$$Y = \frac{V_{cr\,(std)}}{V_{m\,(std)}}$$

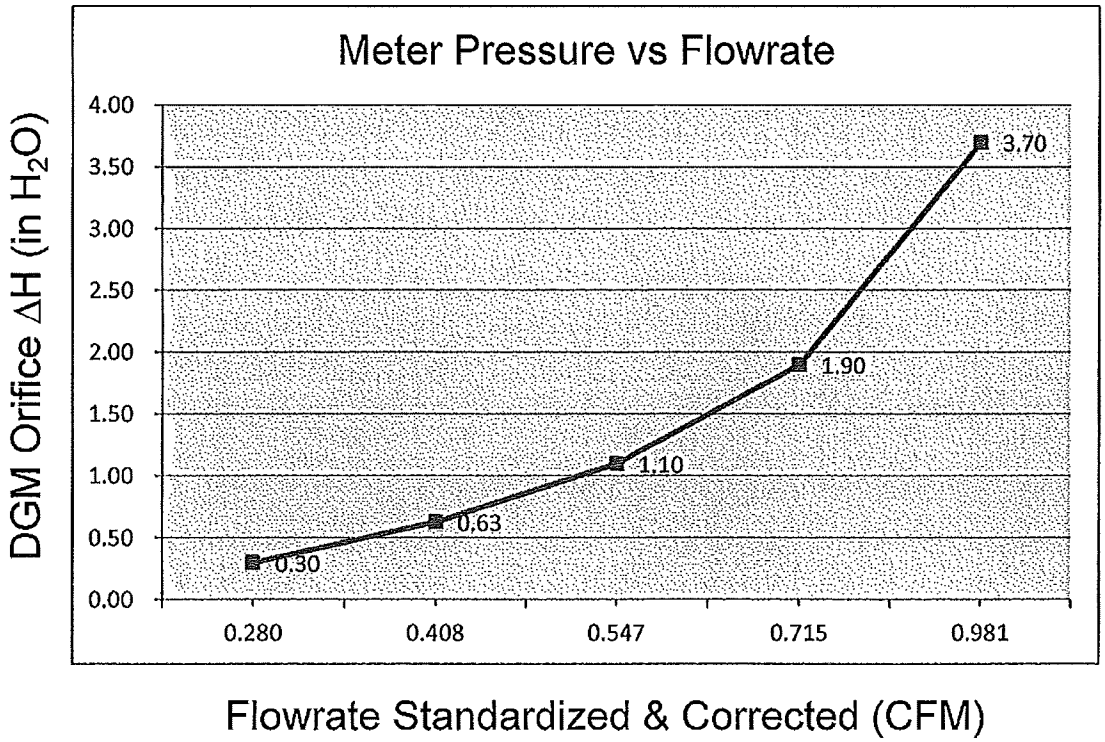
I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR 40 Part 60, Appendix A, Method 5, Item 7.2.2 using a set of calibrated critical orifice.

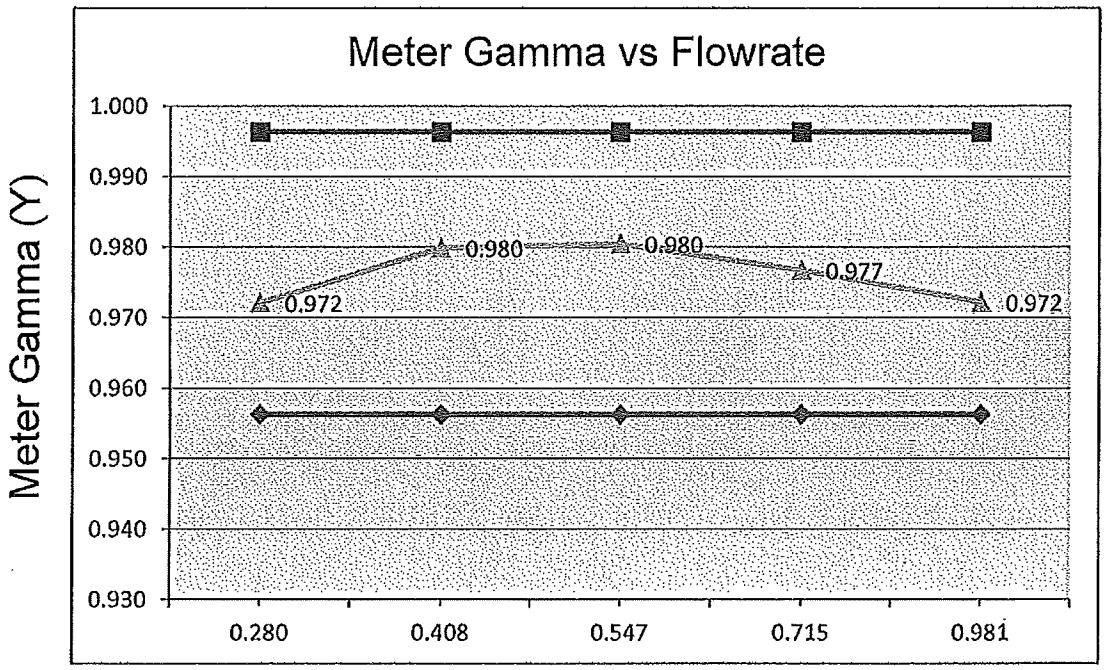
Signature *Kip Anderson* Date 27-Jul-15

SEMIANNUAL METER BOX FULL TEST CALIBRATION
PYROMETER CALIBRATION TEST REPORT

Meter Box ID #	3U	Reference Used:	Altek Model 222A
Date	27-Jul-15	Serial #:	1104072
Calibration Technician	K. Anderson	Calibrated By:	Davis Instruments

Calibration Reference Setting for Fahrenheit Scale	Pyrometer Reading							
	Stack	Probe	Filter	Impinger Exit	Dry Gas Meter In	Dry Gas Meter Out	Aux I	Aux II
50	53	52	52	53	52	52	52	n/a
100	103	102	102	102	102	102	102	n/a
150	153	152	153	153	152	151	153	n/a
200	203	202	203	203	202	200	203	n/a
250	253	252	252	253	252	252	253	n/a
300	303	302	203	303	302	300	303	n/a
350	353	352	353	353	353	349	353	n/a
400	403	402	402	403	403	399	400	n/a
450	453	452	452	452	453	449	453	n/a
500	503	502	502	503	503	498	503	n/a
550	553	550	551	553	553	548	552	n/a
600	603	600	601	603	603	597	602	n/a


Meter Pressure vs Flowrate
DGM Orifice ΔH (in H2O)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.30
0.63
1.10
1.90
3.70
0.280
0.408
0.547
0.715
0.981
Flowrate Standardized & Corrected (CFM)


Meter Gamma vs Flowrate
Meter Gamma (Y)
1.000
0.990
0.980
0.970
0.960
0.950
0.940
0.930
0.972
0.980
0.980
0.977
0.972
0.280
0.408
0.547
0.715
0.981
Flowrate Standardized & Corrected (CFM)

SEMIANNUAL METER BOX FULL TEST CALIBRATION
CRITICAL ORIFICES 5-POINT CALIBRATION (English Units)

Meter Box ID #	4X	Meter Box Yd:	1.014
Date of Calibration	28-Jul-15	Meter Box ΔH@:	2.048
Calibration Technician	G. Kendall	Due Date of Next Calibration:	24-Jan-16
Barometric Pressure (in "Hg)	28.61	PASS/FAIL Calibration:	PASS
Theoretical Critical Vacuum[1] (in "Hg)	13.5		
Critical Orifice Set I.D. #	IA	[IA, HZ or NL]	

[1]For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.
[2]The Critical Orifice Coefficient, K', must be entered in English units, $(ft^3 x °R^{1/2})/(in.Hg*min)$.

Calibration Data										
Run Time	Metering Console					Critical Orifice				
Elapsed	DGM Orifice ΔH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Serial Number	Coefficient	Amb Temp Initial	Amb Temp Final	Actual Vacuum
Q m'n	P_m In H_2O	Vm_i cubic feet (ft^3)	Vm_f cubic feet (ft^3)	Tm_i °F	Tm_f °F		K'	Tm_{amb} °F	Tm_{amb} °F	In "Hg
5.0	0.31	164.500	166.008	92	92	IA-40	0.2303	96	95	15
5.0	0.64	166.100	168.286	92	92	IA-48	0.3358	95	95	15
5.0	1.20	168.400	171.333	92	92	IA-55	0.4504	95	95	15
5.0	2.00	171.500	175.339	93	92	IA-63	0.5884	95	95	15
5.0	3.85	175.400	180.664	93	92	IA-73	0.8079	93	93	12

Results								
Standardized Data				Dry Gas Meter				
				Calibration Factor		Flowrate	ΔH@	
Dry Gas Meter		Critical Orifice		Value	Variation	Std & Corr	0.75 SCFM	Variation
Vm_{std} cubic feet (ft^3)	Qm_{std} ft^3/min	Vcr_{std} cubic feet (ft^3)	Qcr_{std} ft^3/min	Y	ΔY	$Qm_{std(corr)}$ cfm	ΔH@ In H_2O	ΔΔH@
1.380	0.276	1.398	0.280	1.013	-0.002	0.280	2.046	-0.002
2.003	0.401	2.039	0.408	1.018	0.004	0.408	1.988	-0.060
2.691	0.538	2.735	0.547	1.016	0.002	0.547	2.078	0.030
3.526	0.705	3.573	0.715	1.013	-0.001	0.715	2.036	-0.012
4.858	0.972	4.915	0.983	1.012	-0.003	0.983	2.091	0.043
				1.014	Y Average		2.048	ΔH@ Average

Corrected Flow Rate	Orifice Calibration Factor	Minimum Allowable Calibration Factor	Overall Average Calibration Factor	Maximum Allowable Calibration Factor	Meter Pressure	Individual Orifice Calibration Factor (Pass/Fail)
Q_m ft^3/min	Y	Y_{min}	Y_{avg}	Y_{max}	P_m In H_2O	
0.280	1.013	0.994	1.014	1.034	0.31	Pass
0.408	1.018	0.994	1.014	1.034	0.64	Pass
0.547	1.016	0.994	1.014	1.034	1.20	Pass
0.715	1.013	0.994	1.014	1.034	2.00	Pass
0.983	1.012	0.994	1.014	1.034	3.85	Pass

$$V_{m(std)} = \frac{K_1 V_m \left(P_{bar} + \frac{\Delta H}{13.6}\right)}{T_m}$$

$$ENGLISHK' = \frac{17.64 V_m Y \left(P_{bar} + \frac{\Delta H}{13.6}\right)\sqrt{T_{amb}+460}}{P_{bar}(T_m+460)\theta}$$

$$DELTA\ H_@' = \frac{0.0319\ \Delta H\ T_m\ \theta^2}{P_{bar}\ Y^2\ V_m^{\ 2}}$$

$$V_{cr(std)} = \frac{K' P_{bar} \theta}{T_{amb}}$$

$$Y = \frac{V_{cr(std)}}{V_{m(std)}}$$

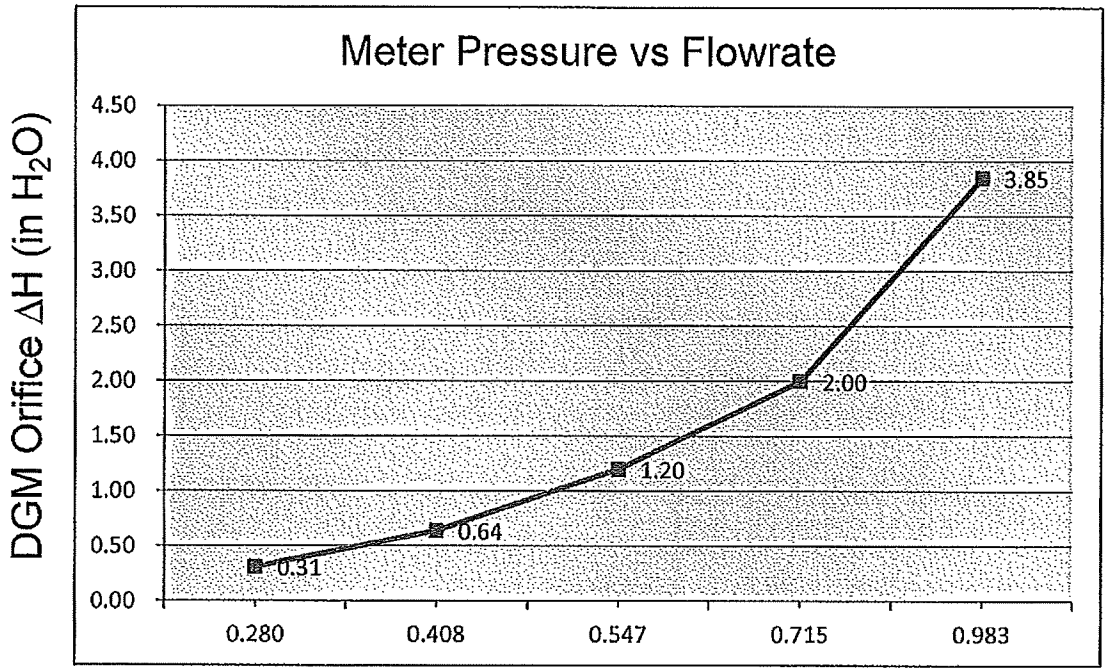
I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR 40 Part 60, Appendix A, Method 5, Item 7.2.2 using a set of calibrated critical orifice.

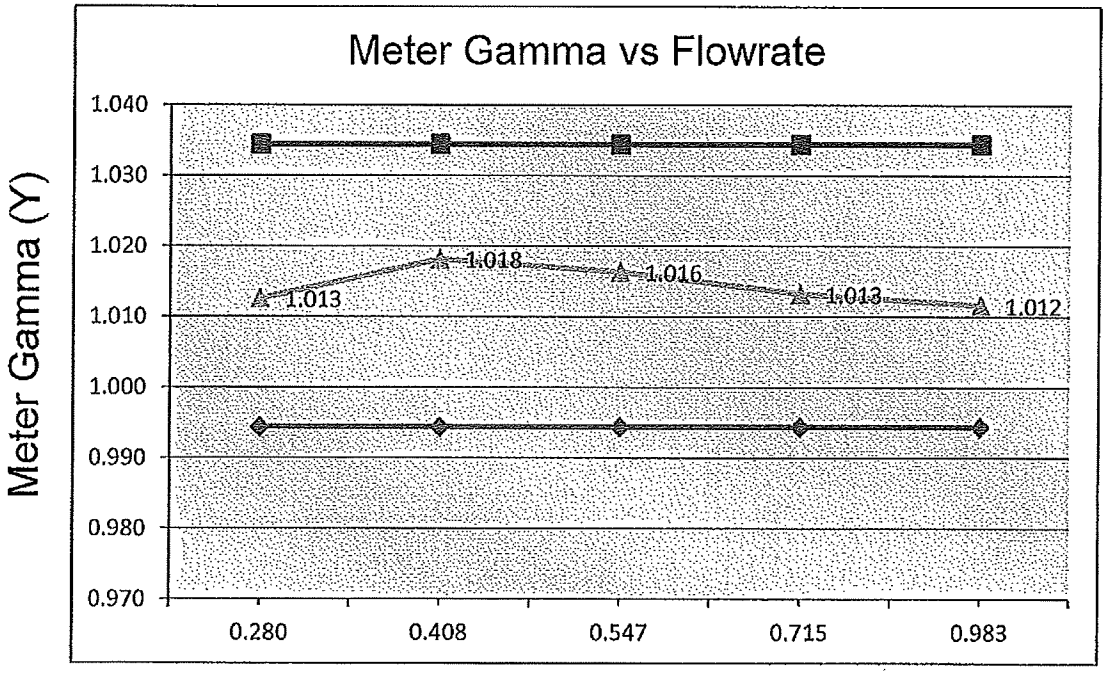
Signature *Greg Kendall* Date 28-Jul-15

SEMIANNUAL METER BOX FULL TEST CALIBRATION
PYROMETER CALIBRATION TEST REPORT

Meter Box ID #	4X	Reference Used:	Altek Model 222A
Date	28-Jul-15	Serial #:	1104072
Calibration Technician	G. Kendall	Calibrated By:	Davis Instruments

Calibration Reference Setting for Fahrenheit Scale	Pyrometer Reading							
	Stack	Probe	Filter	Impinger Exit	Dry Gas Meter In	Dry Gas Meter Out	Aux I	Aux II
50	51	51	51	50	50	50	50	n/a
100	101	101	100	100	100	100	100	n/a
150	151	151	150	150	150	150	150	n/a
200	201	201	200	201	200	200	201	n/a
250	251	251	249	251	250	250	251	n/a
300	301	301	299	301	300	300	301	n/a
350	351	351	349	350	350	350	351	n/a
400	401	300	399	400	400	400	401	n/a
450	451	450	449	450	450	450	450	n/a
500	500	500	499	500	500	500	500	n/a
550	551	550	549	551	550	550	550	n/a
600	601	600	599	601	600	600	600	n/a


Meter Pressure vs Flowrate
DGM Orifice ΔH (in H_2O)
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.280
0.408
0.547
0.715
0.983
0.31
0.64
1.20
2.00
3.85
Flowrate Standardized & Corrected (CFM)


Meter Gamma vs Flowrate
Meter Gamma (Y)
1.040
1.030
1.020
1.010
1.000
0.990
0.980
0.970
0.280
0.408
0.547
0.715
0.983
1.013
1.018
1.016
1.013
1.012
Flowrate Standardized & Corrected (CFM)

SEMIANNUAL METER BOX FULL TEST CALIBRATION
CRITICAL ORIFICES 5-POINT CALIBRATION (English Units)

Meter Box ID #	5X	Meter Box Yd:	0.990
Date of Calibration	10-Aug-15	Meter Box ΔH@:	1.735
Calibration Technician	K. Anderson	Due Date of Next Calibration:	6-Feb-16
Barometric Pressure (in "Hg)	28.64	PASS/FAIL Calibration:	PASS
Theoretical Critical Vacuum[1] (in "Hg)	13.5		
Critical Orifice Set I.D. #	IA	(IA, HZ or NL)	

[1]For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.
[2]The Critical Orifice Coefficient, K', must be entered in English units, $(ft^3 x °R^{1/2})/(in.Hg*min)$.

Calibration Data

Run Time	Metering Console					Critical Orifice				
Elapsed	DGM Orifice ΔH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Serial Number	Coefficient	Amb Temp Initial	Amb Temp Final	Actual Vacuum
Q min	P_m in H_2O	Vm_i cubic feet (ft^3)	Vm_f cubic feet (ft^3)	Tm_i °F	Tm_f °F		K'	Tm_{amb} °F	Tm_{amb} °F	in "Hg
5.0	0.27	686.725	688.275	90	92	IA-40	0.2303	89	89	15
5.0	0.56	688.405	690.650	89	89	IA-48	0.3358	89	89	15
5.0	0.98	690.891	693.905	89	89	IA-55	0.4504	89	89	15
5.0	1.70	694.455	698.385	89	89	IA-63	0.5884	89	89	15
5.0	3.30	698.690	704.075	89	89	IA-73	0.8079	89	89	15

Results

Standardized Data				Dry Gas Meter				
				Calibration Factor		Flowrate	ΔH@	
Dry Gas Meter		Critical Orifice		Value	Variation	Std & Corr	0.75 SCFM	Variation
Vm_{std} cubic feet (ft^3)	Qm_{std} ft^3/min	Vcr_{std} cubic feet (ft^3)	Qcr_{std} ft^3/min	Y	ΔY	$Qm_{std(corr)}$ cfm	ΔH@ in H_2O	ΔΔH@
1.423	0.285	1.408	0.282	0.989	0.000	0.282	1.762	0.027
2.070	0.414	2.052	0.410	0.992	0.002	0.410	1.728	-0.007
2.782	0.556	2.753	0.551	0.990	0.000	0.551	1.684	-0.051
3.634	0.727	3.596	0.719	0.990	0.000	0.719	1.718	-0.017
4.999	1.000	4.938	0.988	0.988	-0.002	0.988	1.784	0.049
				0.990	Y Average		1.735	ΔH@ Average

Corrected Flow Rate	Orifice Calibration Factor	Minimum Allowable Calibration Factor	Overall Average Calibration Factor	Maximum Allowable Calibration Factor	Meter Pressure	Individual Orifice Calibration Factor (Pass/Fail)
Q_m ft^3/min	Y	Y_{min}	Y_{a-g}	Y_{max}	P_m in H_2O	
0.282	0.989	0.970	0.990	1.010	0.27	Pass
0.410	0.992	0.970	0.990	1.010	0.56	Pass
0.551	0.990	0.970	0.990	1.010	0.98	Pass
0.719	0.990	0.970	0.990	1.010	1.70	Pass
0.988	0.988	0.970	0.990	1.010	3.30	Pass

$$V_{m(std)} = \frac{K_1 V_m (P_{bar} + \frac{\Delta H}{13.6})}{T_m}$$

$$ENGLISH K' = \frac{17.64 V_m Y (P_{bar} + \frac{\Delta H}{13.6}) \sqrt{T_{amb} + 460}}{P_{bar}(T_m + 460)\theta}$$

$$DELTA\ H_@' = \frac{0.0319\ \Delta H\ T_m\ \theta^2}{P_{bar}\ Y^2\ V_m^{\ 2}}$$

$$V_{cr(std)} = \frac{K' P_{bar} \theta}{T_{amb}}$$

$$Y = \frac{V_{cr(std)}}{V_{m(std)}}$$

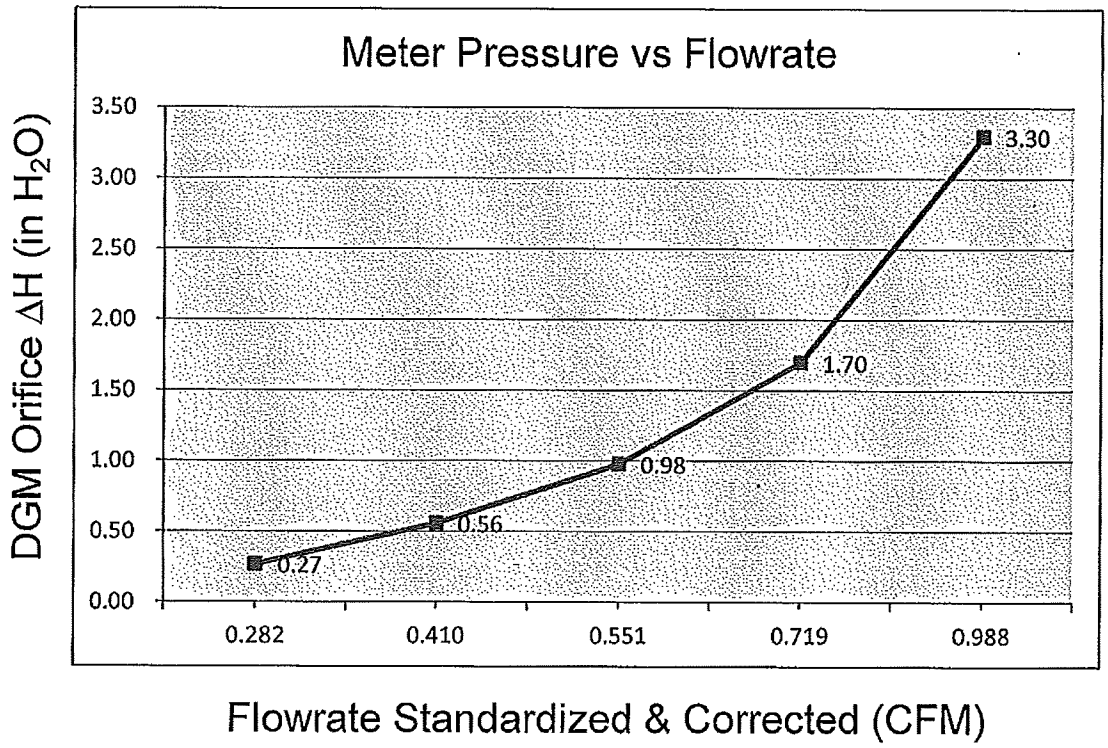
I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR 40 Part 60, Appendix A, Method 5, Item 7.2.2 using a set of calibrated critical orifice.

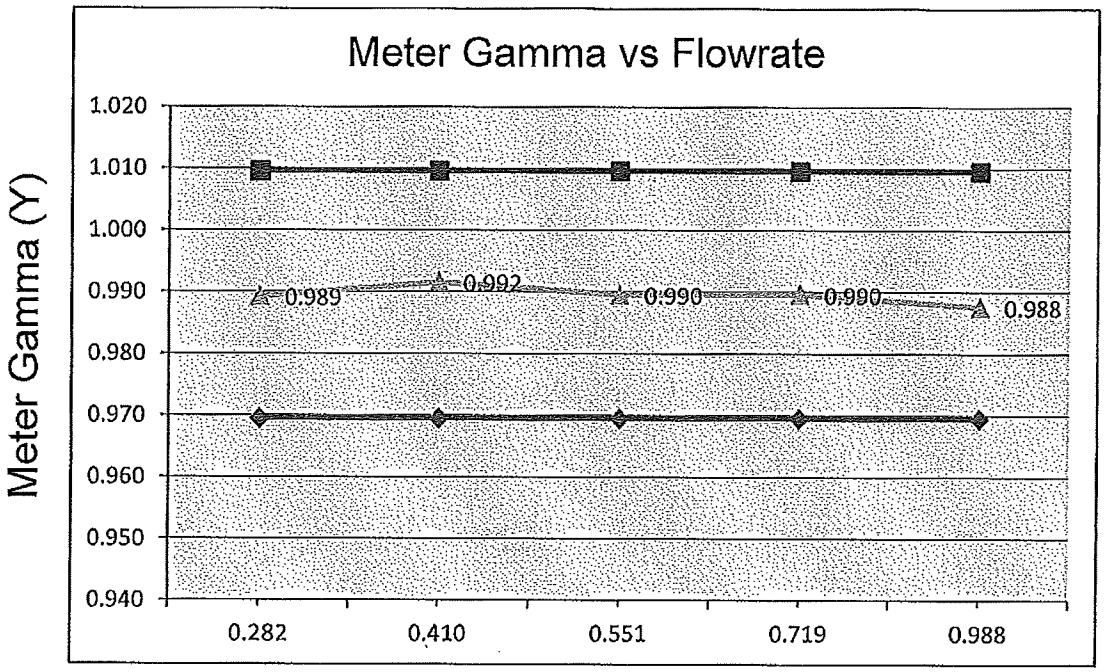
Signature Kip Anderson Date 10-Aug-15

SEMIANNUAL METER BOX FULL TEST CALIBRATION
PYROMETER CALIBRATION TEST REPORT

Meter Box ID #	5X	Reference Used:	Altek Model 222A
Date	10-Aug-15	Serial #:	1104072
Calibration Technician	K. Anderson	Calibrated By:	Davis Instruments

Calibration Reference Setting for Fahrenheit Scale	Pyrometer Reading							
	Stack	Probe	Filter	Impinger Exit	Dry Gas Meter In	Dry Gas Meter Out	Aux I	Aux II
50	50	49	49	50	50	50	50	n/a
100	100	99	99	100	100	100	100	n/a
150	150	149	149	150	150	150	150	n/a
200	200	199	200	200	200	200	201	n/a
250	250	249	250	250	250	250	251	n/a
300	300	299	300	300	300	300	300	n/a
350	350	349	350	350	350	350	350	n/a
400	400	399	400	400	400	400	400	n/a
450	450	449	450	450	450	450	450	n/a
500	500	499	500	500	500	500	500	n/a
550	550	549	550	550	550	550	550	n/a
600	600	599	600	600	600	600	600	n/a


Meter Pressure vs Flowrate
DGM Orifice ΔH (in H_2O)
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.27
0.56
0.98
1.70
3.30
0.282
0.410
0.551
0.719
0.988
Flowrate Standardized & Corrected (CFM)


Meter Gamma vs Flowrate
Meter Gamma (Y)
1.020
1.010
1.000
0.990
0.980
0.970
0.960
0.950
0.940
0.989
0.992
0.990
0.990
0.988
0.282
0.410
0.551
0.719
0.988
Flowrate Standardized & Corrected (CFM)

EPA APPROVED ALTERNATIVE METHOD ALT-009

Client:	Gem State
Test Date:	01-Oct-15
Emissions Unit:	Unit 1
Project No.:	203705130
Meter Box No.:	3X

Run Data

	Run1	Run 2	Run 3	Averages
Test Date	01-Oct-15	01-Oct-15	1-Oct-15	
Start Time	3:58 PM	7:10 AM	9:03 AM	
Stop Time	5:48 PM	8:58 AM	10:50 AM	
Sampling Time, min	108	108	108	
Orifice ΔP, ΔH@, "H_2O	2.0960	2.0960	2.0960	2.0960
Barometric Pressure, P_{bar}, "Hg	25.65	25.65	25.65	25.65
DGM Total, Vm, dcf	88.963	87.546	89.323	88.611
Meter Temperature, T_m, °R	556	528	532	539
Average ΔH, "H_2O	2.06	2.05	2.03	2.05
Average $\sqrt{\Delta H}$, "H_2O	1.44	1.43	1.43	1.43
Dry Molecular Weight, M_d, lb/lb-mole	28.82	29.69	29.62	29.38
Dry Ambient Air Molecular Weight, (lb/lb-mole)	29	29	29	29
Mercury Specific Gravity	13.6	13.6	13.6	13.6
Constant ("Hg/°R) $(cfm)^2$	0.0319	0.0319	0.0319	0.0319

Alternative Method 5 Post-Test Calibration Results

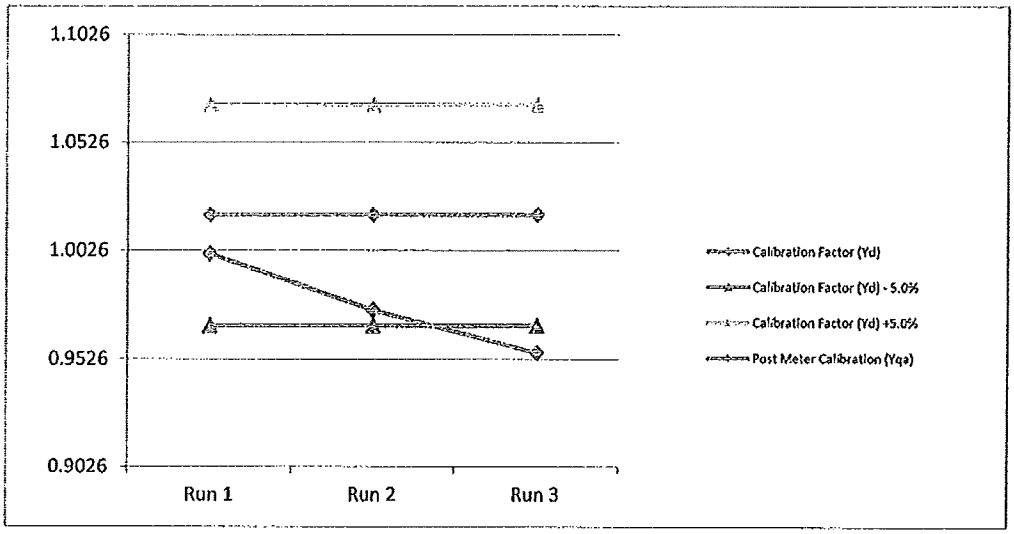
Post Dry Gas Meter Calibration Factor (Y_{qa})	1.0010	0.9751	0.9555	0.9772
Dry Gas Meter Calibration Factor	1.0190	1.0190	1.0190	1.0190
Percent Difference				-4.28
Pass/Fail Post Calibration				PASS

Calculations

$$Y_{qa} = \frac{\theta}{V_m}\sqrt{\frac{0.0319 * T_m * 29}{\Delta H @ * \left(P_{bar} + \frac{\Delta H_{avg}}{13.6}\right) * M_d}} * \left(\sqrt{\Delta H}\right)_{avg}$$

Y_{qa}	=	Dry gas meter calibration check valve, (dimensionless)
θ	=	Sampling Time, min
V_m	=	DGM Total, Vm, dcf
T_m	=	Meter Temperature, T_m, °R
P_{bar}	=	Barometric Pressure, P_{bar}, "Hg
0.0319	=	$(20.92/528)(0.75)^2$ ("Hg/°R)$(cfm)^2$
ΔH_{avg}	=	Average ΔH, "H_2O
ΔH@	=	Orifice ΔP, ΔH@, "H_2O
M_d	=	Dry Molecular Weight, M_d, Lb/lb-mole
29	=	Dry Ambient Air Molecular Weight, (lb/lb-mole)
13.6	=	Mercury Specific Gravity

Alternative Method 5 Post-Test Calibration Results



EPA APPROVED ALTERNATIVE METHOD ALT-009

Client:	Gem State
Test Date:	01-Oct-15
Emissions Unit:	Unit 2
Project No.:	203705130
Meter Box No.:	3u

Run Data

	Run1	Run 2	Run 3	Averages
Test Date	01-Oct-15	01-Oct-15	1-Oct-15	
Start Time	4:05 PM	7:11 AM	9:20 AM	
Stop Time	6:10 PM	9:16 AM	11:25 AM	
Sampling Time, min	125	125	125	
Orifice ΔP, ΔH@, "H_2O	1.9650	1.9650	1.9650	1.9650
Barometric Pressure, P_{bar}, "Hg	25.40	25.40	25.40	25.40
DGM Total, Vm, dcf	108.874	97.260	100.526	102.220
Meter Temperature, T_m, °R	562	530	534	542
Average ΔH, "H_2O	2.22	1.90	1.89	2.00
Average $\sqrt{\Delta H}$, "H_2O	1.46	1.38	1.37	1.40
Dry Molecular Weight, M_d, lb/lb-mole	28.82	29.65	29.62	29.37
Dry Ambient Air Molecular Weight, (lb/lb-mole)	29	29	29	29
Mercury Specific Gravity	13.6	13.6	13.6	13.6
Constant ("Hg/°R) (cfm)^2	0.0319	0.0319	0.0319	0.0319

Alternative Method 5 Post-Test Calibration Results

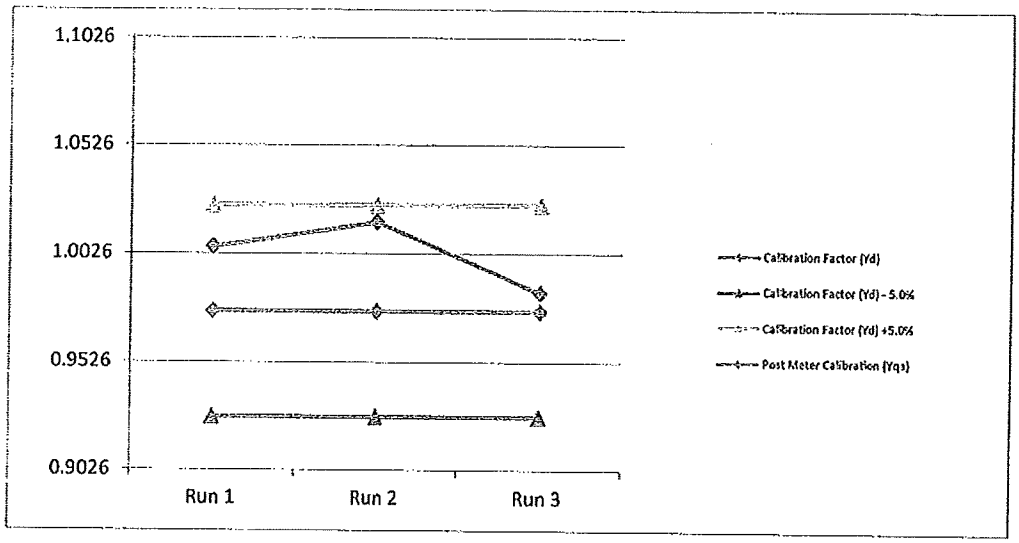
Post Dry Gas Meter Calibration Factor (Y_{qa})	1.0056	1.0172	0.9848	1.0025
Dry Gas Meter Calibration Factor	0.9760	0.9760	0.9760	0.9760
Percent Difference				2.64
Pass/Fail Post Calibration				PASS

Calculations

$$Y_{qa} = \frac{\theta}{V_m}\sqrt{\frac{0.0319 * T_m * 29}{\Delta H @ * \left(P_{bar} + \frac{\Delta H_{avg}}{13.6}\right) * M_d}} * \left(\sqrt{\Delta H}\right)_{avg}$$

Y_{qa}	=	Dry gas meter calibration check valve, (dimensionless)
θ	=	Sampling Time, min
V_m	=	DGM Total, Vm, dcf
T_m	=	Meter Temperature, T_m, °R
P_{bar}	=	Barometric Pressure, P_{bar}, "Hg
0.0319	=	(20.92/528)(0.75)^2 ("Hg/°R)(cfm)^2
ΔH_{avg}	=	Average ΔH, "H_2O
ΔH@	=	Orifice ΔP, ΔH@, "H_2O
M_d	=	Dry Molecular Weight, M_d, Lb/lb-mole
29	=	Dry Ambient Air Molecular Weight, (lb/lb-mole)
13.6	=	Mercury Specific Gravity

Alternative Method 5 Post-Test Calibration Results



EPA APPROVED ALTERNATIVE METHOD ALT-009

Client:	Gem State
Test Date:	01-Oct-15
Emissions Unit:	Unit 3
Project No.:	203705130
Meter Box No.:	4x

Run Data

	Run1	Run 2	Run 3	Averages
Test Date	01-Oct-15	02-Oct-15	2-Oct-15	
Start Time	4:25 PM	8:11 AM	10:19 AM	
Stop Time	6:30 PM	10:17 AM	12:24 PM	
Sampling Time, min	125	125	125	
Orifice ΔP, ΔH@, "H_2O	2.0480	2.0480	2.0480	2.0480
Barometric Pressure, P_{bar}, "Hg	25.40	25.40	25.40	25.40
DGM Total, Vm, dcf	100.035	95.755	94.875	96.888
Meter Temperature, T_m, °R	554	526	528	536
Average ΔH, "H_2O	1.65	1.99	2.05	1.90
Average √ΔH, "H_2O	1.27	1.41	1.43	1.37
Dry Molecular Weight, M_d, lb/lb-mole	28.82	29.65	29.62	29.37
Dry Ambient Air Molecular Weight, (lb/lb-mole)	29	29	29	29
Mercury Specific Gravity	13.6	13.6	13.6	13.6
Constant ("Hg/°R) (cfm)^2	0.0319	0.0319	0.0319	0.0319

Alternative Method 5 Post-Test Calibration Results

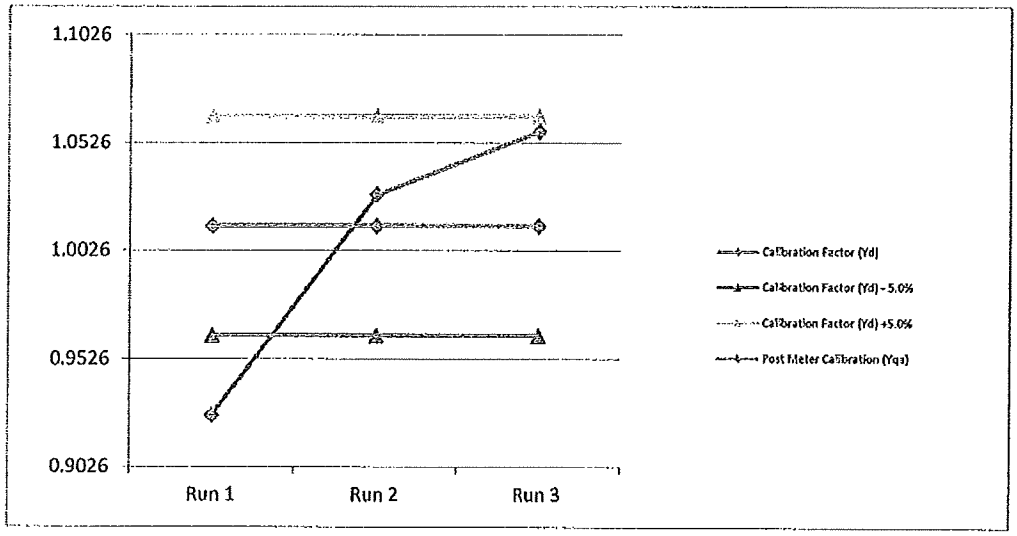
Post Dry Gas Meter Calibration Factor (Y_{qa})	0.9267	1.0283	1.0576	1.0042
Dry Gas Meter Calibration Factor	1.0140	1.0140	1.0140	1.0140
Percent Difference				-0.98
Pass/Fail Post Calibration				PASS

Calculations

$$Y_{qa} = \frac{\theta}{V_m}\sqrt{\frac{0.0319 * T_m * 29}{\Delta H @ * \left(P_{bar} + \frac{\Delta H_{avg}}{13.6}\right) * M_d}} * \left(\sqrt{\Delta H}\right)_{avg}$$

Y_{qa}	=	Dry gas meter calibration check valve, (dimensionless)
θ	=	Sampling Time, min
V_m	=	DGM Total, Vm, dcf
T_m	=	Meter Temperature, T_m, °R
P_{bar}	=	Barometric Pressure, P_{bar}, "Hg
0.0319	=	(20.92/528)(0.75)^2 ("Hg/°R)(cfm)^2
ΔH_{avg}	=	Average ΔH, "H_2O
ΔH@	=	Orifice ΔP, ΔH@, "H_2O
M_d	=	Dry Molecular Weight, M_d, Lb/lb-mole
29	=	Dry Ambient Air Molecular Weight, (lb/lb-mole)
13.6	=	Mercury Specific Gravity

Alternative Method 5 Post-Test Calibration Results



EPA APPROVED ALTERNATIVE METHOD ALT-009

Client:	Gem State
Test Date:	01-Oct-15
Emissions Unit:	Unit 4
Project No.:	203705130
Meter Box No.:	5x

Run Data

	Run1	Run 2	Run 3	Averages
Test Date	01-Oct-15	02-Oct-15	2-Oct-15	
Start Time	4:25 PM	7:29 AM	9:37 AM	
Stop Time	6:34 PM	9:34 AM	11:42 AM	
Sampling Time, min	125	125	125	
Orifice ΔP, ΔH@, "H_2O	1.7350	1.7350	1.7350	1.7350
Barometric Pressure, P_{bar}, "Hg	25.40	25.40	25.40	25.40
DGM Total, Vm, dcf	94.935	90.485	95.670	93.697
Meter Temperature, T_m, °R	556	528	530	538
Average ΔH, "H_2O	1.44	1.37	1.41	1.41
Average √ΔH, "H_2O	1.20	1.17	1.19	1.19
Dry Molecular Weight, M_d, lb/lb-mole	28.82	29.65	29.62	29.37
Dry Ambient Air Molecular Weight, (lb/lb-mole)	29	29	29	29
Mercury Specific Gravity	13.6	13.6	13.6	13.6
Constant ("Hg/°R) $(cfm)^2$	0.0319	0.0319	0.0319	0.0319

Alternative Method 5 Post-Test Calibration Results

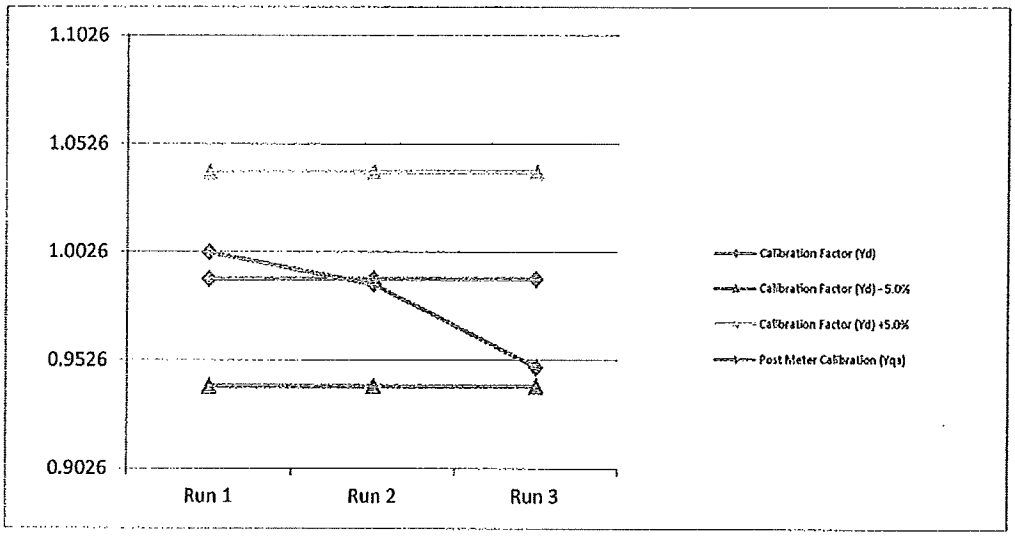
Post Dry Gas Meter Calibration Factor (Y_{qa})	1.0023	0.9875	0.9494	0.9797
Dry Gas Meter Calibration Factor	0.9900	0.9900	0.9900	0.9900
Percent Difference				-1.05
Pass/Fail Post Calibration				PASS

Calculations

$$Y_{qa} = \frac{\theta}{V_m}\sqrt{\frac{0.0319 * T_m * 29}{\Delta H @ * \left(P_{bar} + \frac{\Delta H_{avg}}{13.6}\right) * M_d}} * \left(\sqrt{\Delta H}\right)_{avg}$$

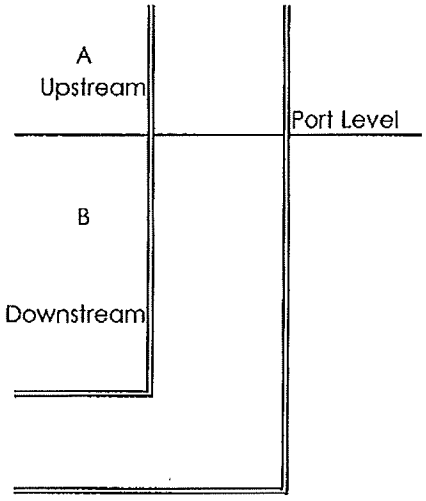
Y_{qa}	=	Dry gas meter calibration check valve, (dimensionless)
θ	=	Sampling Time, min
V_m	=	DGM Total, Vm, dcf
T_m	=	Meter Temperature, T_m, °R
P_{bar}	=	Barometric Pressure, P_{bar}, "Hg
0.0319	=	$(20.92/528)(0.75)^2$ ("Hg/°R)$(cfm)^2$
ΔH_{ovg}	=	Average ΔH, "H_2O
ΔH@	=	Orifice ΔP, ΔH@, "H_2O
M_d	=	Dry Molecular Weight, M_d, Lb/lb-mole
29	=	Dry Ambient Air Molecular Weight, (lb/lb-mole)
13.6	=	Mercury Specific Gravity

Alternative Method 5 Post-Test Calibration Results



METHOD 1 - SAMPLING TRAVERSE POINTS FOR STATIONARY SOURCES

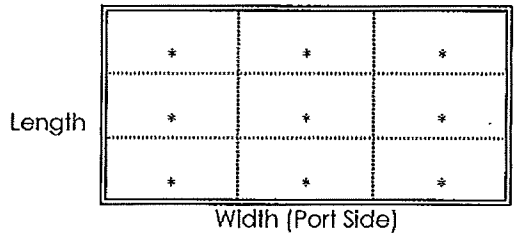
Client:	Gem State
Test Date:	1-Oct-15
Emissions Unit:	Unit 1
Project No.:	203705130



Distance Upstream of Disturbance A: (in")	90.0
Distance Downstream of Disturbance B: (in")	200.0
Width of Stack Cross Section (in")	17.25
Length of Stack Cross Section (in")	23.75
Equivalent Diameter	19.98
Number of Stack Diameters Upstream	4.50
Number of Stack Diameters Downstream	10.01

Minimum Number of Traverse Points Needed	9
Actual Number of Traverse Points Used	9
Coupling Length (in")	0

Number of Traverse Points Layout	
Minimum Number of Traverse Points	9
Traverse Points Matrix	3X3
Number of Traverse Points (Width)	3
Number of Traverse Points (Length)	3
Number of Traverse Points Sampled	9



When the eight- and two- diameter criterion can be met, the minimum number of traverse points shall be (1) twelve, for rectangular stacks with equivalent diameters greater than 24 inches; (3) nine for rectangular stacks with equivalent diameters between 12 and 24 inches.

When the eight- and two- diameter criterion can not be met, the minimum number of traverse points is determined from figure 1-1, 40 CFR Pt. 60, App. A-1, Method 1

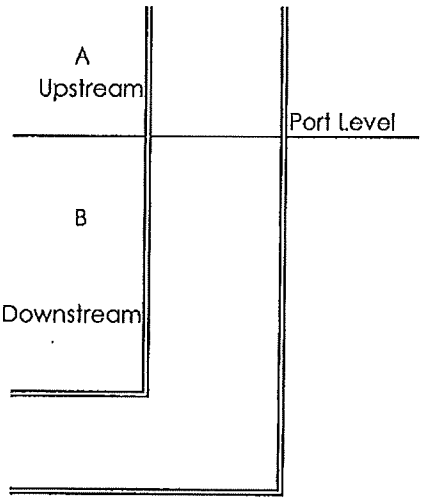
Traverse Point Locations		
Width (Port Side)	Length (in ")	
	Without Coupling (in ")	With Coupling (in ")
2.9	4.0	4.0
8.6	11.9	11.9
14.4	19.8	19.8

METHOD 1 - SAMPLING TRAVERSE POINTS FOR STATIONARY SOURCES

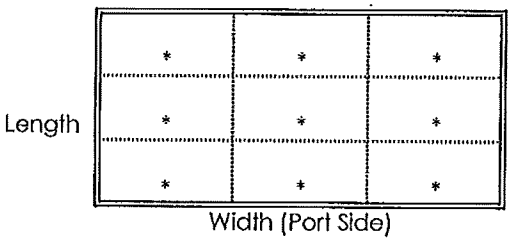
Client:	Gem State
Test Date:	1-Oct-15
Emissions Unit:	Unit 2
Project No.:	203705130

Distance Upstream of Disturbance A: (in")	72.0
Distance Downstream of Disturbance B: (in")	200.0
Width of Stack Cross Section (in")	31.5
Length of Stack Cross Section (in")	23.5
Equivalent Diameter	26.92
Number of Stack Diameters Upstream	2.67
Number of Stack Diameters Downstream	7.43

Minimum Number of Traverse Points Needed	12
Actual Number of Traverse Points Used	25
Coupling Length (in")	0



Number of Traverse Points Layout	
Minimum Number of Traverse Points	12
Traverse Points Matrix	4X3
Number of Traverse Points (Width)	5
Number of Traverse Points (Length)	5
Number of Traverse Points Sampled	25



When the eight- and two- diameter criterion can be met, the minimum number of traverse points shall be (1) twelve, for rectangular stacks with equivalent diameters greater than 24 inches; (3) nine for rectangular stacks with equivalent diameters between 12 and 24 inches.

When the eight- and two- diameter criterion can not be met, the minimum number of traverse points is determined from figure 1-1, 40 CFR Pt. 60, App. A-1, Method 1

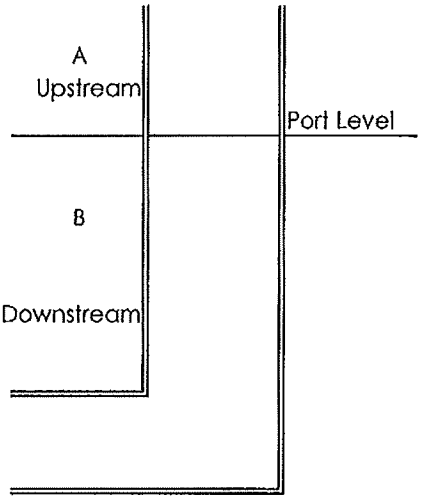
Traverse Point Locations		
Width (Port Side)	Length (in ")	
	Without Coupling (in ")	With Coupling (in ")
3.2	2.4	2.4
9.5	7.1	7.1
15.8	11.8	11.8
22.1	16.5	16.5
28.4	21.2	21.2

METHOD 1 - SAMPLING TRAVERSE POINTS FOR STATIONARY SOURCES

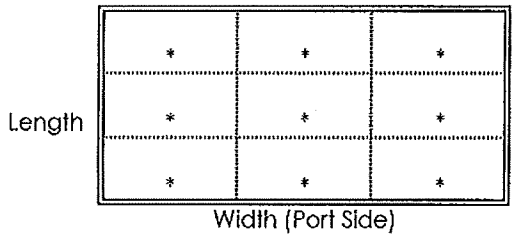
Client:	Gem State
Test Date:	1-Oct-15
Emissions Unit:	Unit 3
Project No.:	203705130

Distance Upstream of Disturbance A: (in")	72.0
Distance Downstream of Disturbance B: (in")	200.0
Width of Stack Cross Section (in")	31.5
Length of Stack Cross Section (in")	23.5
Equivalent Diameter	26.92
Number of Stack Diameters Upstream	2.67
Number of Stack Diameters Downstream	7.43

Minimum Number of Traverse Points Needed	12
Actual Number of Traverse Points Used	25
Coupling Length (in")	0



Number of Traverse Points Layout	
Minimum Number of Traverse Points	12
Traverse Points Matrix	4X3
Number of Traverse Points (Width)	5
Number of Traverse Points (Length)	5
Number of Traverse Points Sampled	25



When the eight- and two- diameter criterion can be met, the minimum number of traverse points shall be (1) twelve, for rectangular stacks with equivalent diameters greater than 24 inches; (3) nine for rectangular stacks with equivalent diameters between 12 and 24 inches.

When the eight- and two- diameter criterion can not be met, the minimum number of traverse points is determined from figure 1-1, 40 CFR Pt. 60, App. A-1, Method 1

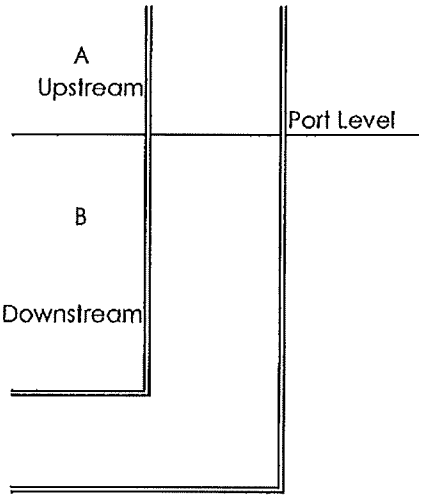
Traverse Point Locations		
Width (Port Side)	Length (in ")	
	Without Coupling (in ")	With Coupling (in ")
3.2	2.4	2.4
9.5	7.1	7.1
15.8	11.8	11.8
22.1	16.5	16.5
28.4	21.2	21.2

METHOD 1 - SAMPLING TRAVERSE POINTS FOR STATIONARY SOURCES

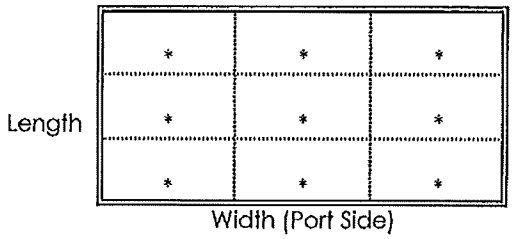
Client:	Gem State
Test Date:	1-Oct-15
Emissions Unit:	Unit 4
Project No.:	203705130

Distance Upstream of Disturbance A: (in")	72.0
Distance Downstream of Disturbance B: (in")	200.0
Width of Stack Cross Section (in")	36.75
Length of Stack Cross Section (in")	24.25
Equivalent Diameter	29.22
Number of Stack Diameters Upstream	2.46
Number of Stack Diameters Downstream	6.84

Minimum Number of Traverse Points Needed	16
Actual Number of Traverse Points Used	25
Coupling Length (in")	0



Number of Traverse Points Layout	
Minimum Number of Traverse Points	16
Traverse Points Matrix	4X4
Number of Traverse Points (Width)	5
Number of Traverse Points (Length)	5
Number of Traverse Points Sampled	25



When the eight- and two- diameter criterion can be met, the minimum number of traverse points shall be (1) twelve, for rectangular stacks with equivalent diameters greater than 24 inches; (3) nine for rectangular stacks with equivalent diameters between 12 and 24 inches.

When the eight- and two- diameter criterion can not be met, the minimum number of traverse points is determined from figure 1-1, 40 CFR Pt. 60, App. A-1, Method 1

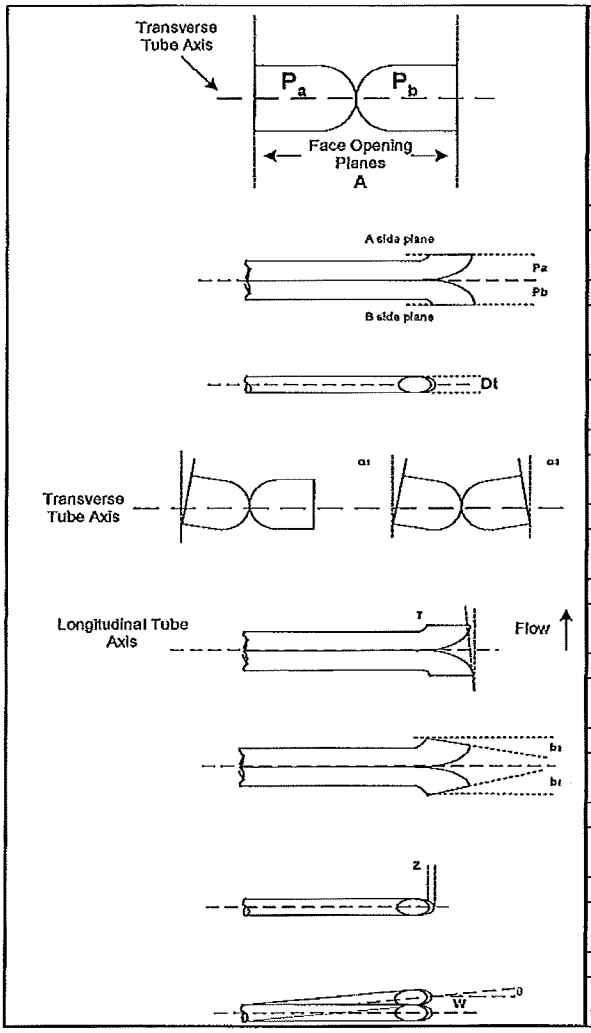
Traverse Point Locations		
Width (Port Side)	Length (in ")	
	Without Coupling (in ")	With Coupling (in ")
3.7	2.4	2.4
11.0	7.3	7.3
18.4	12.1	12.1
25.7	17.0	17.0
33.1	21.8	21.8

Stantec

TYPE S PROBE PITOT TUBE INSPECTION SHEET (Geometric Calibration)

Note: Method 2 provides the criteria for an acceptably constructed Type S pitot tube. However, the procedure for making the nessary measurements is not specified. One approach is given below.

1. Use a vise with the parallels and perpendicular faces. Use an angle-measuring device (analog or digital) for this check.
2. Place the pitot tube in the vise, and level the pitot tube horizontally using the angle-measuring device.
3. Place the angle-measuring device as shown below.
4. Measure distance A, which is P_A plus P_B. Method 2 specifies that $P_A = P_B$, but provides no tolerance for this measurement. Because this measurement is very difficult, it is suggested that $P_A = P_B = A/2$.
5. Measure the external tube diameter (Dt) with a micrometer, machinist's rule, or internal caliper.
6. Record all data as shown on the form below.
7. Calculate dimensions w and z as shown below.



Pitot Tube Number		4-3
Level and Perpendicular		Y
Damaged?		N
$\alpha 1$	$(-10 \le \alpha 1 \le +10)$	0.0
$\alpha 2$	$(-10 \le \alpha 2 \le +10)$	3.0
$\beta 1$	$(-5 \le \beta 1 \le +5)$	1.0
$\beta 2$	$(-5 \le \beta 2 \le +5)$	3.0
γ		2.0
θ		1.0
$Z = A (\tan \gamma)$	[≤ .32cm]	0.061
$W = A (\tan \theta)$	[≤ 0.08cm]	0.031
Dt =	[0.48cm ≤ 0.95cm]	0.65
A =	cm	1.76
A/2Dt =	$(1.05 \le PA/Dt \le 1.50)$	1.35

Certification

I certify that the Type S Pitot Tube ID: 4-3 meets or exceeds all specifications, criteria, and applicable design features.

Certified By: *Jesse Allegretto* Date February 11, 2015

Stantec

Thermocouple Calibration Inspection Sheet

Thermocouple ID No.	4-3	**Thermocouple Type**	K / T / S
Calibration Date	February 11, 2015	**Technician**	Jesse Allegretto
Reference Thermometer ID No.	ALTEX Model 222A Serial No. 9925002		

	Reference Temperature (°F)	Reference Temperature (°R)	Thermocouple Temperature (°F)	Thermocouple Temperature (°R)	Difference %
Ice Bath (32 °F, 492 °R)	32	492	32.0	492.0	0.00
Boiling Water (212 °F, 672 °R)	212	672	213.0	673.0	-0.15
Hot Oil (360 °F, 820 °R)	395	855	395.0	855.0	0.00
				Average	**-0.05**
				Is Percent Difference ≤ 1.50% Yes (Pass) No (Fail)	**PASS**

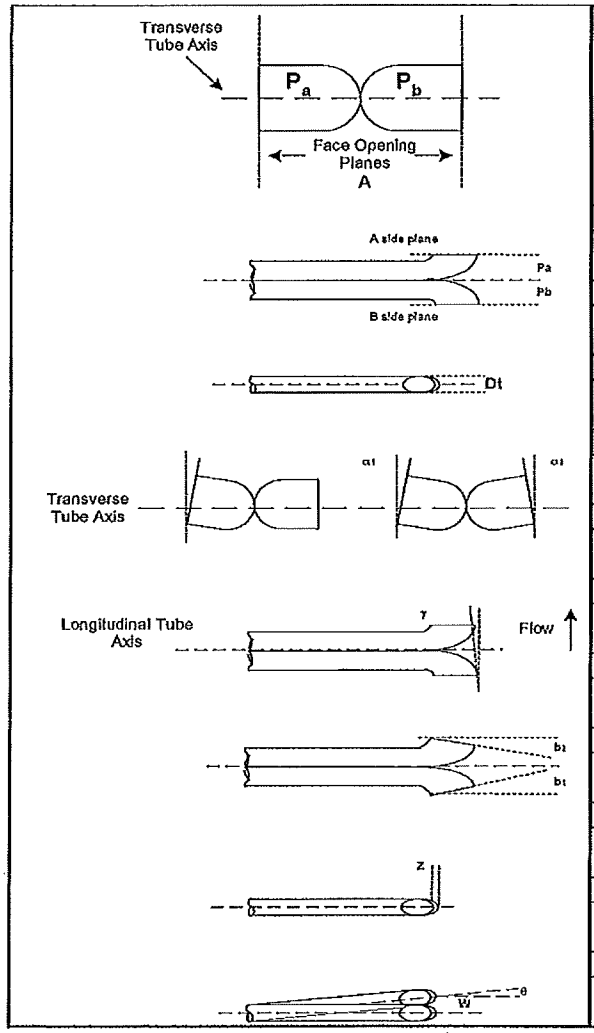
Comments:

Stantec

TYPE S PROBE PITOT TUBE INSPECTION SHEET (Geometric Calibration)

Note: Method 2 provides the criteria for an acceptably constructed Type S pitot tube. However, the procedure for making the nessary measurements is not specified. One approach is given below.

1. Use a vise with the parallels and perpendicular faces. Use an angle-measuring device (analog or digital) for this check.
2. Place the pitot tube in the vise, and level the pitot tube horizontally using the angle-measuring device.
3. Place the angle-measuring device as shown below.
4. Measure distance A, which is P_A plus P_B. Method 2 specifies that $P_A = P_B$, but provides no tolerance for this measurement. Because this measurement is very difficult, it is suggested that $P_A = P_B = A/2$.
5. Measure the external tube diameter (Dt) with a micrometer, machinist's rule, or internal caliper.
6. Record all data as shown on the form below.
7. Calculate dimensions w and z as shown below.



Pitot Tube Number		6-2
Level and Perpendicular		Y
Damaged?		N
a1	(-10 ≤ a1 ≤ +10)	3.0
a2	(-10 ≤ a2 ≤ +10)	3.0
b1	(-5 ≤ b1 ≤ +5)	1.0
b2	(-5 ≤ b2 ≤ +5)	0.0
g		2.0
q		1.0
Z = A (tan g) [≤ .32cm]		0.063
W = A (tan q) [≤ 0.08cm]		0.031
Dt =	[0.48cm ≤ 0.95cm]	0.63
A =	cm	1.80
A/2Dt =	(1.05 ≤ PA/Dt ≤ 1.50)	1.43

Certification

I certify that the Type S Pitot Tube ID: 6-2 meets or exceeds all specifications, criteria, and applicable design features.

Certified By: *Jesse Allegretto* Date February 11, 2015

Stantec

Thermocouple Calibration Inspection Sheet

Thermocouple ID No.	6-2	**Thermocouple Type**	K	T	S
Calibration Date	February 11, 2015	**Technician**	Jesse Allegretto		
Reference Thermometer ID No.	ALTEX Model 222A Serial No. 9925002				

	Reference Temperature (°F)	Reference Temperature (°R)	Thermocouple Temperature (°F)	Thermocouple Temperature (°R)	Difference %
Ice Bath (32 °F, 492 °R)	32	492	32.0	492.0	0.00
Boiling Water (212 °F, 672 °R)	212	672	212.0	672.0	0.00
Hot Oil (360 °F, 820 °R)	400	860	400.0	860.0	0.00
				Average	**0.00**
				Is Percent Difference ≤ 1.50% Yes (Pass) No (Fail)	**PASS**

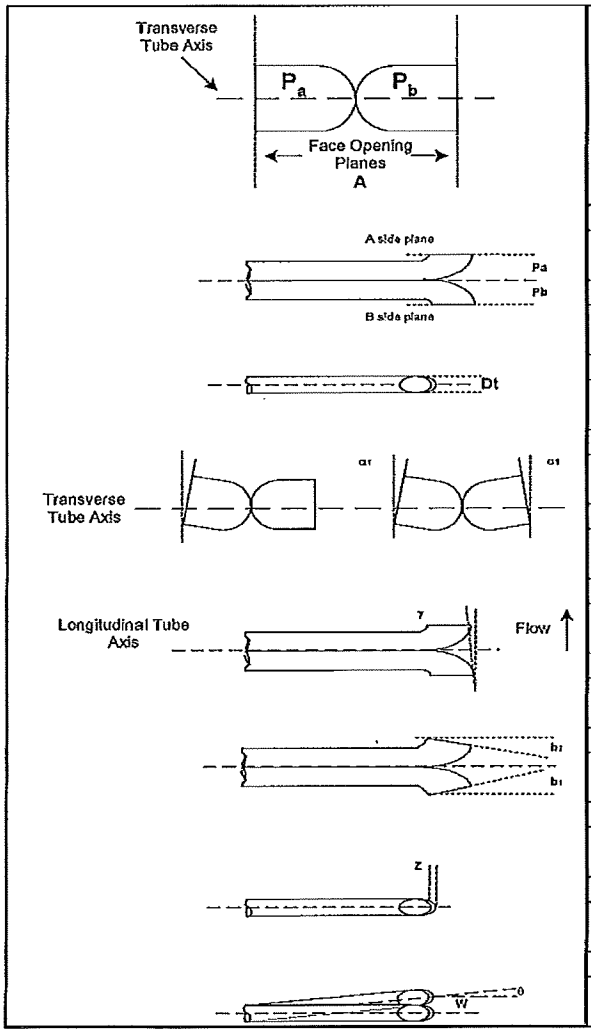
Comments:

Stantec

TYPE S PROBE PITOT TUBE INSPECTION SHEET (Geometric Calibration)

Note: Method 2 provides the criteria for an acceptably constructed Type S pitot tube. However, the procedure for making the nessary measurements is not specified. One approach is given below.

1. Use a vise with the parallels and perpendicular faces. Use an angle-measuring device (analog or digital) for this check.
2. Place the pitot tube in the vise, and level the pitot tube horizontally using the angle-measuring device.
3. Place the angle-measuring device as shown below.
4. Measure distance A, which is P_A plus P_B. Method 2 specifies that $P_A = P_B$, but provides no tolerance for this measurement. Because this measurement is very difficult, it is suggested that $P_A = P_B = A/2$.
5. Measure the external tube diameter (Dt) with a micrometer, machinist's rule, or internal caliper.
6. Record all data as shown on the form below.
7. Calculate dimensions w and z as shown below.



Pitot Tube Number	6-3
Level and Perpendicular	Y
Damaged?	N
$\alpha 1$ $(-10 \le \alpha 1 \le +10)$	3.0
$\alpha 2$ $(-10 \le \alpha 2 \le +10)$	3.0
$\beta 1$ $(-5 \le \beta 1 \le +5)$	1.0
$\beta 2$ $(-5 \le \beta 2 \le +5)$	0.0
γ	1.9
θ	1.1
$Z = A\ (\tan \gamma)$ [≤ .32cm]	0.058
$W = A\ (\tan \theta)$ [≤ 0.08cm]	0.034
Dt = [0.48cm ≤ 0.95cm]	0.61
A = cm	1.75
A/2Dt = (1.05 ≤ PA/Dt ≤ 1.50)	1.43

Certification

I certify that the Type S Pitot Tube ID: 6-3 meets or exceeds all specifications, criteria, and applicable design features.

Certified By: *Jesse Allegretto* Date December 7, 2015

Stantec

Thermocouple Calibration Inspection Sheet

Thermocouple ID No.	6-3	**Thermocouple Type**	K / T / S
Calibration Date	December 7, 2015	**Technician**	Jesse Allegretto
Reference Thermometer ID No.	ALTEX Model 222A Serial No. 9925002		

	Reference Temperature (°F)	Reference Temperature (°R)	Thermocouple Temperature (°F)	Thermocouple Temperature (°R)	Difference %
Ice Bath (32 °F, 492 °R)	32	492	32.0	492.0	0.00
Boiling Water (212 °F, 672 °R)	212	672	212.0	672.0	0.00
Hot Oil (360 °F, 820 °R)	400	860	400.0	860.0	0.00
				Average	**0.00**
				Is Percent Difference ≤ 1.50% Yes (Pass) No (Fail)	**PASS**

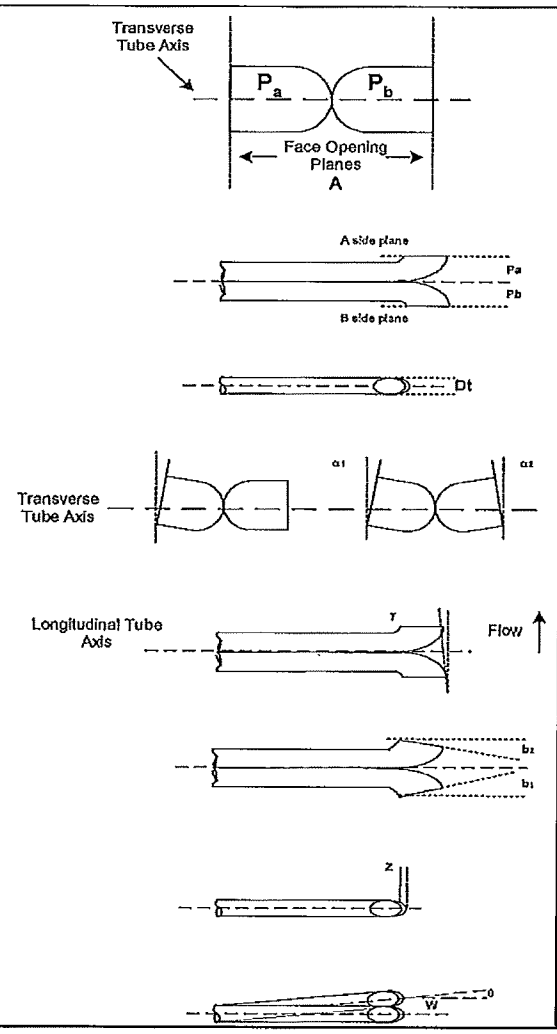
Comments:

Stantec

TYPE S PROBE PITOT TUBE INSPECTION SHEET (Geometric Calibration)

Note: Method 2 provides the criteria for an acceptably constructed Type S pitot tube. However, the procedure for making the nessary measurements is not specified. One approach is given below.

1. Use a vise with the parallels and perpendicular faces. Use an angle-measuring device (analog or digital) for this check.
2. Place the pitot tube in the vise, and level the pitot tube horizontally using the angle-measuring device.
3. Place the angle-measuring device as shown below.
4. Measure distance A, which is P_A plus P_B. Method 2 specifies that $P_A = P_B$, but provides no tolerance for this measurement. Because this measurement is very difficult, it is suggested that $P_A = P_B = A/2$.
5. Measure the external tube diameter (Dt) with a micrometer, machinist's rule, or internal caliper.
6. Record all data as shown on the form below.
7. Calculate dimensions w and z as shown below.



Pitot Tube Number	4-1
Level and Perpendicular	Y
Damaged?	N
$\alpha 1$ $(-10 \le \alpha 1 \le +10)$	2.0
$\alpha 2$ $(-10 \le \alpha 2 \le +10)$	2.0
$\beta 1$ $(-5 \le \beta 1 \le +5)$	1.0
$\beta 2$ $(-5 \le \beta 2 \le +5)$	4.0
γ	2.0
θ	1.0
$Z = A (\tan \gamma)$ [≤ .32cm]	0.061
$W = A (\tan \theta)$ [≤ 0.08cm]	0.031
Dt = [0.48cm ≤ 0.95cm]	0.611
A = cm	1.75
$A/2Dt = (1.05 \le P_A/Dt \le 1.50)$	1.43

Certification

I certify that the Type S Pitot Tube ID: 4-1 meets or exceeds all specifications, criteria, and applicable design features.

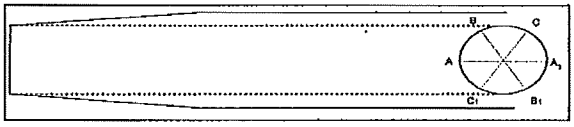
Certified By: *Jesse Allegretto* Date February 11, 2015

ISOKINETIC SAMPLING - NOZZLE SELECTION
EPA METHOD 5/202

Time	DGM	Delta P (ΔP)	Orifice Delta H		Tstack (°F)	DGM Temp (°F)		% ISO
			Actual	Desired		In	Out	
1.00	0.75	0.55	1.81	2.07	175	85.0	85.0	94.02

Estimation of Ideal Nozzle Diameter (in")	0.239	Run Time (min)	108
Diameter of Nozzle (in")	0.250	Traverse Points	9
Diameter of Nozzle (ft^2)	0.00034	Min / Point	12.0
ΔH K Factor	3.72	Total Volume (dcf)	81.000
		Est. Corrected Volume (dscf)	68.880

Barometric Pressure ("Hg)	25.65	Ave Ts (°R)	635.0
Stack Static Pressure	0.50	Bws (est.)	0.0700
Pitot Tube Calibration Coefficient (Cp)	0.84	1-Bws	0.9300
Percent Moisture in Stack Gas Estimate (% H_2O)	7.00%	Total Volume DCF	0.750
Average Stack Temperature (°F)	175.0	Total Volume DSCF	0.638
Ave. Delta P (ΔP)	0.55	Ave. Delta P (ΔP) ("H_2O)	0.55
Net Time of Test (min)	1	Average Delta H@ ("H_2O)	1.81
Meter Box No.	3X	Ave. of the Sqrt ΔP	0.74
Ym Meter Corr. Factor	1.019	Ave. Tm (°F)	85.00
Meter Delta H@ ("H_2O)	2.096	Stack Gas Pressure ("Hg)	25.69
Np # of Points	1	Stack Gas Velocity (ft/sec)	49.99
Mol Wt. of Stack Gas Dry	29.00	Percent Isokinetic (%I)	94.02
Mol. Wt. of Stack Gas Wet	28.23		



Diameter	Measurement	
A - A1	0.240	
B - B1	0.240	
C - C1	0.240	
Maximum Difference	0.000	(< 0.004 in.)
Average Diameter	0.240	

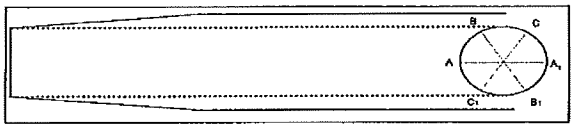
Nozzle Identification No.:	0.250
Calibration Date:	10/01/15
Technician:	DEV
Nozzle Type:	Teflon

ISOKINETIC SAMPLING - NOZZLE SELECTION
EPA METHOD 5/202

Time	DGM	Delta P (ΔP)	Orifice Delta H		Tstack (°F)	DGM Temp (°F)		% ISO
			Actual	Desired		In	Out	
1.00	0.75	0.25	1.51	1.84	170	95.0	95.0	91.19

Estimation of Ideal Nozzle Diameter (in")	0.296	Run Time (min)	125
Diameter of Nozzle (in")	0.300	Traverse Points	25
Diameter of Nozzle (ft^2)	0.00049	Min / Point	5.00
ΔH K Factor	7.42	Total Volume (dcf)	93.750
		Est. Corrected Volume (dscf)	74.192

Barometric Pressure ("Hg)	25.40	Ave Ts (°R)	630.0
Stack Static Pressure	0.50	Bws (est.)	0.0700
Pitot Tube Calibration Coefficient (Cp)	0.84	1-Bws	0.9300
Percent Moisture in Stack Gas Estimate (% H_2O)	7.00%	Total Volume DCF	0.750
Average Stack Temperature (°F)	170.0	Total Volume DSCF	0.594
Ave. Delta P (ΔP)	0.25	Ave. Delta P (ΔP) ("H_2O)	0.25
Net Time of Test (min)	1	Average Delta H@ ("H_2O)	1.51
Meter Box No.	3U	Ave. of the Sqrt ΔP	0.50
Ym Meter Corr. Factor	0.9760	Ave. Tm (°F)	95.00
Meter Delta H@ ("H_2O)	1.9650	Stack Gas Pressure ("Hg)	25.44
Np # of Points	1	Stack Gas Velocity (ft/sec)	33.37
Mol Wt. of Stack Gas Dry	29.00	Percent Isokinetic (%I)	91.19
Mol. Wt. of Stack Gas Wet	28.23		



Diameter	Measurement	
A - A1	0.280	
B - B1	0.280	
C - C1	0.280	
Maximum Difference	0.000	(< 0.004 in.)
Average Diameter	0.280	

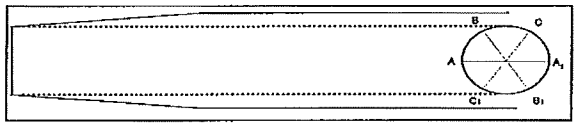
Nozzle Identification No.:	0.300
Calibration Date:	10/01/15
Technician:	DEV
Nozzle Type:	Teflon

ISOKINETIC SAMPLING - NOZZLE SELECTION
EPA METHOD 5/202

Time	DGM	Delta P (ΔP)	Orifice Delta H			DGM Temp (°F)		
			Actual	Desired	Tstack (°F)	In	Out	% ISO
1.00	0.80	0.36	1.93	1.92	198	95.0	95.0	101.05

Estimation of Ideal Nozzle Diameter (in")	0.268	Run Time (min)	125
Diameter of Nozzle (in")	0.275	Traverse Points	25
Diameter of Nozzle (ft^2)	0.00041	Min / Point	5.00
ΔH K Factor	5.24	Total Volume (dcf)	100.000
		Est. Corrected Volume (dscf)	82.319

Barometric Pressure ("Hg)	25.40	Ave Ts (°R)	658.0
Stack Static Pressure	1.90	Bws (est.)	0.0700
Pitot Tube Calibration Coefficient (Cp)	0.84	1-Bws	0.9300
Percent Moisture in Stack Gas Estimate (% H_2O)	7.00%	Total Volume DCF	0.800
Average Stack Temperature (°F)	198.0	Total Volume DSCF	0.659
Ave. Delta P (ΔP)	0.36	Ave. Delta P (ΔP) ("H_2O)	0.36
Net Time of Test (min)	1	Average Delta H@ ("H_2O)	1.93
Meter Box No.	4x	Ave. of the Sqrt ΔP	0.60
Ym Meter Corr. Factor	1.0140	Ave. Tm (°F)	95.00
Meter Delta H@ ("H_2O)	2.0480	Stack Gas Pressure ("Hg)	25.54
Np # of Points	1	Stack Gas Velocity (ft/sec)	41.37
Mol Wt. of Stack Gas Dry	29.00	Percent Isokinetic (%I)	101.05
Mol. Wt. of Stack Gas Wet	28.23		



Nozzle Identification No.:	0.275
Calibration Date:	10/01/15
Technician:	DEV
Nozzle Type:	Teflon

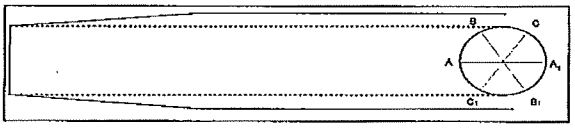
Diameter	Measurement	
A - A1	0.275	
B - B1	0.275	
C - C1	0.275	
Maximum Difference	0.000	(< 0.004 in.)
Average Diameter	0.275	

ISOKINETIC SAMPLING - NOZZLE SELECTION
EPA METHOD 5/202

Time	DGM	Delta P (ΔP)	Orifice Delta H		Tstack (°F)	DGM Temp (°F)		% ISO
			Actual	Desired		In	Out	
1.00	0.85	0.57	1.76	1.82	165	95.0	95.0	99.15

Estimation of Ideal Nozzle Diameter (in")	0.247	Run Time (min)	125
Diameter of Nozzle (in")	0.250	Traverse Points	25
Diameter of Nozzle (ft^2)	0.00034	Min / Point	5.00
ΔH K Factor	3.19	Total Volume (dcf)	106.250
		Est. Corrected Volume (dscf)	85.352

Barometric Pressure ("Hg)	25.40	Ave Ts (°R)	625.0
Stack Static Pressure	1.70	Bws (est.)	0.0700
Pitot Tube Calibration Coefficient (Cp)	0.84	1-Bws	0.9300
Percent Moisture in Stack Gas Estimate (% H_2O)	7.00%	Total Volume DCF	0.850
Average Stack Temperature (°F)	165.0	Total Volume DSCF	0.683
Ave. Delta P (ΔP)	0.57	Ave. Delta P (ΔP) ("H_2O)	0.57
Net Time of Test (min)	1	Average Delta H@ ("H_2O)	1.76
Meter Box No.	5x	Ave. of the Sqrt ΔP	0.75
Ym Meter Corr. Factor	0.9900	Ave. Tm (°F)	95.00
Meter Delta H@ ("H_2O)	1.7350	Stack Gas Pressure ("Hg)	25.53
Np # of Points	1	Stack Gas Velocity (ft/sec)	50.27
Mol Wt. of Stack Gas Dry	29.00	Percent Isokinetic (%I)	99.15
Mol. Wt. of Stack Gas Wet	28.23		



Diameter	Measurement	
A - A1	0.250	
B - B1	0.250	
C - C1	0.250	
Maximum Difference	0.000	(< 0.004 in.)
Average Diameter	0.250	

Nozzle Identification No.:	0.250
Calibration Date:	10/01/15
Technician:	DEV
Nozzle Type:	Teflon

Stantec

Thermocouple Calibration Inspection Sheet

Thermocouple ID No.	4-1	**Thermocouple Type**	K / T / S
Calibration Date	February 11, 2015	**Technician**	Jesse Allegretto
Reference Thermometer ID No.	ALTEX Model 222A Serial No. 9925002		

	Reference Temperature (°F)	Reference Temperature (°R)	Thermocouple Temperature (°F)	Thermocouple Temperature (°R)	Difference %
Ice Bath (32 °F, 492 °R)	32	492	32.0	492.0	0.00
Boiling Water (212 °F, 672 °R)	212	672	212.0	672.0	0.00
Hot Oil (360 °F, 820 °R)	395	855	390.0	850.0	0.58
				Average	**0.19**
				Is Percent Difference ≤ 1.50% Yes (Pass) No (Fail)	**PASS**

Comments:

ilac-MRA ACCREDITED Calibration Certificate No. 1760.01

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

Cert. No.: 4198-6352566

Traceable® Certificate of Calibration for Hand Held Barometer

Instrument Identification:

Model: 4198 S/N: 140755782 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Digital Barometer	D4540001	9/15/15	1000362707
Digital Thermometer	111879345	2/12/15	4000-5704449

Certificate Information:

Technician: 57 Procedure: CAL-32 Cal Date: 11/18/14 Due Date: 11/18/16

Test Conditions: 22.0°C 31.0 %RH 1034 mBar

Calibration Data: (New Instrument)

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
mb/hPa		N.A.		550.05	547	Y	542	558	0.70	>4:1
mb/hPa		N.A.		750.10	754	Y	742	758	0.70	>4:1
mb/hPa		N.A.		1,030.10	1,029	Y	1,022	1,038	0.70	>4:1
°C		N.A.		21.992	22.6	Y	21.0	23.0	0.17	>4:1

This Instrument was calibrated using Instruments Traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min = As Left Nominal(Rounded) - Tolerance; Max = As Left Nominal(Rounded) + Tolerance; Date=MM/DD/YY

Nicol Rodriguez, Quality Manager

Aaron Judice, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Hand Held Barometer should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Hand Held Barometers change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 4455 Rex Road Friendswood, TX 77546 USA
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

Control Company is an ISO 17025:2005 Calibration Laboratory Accredited by (A2LA) American Association for Laboratory Accreditation, Certificate No. 1760.01.
Control Company is ISO 9001:2008 Quality Certified by (DNV) Det Norske Veritas, Certificate No. CERT-01805-2006-AQ-HOU-RvA.
International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).

Traceable® is a registered trademark of Control Company © 2009 Control Company

Analytical & Precision Balance Co., Inc.
The Weighing Solution
ANSI/ISO/IEC 17025 Accredited • GSA Contract Holder

CERTIFICATE OF CALIBRATION

ISO 17025 ACCREDITED

International Accreditation Service, Inc.
Calibration Laboratory # CL-104

9830 S. 51st Street, Suite B-103 • Phoenix, Arizona 85044
(480) 598-0321 • FAX (480) 598-0768 • (800) 934-4451
E-mail: info@apscales.com
Website: apscales.com

TEMP 74 F° R.H. 49 %
AZ RSR License #0006
AZ RSA License #014790
P.O. # _____
Equipment # N/A

120g x 0.0001g
Capacity/Resolution

±0.0005g
Tolerance Value

Comments:

All ISO 17025 accredited calibrations performed by Analytical & Precision Balance Co. Certified Calibration Technicians are done using N.I.S.T. Traceable weight standards issued from a NVLAP Accredited Metrology Laboratory. These Metrology Weight Reports are available upon client's request.

Customer

Technical Representative

Client #955				
Customer Name: Stantec	Bldg. Main		Date 6/14/15	
	Room Lab		Recall Date 8/16	
Mfgr. AND	Model GR-120		Serial No. 14242676	
Calibration Instructions:	Internal Cal. ☒	External Cal. ☐	Standard Cal. Procedure ☒	Handbook 44 ☐
List Weights Used	500mg	1g	60g	120g
1. Prior to Service	0.5000g	1.0000g	60.0005g	120.0009g
Tolerance Error	0	0	0	+0.0009g
2. After Service	0.5000g	1.0000g	60.0000g	120.0000g
Corner Load	Weight Used: 50g	Prior to Service	2: 0.0000g	3: 0.0000g
			1: 0.0000g	4: -0.0002g
Corner Load		After Service	2: 0.0000g	3: 0.0000g
			1: 0.0000g	4: -0.0002g

*CORNER-LOAD ECCENTRICITY (TYPE B UNCERTAINTY) ☑ *LINEARITY (TYPE A UNCERTAINTY) ☑ *REPRODUCIBILITY (TYPE A UNCERTAINTY) ☑

*This is a Certificate of Calibration not a Combined Uncertainty Report. See below for explanation.[1]

1. Prior to Service: ☐ This instrument was within tolerance and customer specifications
☒ This instrument was NOT within tolerance and customer specifications

2. After Service: ☒ This instrument IS WITHIN TOLERANCE and customer specifications
☐ This instrument is OUT OF TOLERANCE: DO NOT USE THIS INSTRUMENT. Significant out of tolerance may affect end product.

[1]Combined Type A & B Uncertainty Report which includes the adjustment for air buoyancy for the standards used in the calibration process, local acceleration of gravity correction, with estimated standard deviation on repeatability measurements, hysteresis, and worst case eccentricity are provided on a separate report per client's request. The methods used for determining uncertainties in the Combined Uncertainty Report are either the Root Sum Square Statistical Method, Total Collected Added Uncertainty, or an Expanded Uncertainty with a Coverage Factor k = 2. Provided level of confidence: 95%. All measurements were performed with a minimum 4:1 test uncertaintyratio unless otherwise noted in comments section. Measurements reported are traceable to SI units via standards traceable to NIST

Form # 1987 Rev. 4-15
This form is the property of Analytical & Precision Balance Co., Inc. and may not be reproduced. The information contained on this document is proprietary to the client referenced on this form and Analytical & Precision Balance Co., Inc. and may not be altered or reproduced, except in full, without written approval by Analytical & Precision Balance Co., Inc. Original: Vendor Copy: Customer

Analytical & Precision Balance Co., Inc.
The Weighing Solution
ANSI/ISO/IEC 17025 Accredited • GSA Contract Holder

CERTIFICATE OF CALIBRATION
ISO 17025 ACCREDITED

International Accreditation Service, Inc.
Calibration Laboratory # CL-104
9830 S. 51st Street, Suite B-103 • Phoenix, Arizona 85044
(480) 598-0321 • FAX (480) 598-0768 • (800) 934-4451
E-mail: info@apscales.com
Website: apscales.com

TEMP 74 F° R.H. 54 %
AZ RSR License #00 6
AZ RSA License #014790
P.O. # _____
Equipment # N/A

120g x 0.0001g
Capacity/Resolution

±0.0005g
Tolerance Value

Comments:

A specific weight kit is assigned to each APB Certified Calibration Technician. All kits and weight standards have the same NIST Traceability and control #.

NIST TRACEABILITY
Control No. 140203001 Expires 2/2015

Client # 955			
Customer Name: JBR / Stantec	Bldg. Main	Room Lab	Date 8/26/14 Recall Date 8/15
Mfgr.: AND	Model: GR-120	Serial No.: 14242070	

Calibration Instructions: Internal Cal. ☒ External Cal. ☐ Standard Cal. Procedure ☒ Handbook 44 ☐

List Weights Used	500mg	1g	60g	120g
1. Prior to Service	0.5000g	1.0000g	60.0003g	120.0005g
Tolerance Error	0	0	0	0
2. After Service	0.5000g	1.0000g	60.0003g	120.0005g
Corner Load	Weight Used: 50g	Prior to Service	2 +0.0002g	3 +0.0002g
			1 0.0000g	4 0.0000g
Corner Load		After Service	2 +0.0002g	3 +0.0002g
			1 0.0000g	4 0.0000g

*CORNER-LOAD ECCENTRICITY (TYPE B UNCERTAINTY) ☑ *LINEARITY (TYPE A UNCERTAINTY) ☑ *REPRODUCIBILITY (TYPE A UNCERTAINTY) ☑

*This is a Certificate of Calibration not a Combined Uncertainty Report. See below for explanation.[1]

1. Prior to Service: ☒ This instrument was within tolerance and customer specifications
☐ This instrument was NOT within tolerance and customer specifications

2. After Service: ☒ This instrument IS WITHIN TOLERANCE and customer specifications
☐ This instrument is OUT OF TOLERANCE: DO NOT USE THIS INSTRUMENT. Significant out of tolerance may affect end product.

[1]Combined Type A & B Uncertainty Report which includes the adjustment for air buoyancy for the standards used in the calibration process, local accoleration of gravity correction, with estimated standard deviation on repeatability measurements, hysteresis, and worst case eccentricity are provided on a separate report per client's request. The methods used for determining uncertainties in the Combined Uncertainty Report are either the Root Sum Square Statistical Method, Total Collected Added Uncertainty, or an Expanded Uncertainty with a Coverage Factor k = 2. Provided level of confidence: 95%. All measurements were performed with a minimum 4:1 test uncertainty ratio unless otherwise noted in comments section. Measurements reported are tracoable to SI units via standards traceable to NIST

L & T
Customer

Technical Representative

Original: Customer
Copy: Vendor

Form # 1987 Rev. 9-12
This form may not be reproduced, except in full, without prior written approval from Analytical & Precision Balance Co., Inc.

Appendix G AMBIENT AIR BOUNDARY MEMO

creating solutions for today's environment

JBR Environmental Consultants, Inc.
7669 W. Riverside Dr., Ste. 101
Boise, Idaho 83714
[p] 208.853.0883
[f] 208.853.0884
www.jbrenv.com

MEMORANDUM

To: IDEQ Air Quality Modeling/Permit Staff

From: David Strohm, Daniel Heiser, Eric Clark, JBR

cc: Bill Schow, Gem State Processing, LLC

Date: August 2, 2013

Subject: Rationale for Expansion of Ambient Air Boundary

Purpose

Gem State Processing, LLC (Gem State) is a potato dehydration facility located in Heyburn, Idaho. Gem State is required to demonstrate facility-wide compliance with all National Ambient Air Quality Standards (NAAQS). The facility is in the process of becoming compliant with the 24-hr $PM_{2.5}$ standard. As part of the compliance demonstration, the status of the ambient air boundary has been evaluated. It has been determined that an expansion of the existing boundary is necessary to demonstrate compliance with the 24-hr $PM_{2.5}$ NAAQS. As a result, Gem State has drafted lease agreements with two neighboring business entities, Eastern Idaho Railroad, LLC (EIRR) and the Boyer Company (Boyer). These lease agreements are consistent with EPA guidance as outlined in the June 22, 2007, Stephen Page memorandum. The following discussion outlines the portions of the Page memo applicable to Gem State and how the two agreements meet those criteria to expand the ambient air boundary. JBR respectfully requests that IDEQ review the findings in this memorandum and provide concurrence that the proposed boundary fulfills the EPA guidance and is acceptable for use in the facility's NAAQS analysis.

EPA Stephen Page Memo – June 22, 2007

The EPA mandates that two requirements be met to exempt an area from ambient air. First, a source must own or control the land or property. Second, public access must be precluded by a fence or other physical barrier. Four scenarios may apply to determine the air boundary and its effect on a lessor and/or lessee (Page Memo, 2).

1. Under an existing business relationship two (or more) operating companies constitute one single source (Page Memo, 2) (Not applicable to Gem State).

2. Two (or more) companies operate separate sources on property owned by one company and leased in part to the other, and the lessor retains control over public access to the entire property and actually maintains a physical barrier around it to preclude public access (Page Memo, 2) (Not applicable to Gem State).

3. Two (or more) companies operate separate sources on property owned by one company and leased in part to the other, and the lessor grants the lessee sole control over who may access the leased property (Page Memo, 2&3) (Applicable to Gem State).

4. The property owner agrees to allow a lessee to operate a business on the leased land that is open to the general public (such as a restaurant, retail store or office building) the outdoors areas that are accessible to the public, such as parking areas and entrances would be ambient air to the lessor and lessee (Page Memo, 3) (Not applicable to Gem State).

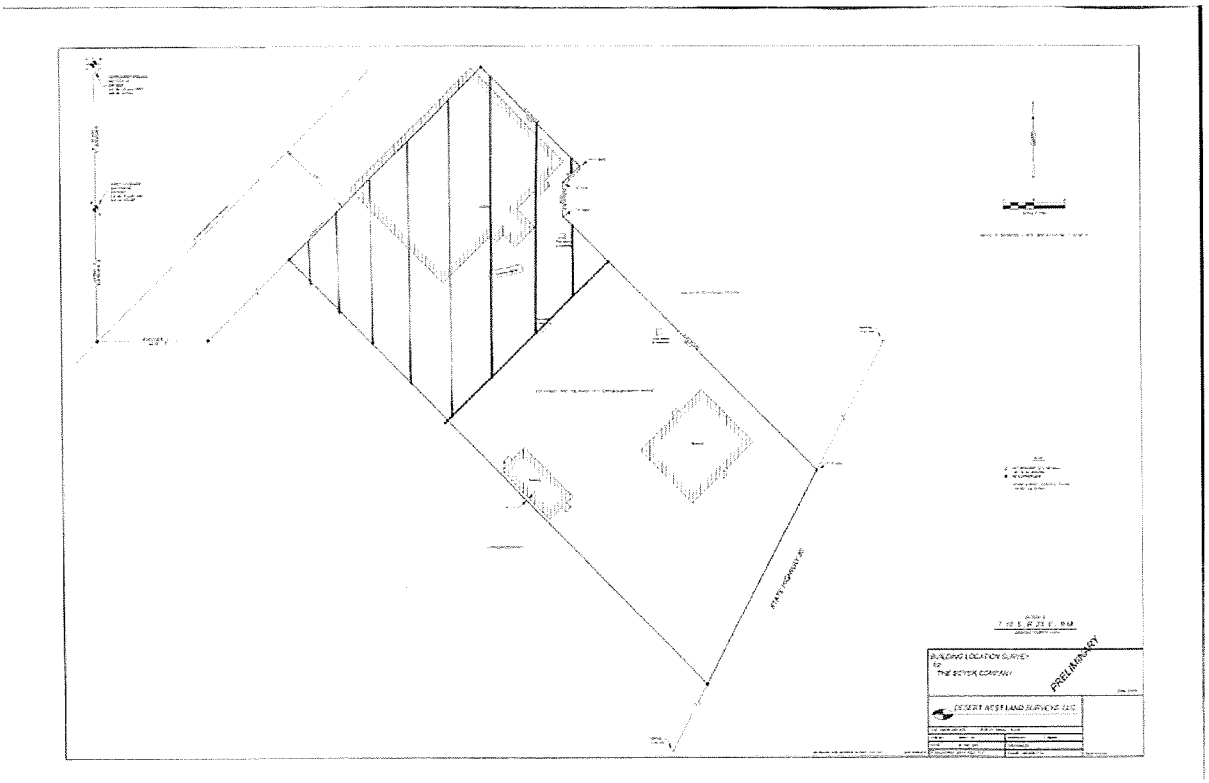
As currently drafted, each lease agreement states that the lessor (EIRR or Boyer) grants Gem State sole access control of the leased property. Section 4.2 of the lease agreement between EIRR states: Neither Party shall allow the Leased Premises to be used by any other person or firm without the prior written consent of the other Party. All public access to the leased premises shall be precluded". In addition, proper physical barriers such as fencing prohibits access for all of the Boyer leased area and the majority of the EIRR property along multiple spurs of the main railway line. On all fencing and particularity where gates and access points exist, appropriate signage has been added to notify the public that no access is legally allowed. It should be noted that a member of the public could access the property via the trail spur tracks. However, to do so, one would have to trespass a few hundred yards along the main railway in order to gain access.

Boyer Leased Area and Agreement

The leased property boundary of Gem State is to be extended to the southwest and encompasses the entirety of the dry storage building (see Figure 1). The hashed area of the figure is included in the lease agreement. The intention of the agreement is to prohibit access to the storage building and surrounding area via existing fencing along the railroad adjacent to the backside of the storage building. No trespassing signage will be included to the south side of the building and other locations where fencing does not exist.

The lease agreement, explicitly states that "Gem State will maintain sole control over the leased premises. All persons not employed by Gem State are allowed on the leased premises by escort or prior permission only. All public access to the leased premises shall be precluded. For those locations void of existing fencing, appropriate "No Trespassing" or "Private Property" signage will be included to limit access."

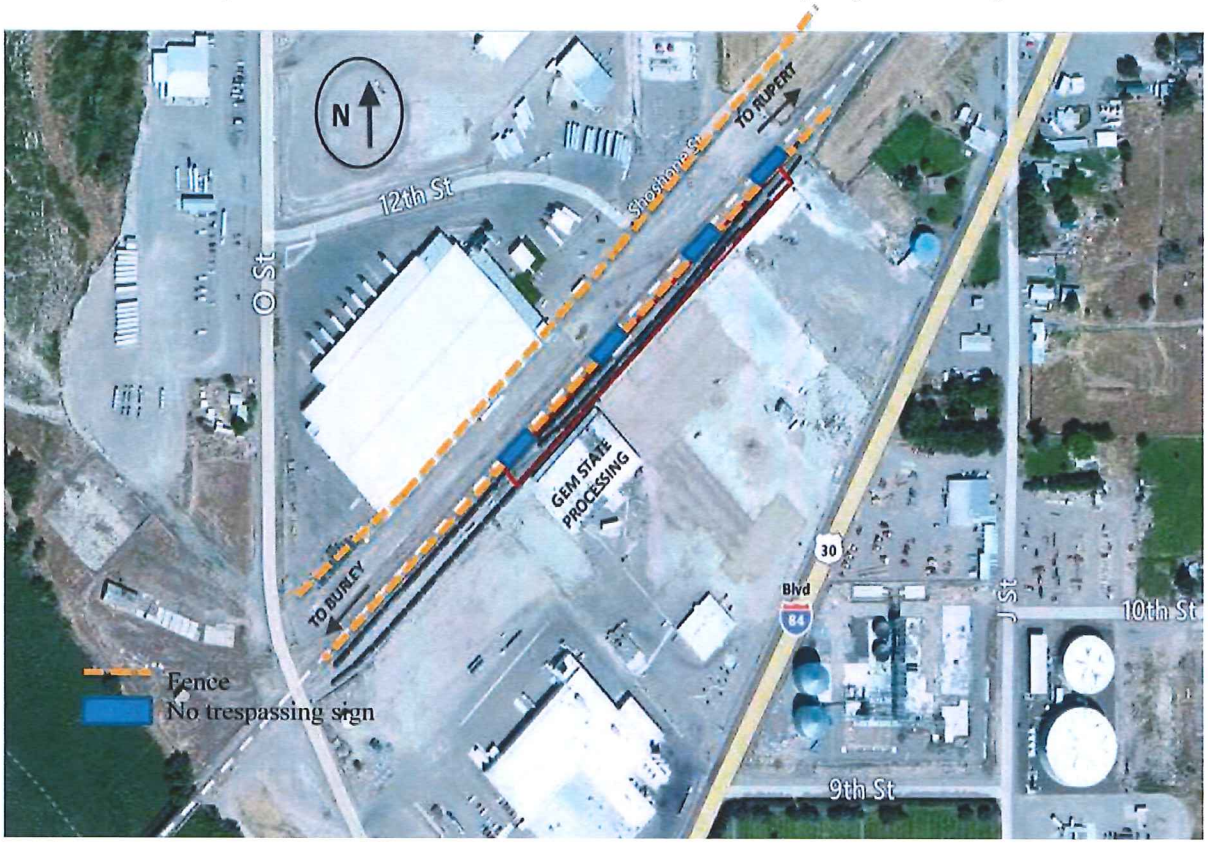
Figure 1 – Boyer Leased Property Boundary



Eastern Idaho Railroad, LLC Leased Area and Agreement

Section 4 of the lease agreement between EIRR and Gem State explicitly states that "the Leased Premises will satisfy EPA requirements of control". Therefore, like Boyer, EIRR is granting Gem State sole control over the rail spur adjacent to the northwest border of current ambient air boundary. As indicated in Figure 2, the newly leased area extends over the entire spur utilized by Gem State. It is 1000 feet in length and extends 75 feet toward the main track from the current property line. It parallels the main line track and is 25 feet from the center of the main track to the outer edge of the added parcel. The boundary extension runs from Mile Post (MP) 19.72 to MP 19.91.

Figure 2 – Eastern Idaho Railroad Leased Property Boundary



Existing fencing parallels the spur to the south and runs the length of the entire Gem State property. Fencing also exists on the opposite side of the main track surrounding the old Simplot building. Fencing exists from the point where the spur meets the main track to the terminus of the spur. However, the surrounding area is fully controlled by either EIRR or Gem State. "No Trespassing" signage will be placed throughout. The following pictures illustrates where fencing and signage exist relative to the rail spurs and main track.

Figure 3 – Fencing Northwest Property Boundary

Figure 3 shows the northwestern boundary looking south back toward the facility. As shown, there is fencing running parallel to the rail spur closet to the Gem State property.

Figure 4 – Fencing Southwest Property Boundary

Figure 4 illustrates fencing fully surrounding the main track line. There is also a lockable gate and appropriate signage prohibiting access (see Figure 5). All rail spurs are enclosed by fencing beginning to the south of the leased premises. At a certain point, heading northeast paralleling the main track, the fencing on the Gem State side only encompasses the innermost spur (see Figure 3). However, fencing on the far side of the main track remains throughout the length of the main track. Therefore, the entire area is privately owned and controlled by the EIRR.

Figure 5 – No Trespassing Signage North Gate

According to the Federal Railroad Administration, it is illegal for anyone to trespass on railroads or right of ways without proper permission. Therefore, a member of the general public will have to trespass along the main railroad track and right a way to gain access to the spur.

Conclusion

Gem State will be granted sole control of the two new leased properties. Proper barriers such as existing fencing or appropriate signage has been constructed in order to preclude public access. On the extreme off chance that a member of the public would be walking along the main track line for several hundred feet, proper signage will be posted prohibiting access to the rail spur.

Please do not hesitate to contact me at eclark@jbrenv.com or 208-853-0883.

Eric E. Clark

JBR ENVIRONMENTAL CONSULTANTS, INC.
Eric Clark, EIT
Environmental Analyst II